

Hot Water Heat Pump Unit

CAHV

CAHV-R450YA-HPB(-BS)

For use with R454C

Installation/Operation Manual
Installations-/Bedienungsanleitung
Manuel d'installation et d'utilisation
Installatie-/gebruikshandleiding
Manual de instalación/operación
Manuale di installazione e funzionamento
Εγχειρίδιο εγκατάστασης/λειτουργίας
Manual de Instalação/Funcionamento
Installations- og betjeningsvejledning
Installations- och driftshandbok
Ръководство за монтаж/експлоатация
Instrukcja montażu/obsługi
Installasjons-/driftshåndbok
Asennus- ja käyttöopas
Руководство по установке/эксплуатации
Посібник з монтажу/експлуатації
Instalační/provozní příručka
Inštaláčn/prevdzkov prručka
Beptsi/zemelttsi kzkonyv
Prironik za namestitev/uporabo
Manual de instalare/utilizare
Paigaldus-/kasutusjuhend
Uzstdšanas/ekspluatcijas rokasgrmata
Montavimo ir eksploataavimo vadovas
Upute za postavljanje/rukovanje

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1. Safety Precautions

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



Indicates a risk of death or serious injury



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.

1-1. General



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.

Do not connect multiple units to other models with different refrigerants.

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 antifreeze 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.
-

1-2. 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.

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1-3. 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.

1-4. 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.

Do not open the control box cover while charging refrigerant.

- If the refrigerant leaks, a fire may result.

1-5. 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.

1-6. 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.

1-7. IMPORTANT

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

To reduce the risk of 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.

2. Selecting the Installation Site

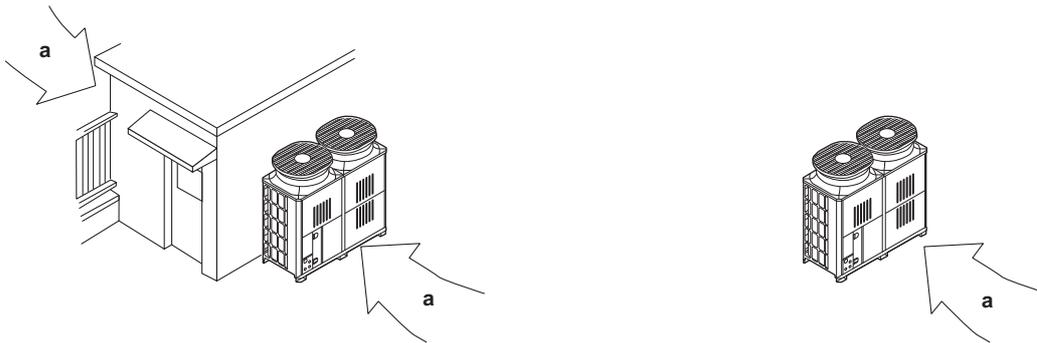
2-1. Installation Conditions

Consult with the client to select an outdoor unit installation site that meets the following conditions:

- ♦ The unit is not subject to heat from other heat sources.
- ♦ The unit's noise will not be problematic.
- ♦ The unit's water can be properly drained.
- ♦ The space requirements are met. Refer to the following page(s) for detail. "Space Requirements" (p. 11)
- ♦ Wet bulb temp. does not exceed 32°C.

2-1-1. Protection against wind exposure

A unit installed alone is susceptible to wind exposure, so choose a sheltered site (e.g., behind a structure). If the wind consistently blows from one direction, position the unit so its outlet faces away from the wind.



a Wind

2-1-2. Cold climate installation

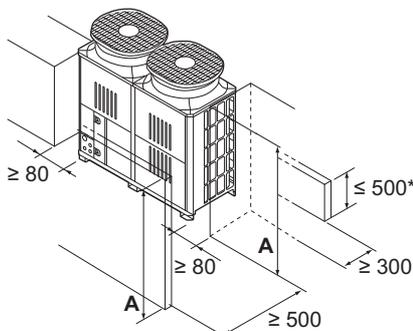
- ♦ Choose a sheltered site to minimize exposure to winds, rain, and snow, and to prevent possible damage or injury from falling icicles, particularly when installing on a roof.
- ♦ Install snow hoods on both the discharge and suction ducts if the units are exposed to rain, winds, or snow, or if the outdoor temperature can drop to -10°C or below. Use a snow net or snow fence as necessary.
- ♦ Install the units on a base approximately twice the height of the expected snowfall.
- ♦ If the units are operated continuously in freezing temperatures, install a base heater to prevent water at the unit bottom from freezing.

2-2. Space Requirements

2-2-1. Individual unit installation

[1] No walls surrounding the unit are taller than the unit height, and the wall behind the unit is no higher than 500 mm (* in the figure).

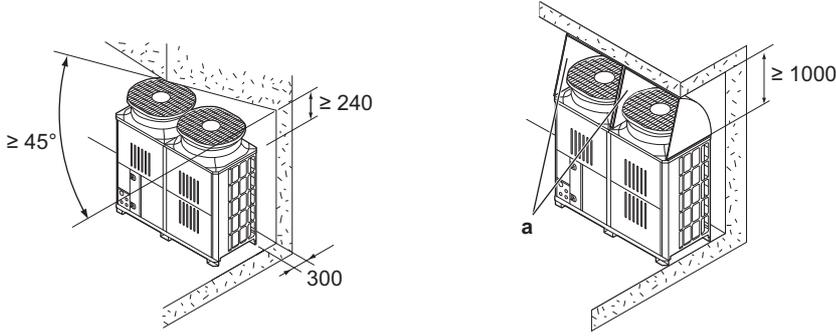
<Unit: mm>



A Unit height

[2] Required distance from the ceiling

<Unit: mm>



a Flow hood (not supplied)

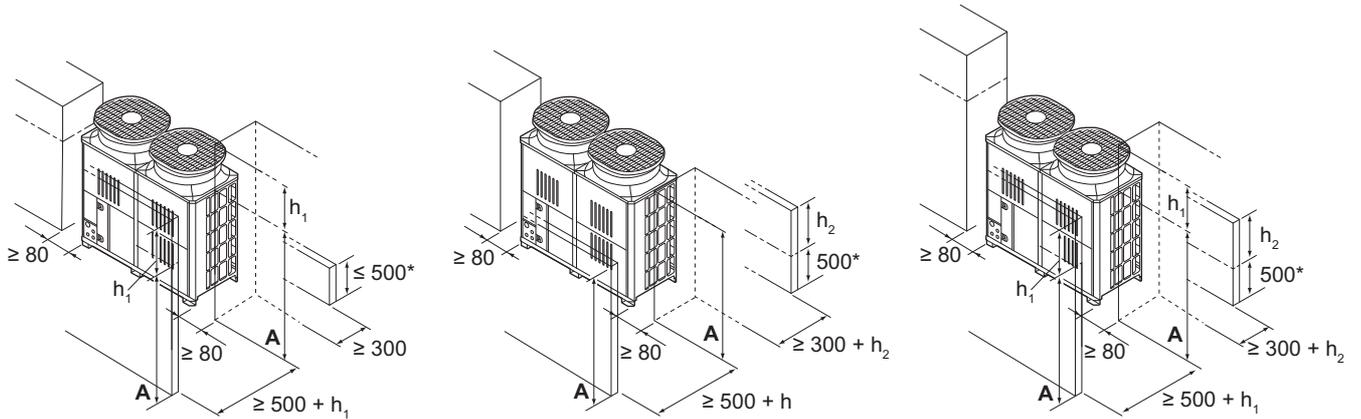
[3] One or more walls surrounding the unit are taller than the unit height, and there is a wall behind the unit.

If the wall(s) surrounding the unit are taller than the unit height, and/or the wall behind the unit is taller than 500 mm, the minimum space requirements will be increased by the amount indicated by h_1 and h_2 in the figures below.

h_1 : Height difference between wall and unit

h_2 : Wall height minus 500 mm

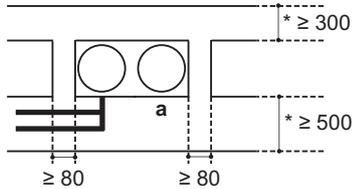
<Unit: mm>



A Unit height

[4] Water piping

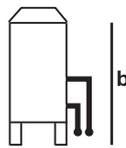
Top view



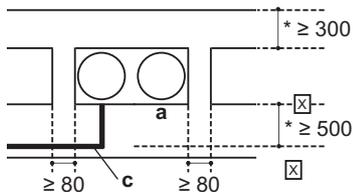
Side view

<Unit: mm>

a Front
b Wall



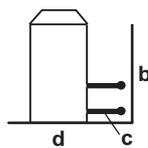
Top view



Side view

<Unit: mm>

a Front
b Wall
c Water pipe
d Foundation



Water pipe must be routed at least 500 mm from the unit. If it is not possible to install the unit on a raised foundation. (See x in the figure.)

2-2-2. Multiple unit installation

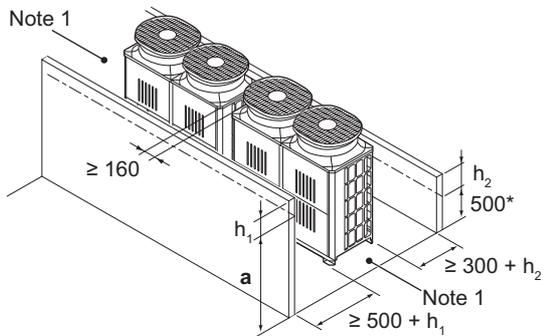
Leave sufficient space for air passage and as a walkway between units as shown below.

Note 1: Leave both sides of each group of units open.

If the wall(s) surrounding the unit are taller than the unit height, the minimum space requirements will be increased by the amount that the wall exceeds the unit height.

[1] Units installed side-by-side

<Unit: mm>

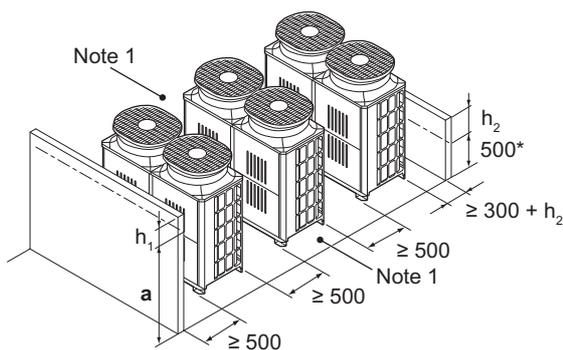


a Unit height

[2] Units installed face-to-face

♦ Walls in the back and the front

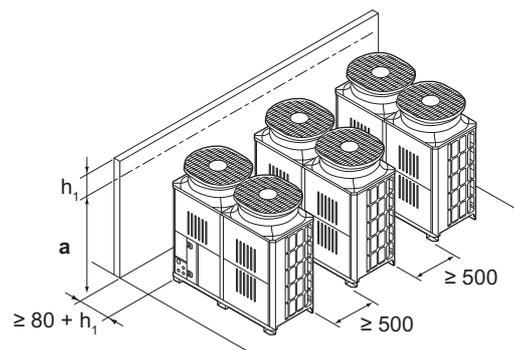
<Unit: mm>



a Unit height

♦ Wall on one side

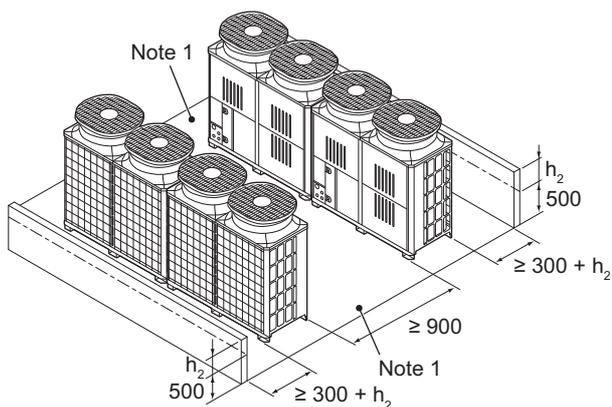
<Unit: mm>



[3] Combination of face-to-face and side-by-side installations

♦ Walls in the back and the front

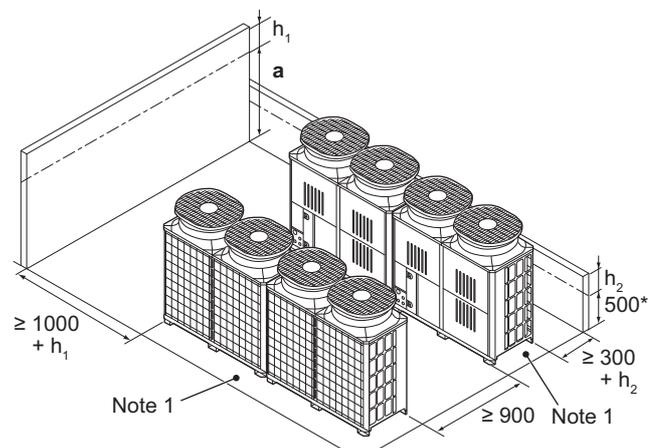
<Unit: mm>



a Unit height

♦ A wall on one side and either in the front or the back of a given group of unit

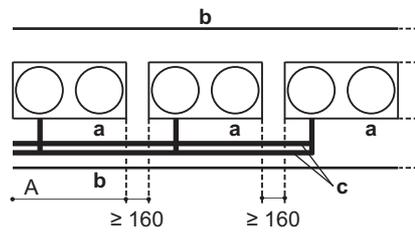
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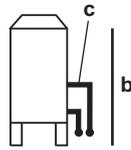
[4] Water piping

(1) Units installed side-by-side

Top view



Side view



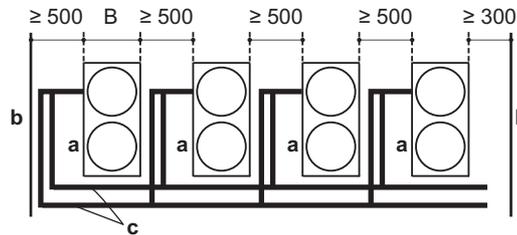
<Unit: mm>

- a Front
- b Wall
- c Water pipe

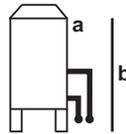
If the product width (labeled A in the figure) times the number of units that are installed side by side exceeds 6 m, leave a space of 1000 mm between each block, which is defined as a group of units that fits within 6 m.

(2) Units installed face-to-face

Top view



Side view



<Unit: mm>

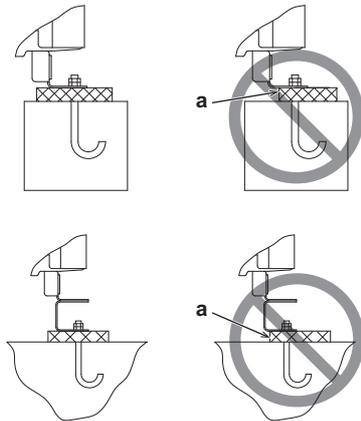
- a Front
- b Wall
- c Water pipe

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 which is defined as a group of units that fits within 6 m.

3. Unit Installation

Units must be properly installed by personnel certified by Mitsubishi Electric, following the installation instructions. Improper installation can cause the unit to topple or fall, leading to serious injuries. For safety measures against earthquakes and strong winds, consult local specialists.

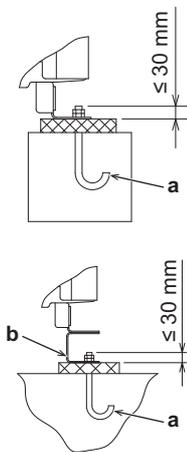
Install the unit on a foundation made of concrete or iron that can withstand its weight, and secure it with bolts. Ensure the foundation properly supports all corners of the installation legs as shown in the figures below. If the corners of the legs are not properly supported, the legs may bend. Build a foundation by considering the routes for drainage, piping, and wiring.



a Leg corner is not properly seated.

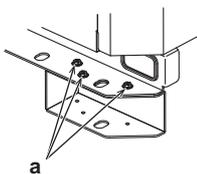
To prevent noise, pipe damage, and refrigerant gas leakage caused by vibrations from the unit being transmitted to floors and walls, take appropriate vibration control measures (e.g., rubber pads that cover the entire width of the legs).

The projecting length of the anchor bolt must be 30 mm or less. The unit cannot be installed using hole-in anchor bolts unless brackets support the corners.



a M10 anchor bolt (not supplied)
b Detachable leg

The legs of the unit (two each in the front and back) can be detached by loosening the three screws on each leg. Repaint the finish coat if damaged. When installing units without using the detachable legs and routing pipes and wires underneath the unit, ensure the foundation does not block the piping access holes. To route the pipes under the unit, the foundation height must be at least 100 mm.

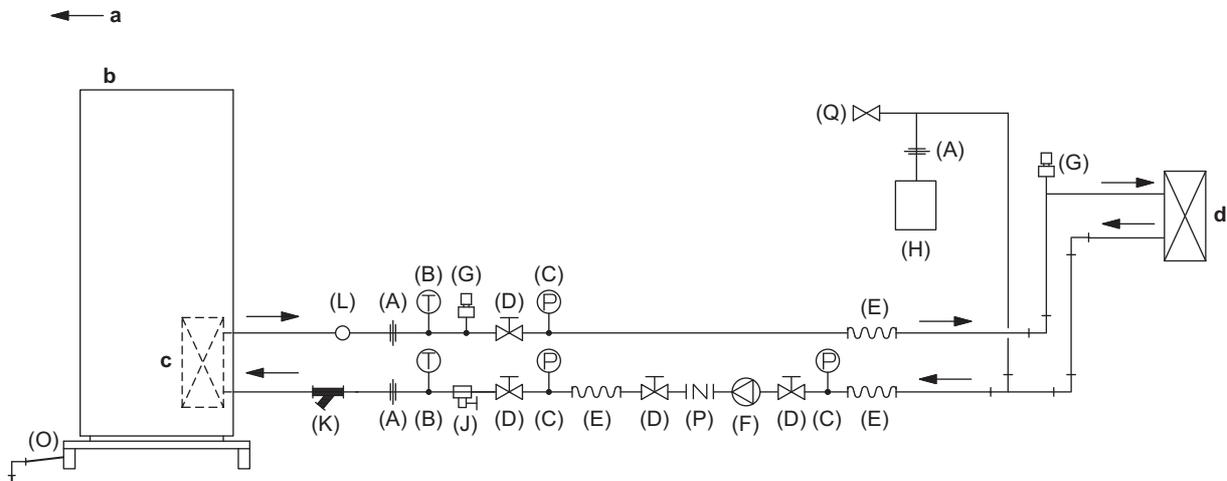


a Unscrew to detach legs

en

4. Water Pipe Installation

4-1. Piping System Schematic



- a Water flow direction
- b Outdoor unit
- c Water-side HEX
- d AC units, floor heater, etc.

(A)	Union joints/flange joints	Allows for equipment replacement
(B)	Thermistor	For performance check and unit operation monitoring
(C)	Water pressure gauge	For operation status monitoring (recommended)
(D)	Valve	Allows for replacement/cleaning of flow adjuster
(E)	Flexible joint	Reduces the noise and vibration from the pump from being transmitted (recommended)
(F)	Pump	Must be large enough to accommodate the total water pressure loss and capable of supplying sufficient water to the unit
(G)	Automatic air-vent valve	To be installed where air tends to accumulate Note 1: Refrigerant may leak through the automatic air-vent valve if the water-side HEX fails, even when the refrigerant-side heat exchanger is normal. To avoid accidents from refrigerant leakage, install the unit outdoors where leaked refrigerant will not accumulate.
(H)	Closed expansion tank	Accommodates expanded water supplies
(I)	Water pipe	Use pipes designed for easy air purging, and ensure proper insulation.
(J)	Drain valve	For draining water for servicing
(K)	Strainer	To be installed near the unit to keep debris from entering the water-side HEX
(L)	Flow switch	Ensures sufficient water flow
(O)	Drain pipe	Install the drain pipe at a downward slope between 1/100 and 1/200. To keep drain water from freezing, install the pipes at a downward angle and minimize horizontal sections. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
(P)	Check valve	Prevents water backflow
(Q)	Safety valve	To be installed near the closed expansion tank Refer to Note 1 above (G).

4-2. Maintaining Water Quality

4-2-1. Water quality control

Poor-quality circulating water can corrode or scale up the water-side HEX and compromises its performance. Proper water quality control and regular water treatment are required. During installation, remove debris (e.g., welding and sealant fragments, rust) out of the pipes.

Water circulation systems with 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. When using a water supply tank, minimize air exposure, and maintain dissolved oxygen levels in the water at or below 1 mg/ℓ.

(1) Water quality standard

Item		Lower mid-range temp. water system Water Temp. ≤ 60°C		Higher mid-range temp. water system Water Temp. > 60°C		Corrosive tendency	Scale-forming tendency	
		Circulating water	Make-up water	Circulating water	Make-up water			
Standard	pH (25°C)	7.0 – 8.0	7.0 – 8.0	7.0 – 8.0	7.0 – 8.0	○	○	
	Electrical conductivity (mS/m) (25°C)	≤ 30	≤ 30	≤ 30	≤ 30	○	○	
		(μS/cm) (25°C)	≤ 300	≤ 300	≤ 300	≤ 300		
	Chloride ion (mg Cl ⁻ /ℓ)	≤ 50	≤ 50	30	≤ 30	○		
	Sulfate ion (mg SO ₄ ²⁻ /ℓ)	≤ 50	≤ 50	≤ 30	≤ 30	○		
	Acid consumption (pH4.8) (mg CaCO ₃ /ℓ)	≤ 50	≤ 50	≤ 50	≤ 50		○	
	Total hardness (mg CaCO ₃ /ℓ)	≤ 70	≤ 70	≤ 70	≤ 70		○	
	Calcium hardness (mg CaCO ₃ /ℓ)	≤ 50	≤ 50	≤ 50	≤ 50		○	
Reference	Ionic silica (mg SiO ₂ /ℓ)	≤ 30	≤ 30	≤ 30	≤ 30		○	
	Iron (mg Fe/ℓ)	≤ 1.0	≤ 0.3	≤ 1.0	≤ 0.3	○	○	
	Copper (mg Cu/ℓ)	≤ 1.0	≤ 0.1	≤ 1.0	≤ 0.1	○		
	Sulfide ion (mg S ²⁻ /ℓ)	Undetectable	Undetectable	Undetectable	Undetectable	○		
	Ammonium ion (mg NH ₄ ⁺ /ℓ)	≤ 0.3	≤ 0.1	≤ 0.1	≤ 0.1	○		
	Residual chlorine (mg Cl/ℓ)	≤ 0.25	≤ 0.3	≤ 0.1	≤ 0.3	○		
	Free carbon dioxide (mg CO ₂ /ℓ)	≤ 0.4	≤ 4.0	≤ 0.4	≤ 4.0	○		
	Ryznar stability index	–	–	–	–	○	○	

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

(2) Consult a water quality control specialist before using anti-corrosive solutions.

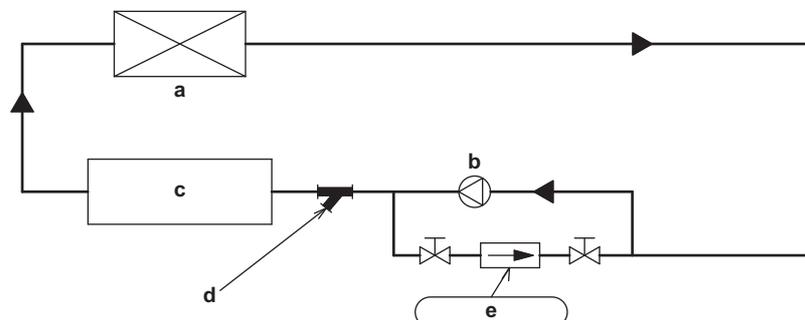
(3) Before replacing the hot water heat pump unit (or only the heat exchanger), analyze the water quality to see if the water is the problem.

Note that corrosion can suddenly occur in water systems with no obvious signs of corrosion. If improving the water quality solves the problem, there is no need to replace the unit.

(4) Debris Removal

Debris and corrosive substances in water can damage or corrode the heat exchanger surface. Install a 20 mesh or finer strainer at the inlet of the unit.

Consider installing a settlement tank or a bypass strainer capable of handling two to three percent of the circulating water to remove debris from the water system.



- a Air-conditioning unit
- b Water pump
- c Heat pump unit
- d 20 mesh or finer strainer
- e Bypass strainer

4-3. Installing the Strainer and Flow Switch

4-3-1. Strainer

Install an optional strainer near the unit in the inlet water pipe to keep the heat exchanger from clogging and corrosion.

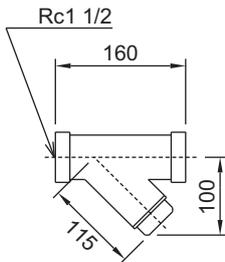
Operating the units with a clogged strainer may cause the units to make an abnormal stop.

Install the strainer for easy cleaning access, and advise the user to clean it regularly.

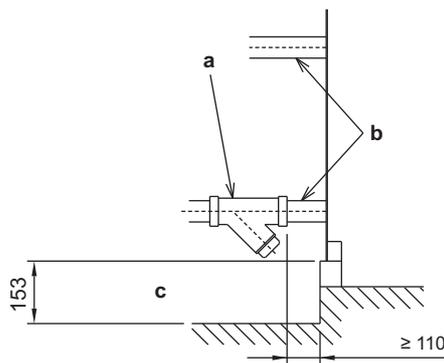
Consider the installation angle, insulation thickness, and maintenance access space.

♦ Y-strainer dimensions

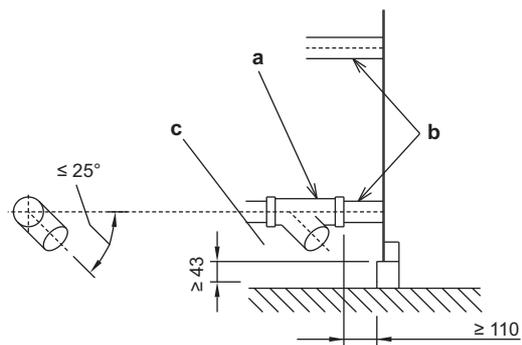
<Unit: mm>



♦ Space required around the Y-strainer for screwing it in



Example 1



Example 2

- a Y-strainer (Option: YS-40A)
- b Pipes (not supplied)
- c Y-strainer maintenance access space

4-3-2. Flow switch

Install a flow switch (not supplied) in the water pipe, and connect the flow switch to the contact point on the unit.

4.0 - 15.0 m³/h under the following conditions:

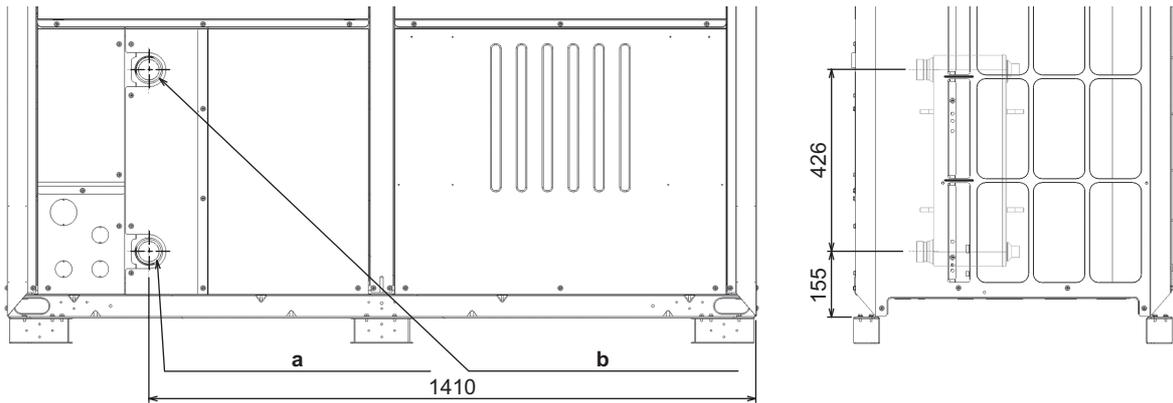
a. When the outdoor temperature is below 0°C,

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

When entering defrosting operation, ensure that the flow rate is within 6°C of the inlet/outlet temperature difference. (If flow rate of 66 L/min or more is provided, the inlet/outlet temperature difference during defrosting will be within the allowable range over the entire operation range.)

4-4. Water Pipe Connection Ports

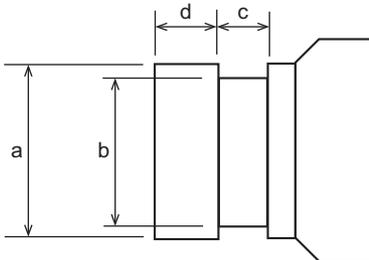
<Unit: mm>



- a Water inlet (40A Housing joint)
- b Water outlet (40A Housing joint)

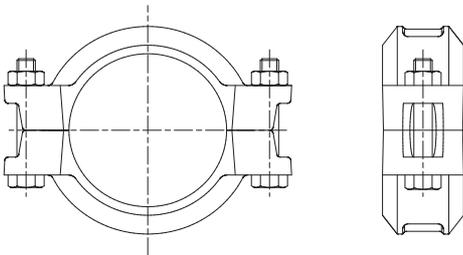
(1) Water pipe connection specification

<Unit: mm>



	Pipe size
	1-1/2B (40A)
a	$\phi 48.3 \pm 0.3$
b	$\phi 45^{0}_{-0.3}$
c	8 ± 0.3
d	15.9 ± 0.3

(2) Housing joint (not supplied)



4-5. Connecting Pipes of Different Materials

The contact surface of different types of metals will corrode. Install an insulating material between pipes of different materials to keep them out of direct contact.

4-6. Minimum Water Volume Requirements for Water Circuits

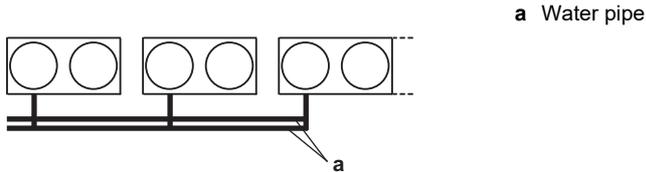
(1) Required water volume

Insufficient water in the water circuit may shorten unit operation time, cause drastic temperature fluctuations, or impair defrost function during heating. Refer to the table below for minimum water volume requirements. If the pipe is too short to hold sufficient water, install a cushion tank to ensure sufficient water volume.

Model	Min. water volume (ℓ)
CAHV-R450YA-HPB (-BS)	525

Minimum water volume requirement for units that are installed in series under the condition with the outlet water temperature of 55°C or higher: $360 \times$ number of units.

(Ex. $360 \times 3 = 1080 \text{ ℓ}$)



(2) Calculating the necessary water volume for water circuits

Calculation formula

(Necessary amount of water in the water circuit) = (water capacity of water pipes) + (water capacity of heat source unit) + (water capacity of load-side unit)

Water capacity of water per meter (ℓ/m)

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

Water capacity of heat source unit (ℓ)

CAHV-R450YA-HPB (-BS)
4.3

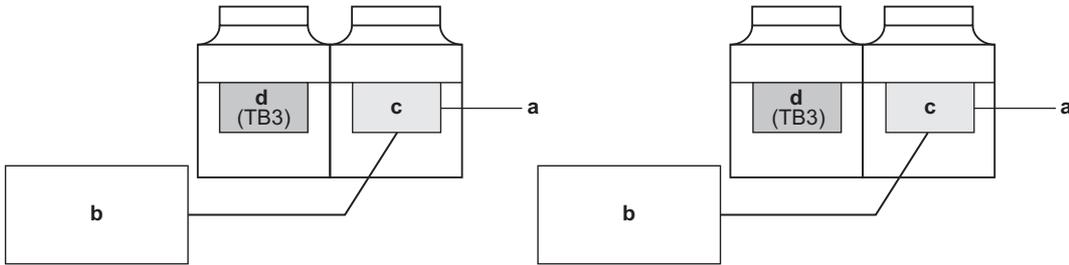
(3) Inlet/Outlet pipe fitting size

Model	Inlet	Outlet
CAHV-R450YA-HPB (-BS)	R1 - 1/2 Housing joint	R1 - 1/2 Housing joint

5. System Configurations

5-1. Schematics of Individual and Multiple Systems

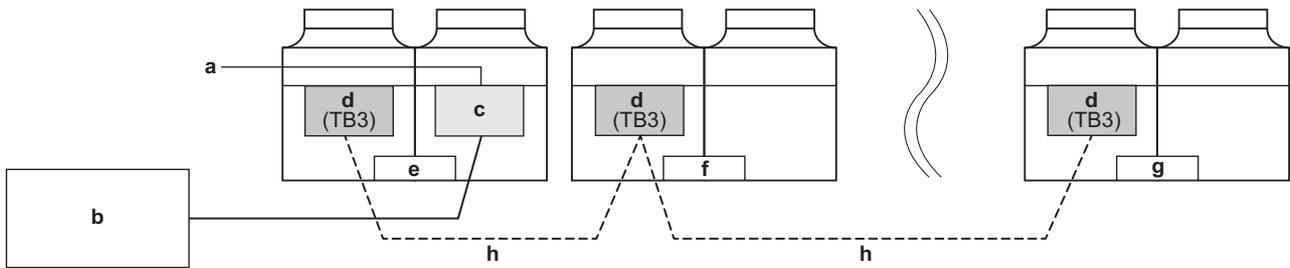
5-1-1. Schematics of individual and multiple systems



- a External water temp. thermistor
- b Dry contact switch/relay or remote controller (not supplied)
- c Sub control box
- d PCB

5-1-2. Multiple system

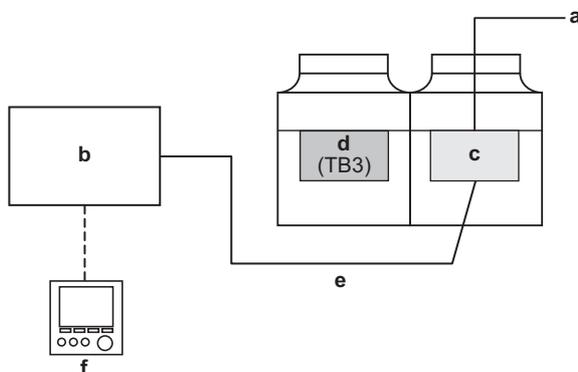
Consists of one main unit that connects to an external water temp. thermistor and a dry contact switch/relay, and up to 15 sub units that are operated collectively



- a External water temp. thermistor
- b Dry contact switch/relay or remote controller (not supplied)
- c Sub control box
- d PCB
- e Main unit
- f Sub unit
- g Sub unit(s)
- h Inter-unit wiring (M-NET)

5-1-3. Individual system with FTC connection

Each unit connects to a primary FTC unit.

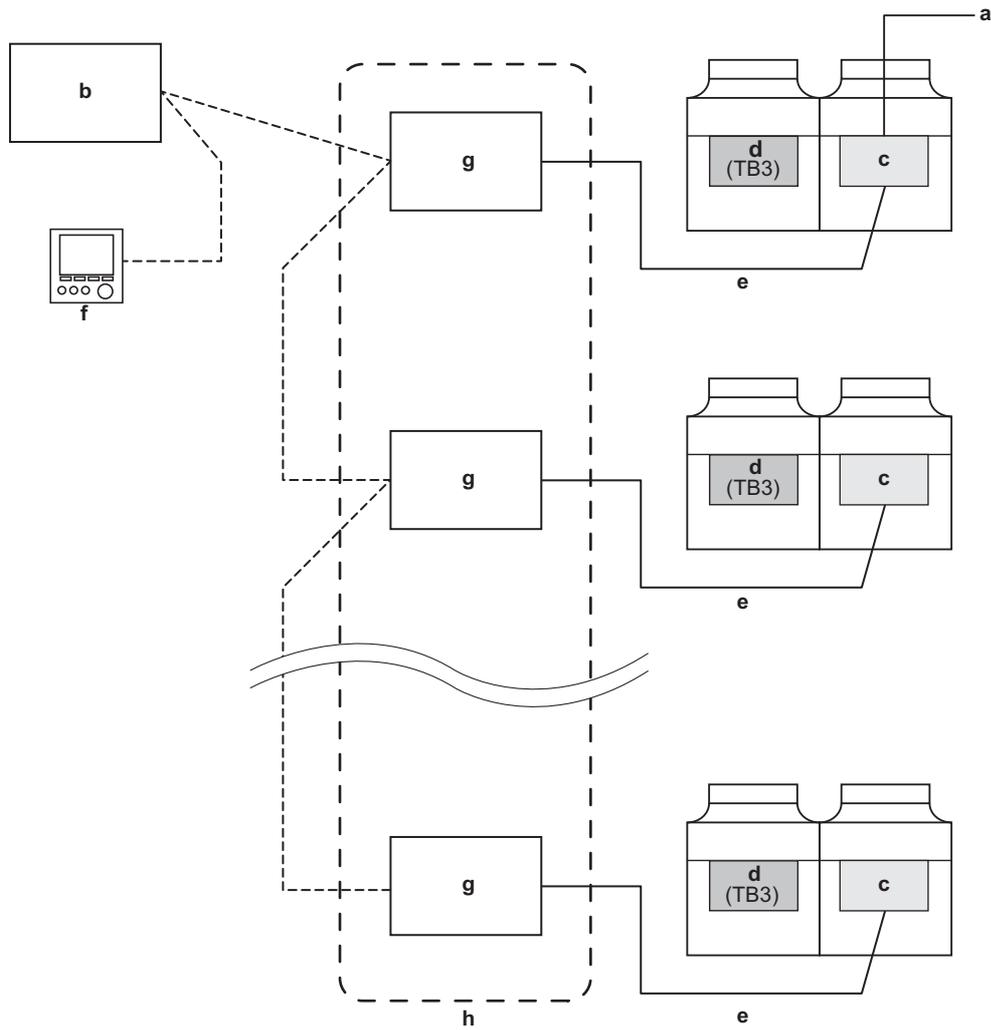


- a External water temp. thermistor
- b FTC6 (Primary)
- c Sub control box
- d PCB
- e Outdoor unit
- f Main RC

See the FTC manual for information about FTC.

5-1-4. Multiple system with FTC connection

Consists of one main FTC that connects to the main remote controller, and up to six units, each with connection to a secondary FTC. The unit connected to an external temp. thermistor is the main unit.



- a External water temp. thermistor
- b FTC6 (Primary)
- c Sub control box
- d PCB
- e Outdoor unit
- f Main RC
- g FTC6 (Secondary)
- h Max. six secondary FTCs

See the FTC manual for information about FTC.

5-2. Switch Types and Default Settings

5-2-1. Switches on the PCB

Dip switches (SW4-SW7)

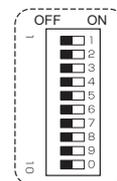
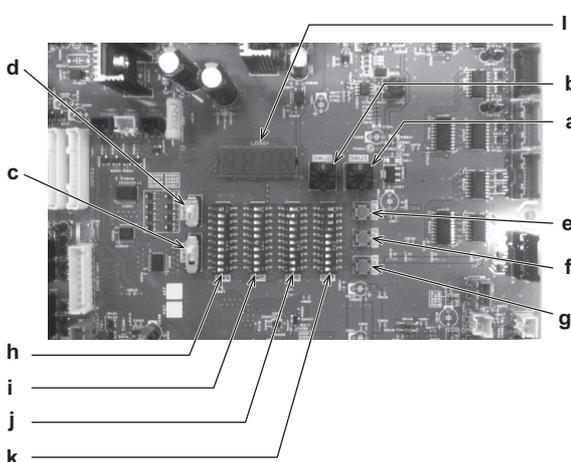
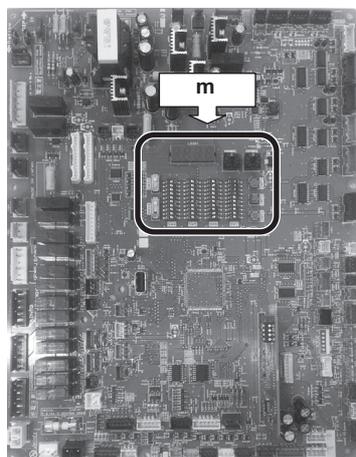
Push switches (SWP1-SWP3)

Rotary switches (SWU1, SWU2)

Slide switches (SWS1, SWS2)

Switches on the PCB

Enlarged view



Slide (not push down) the dip switches.

	Switch	Function	Default
a	Rotary switch (SWU1)	Sets the ones place of the unit address (multiple system)	1
b	Rotary switch (SWU2)	Sets the tens place of the unit address (multiple system)	0
c	Slide switch (SWS1)	Used to select Remote, OFF, or LOCAL. (Switch positions and corresponding functions depend on the system configuration.)	REMOTE
d	Slide switch (SWS2)	Not used	A
e	Push switch (SWP1)	Switches the display between the item code and the current value for a specific item, or increases the current value	-
f	Push switch (SWP2)	Switches the display between the item code and the current value for a specific item, or decreases the current value	-
g	Push switch (SWP3)	Advances the item code or saves the change	-
h	Dip switches (SW4)	Sets the LED display contents	
i	Dip switches (SW5)	Sets the LED display contents	
j	Dip switches (SW6)	Sets the LED display contents	
k	Dip switches (SW7)	Sets the LED display contents	
l	-	LED display	
m	-	Switches	

en

5-2-2. Default dip switch settings

SW	Function	Circuit board (Default)	OFF	ON	Setting timing		
SW 4	1	Model setting	Sets the model	Depends on the unit	-	Upon reset	
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
SW 5	1	Freeze-up protection	Starts the pump to prevent water pipe freeze-up	OFF	Outdoor temp. $\leq 1^{\circ}\text{C}$	Same as when set to OFF	Upon reset
	2	Scheduled operation display	Turns on and off the remote display when the units are scheduled to stop	OFF	Leaves the display on	Turns off the display	Upon reset
	3	Model setting	Sets the model	OFF	-	-	Upon reset
	4	Model setting	Sets the model	OFF	-	-	Upon reset
	5	Recovery conditions after forced stoppage	Selects the thermistor used to determine if the water outlet temp. meets the recovery conditions	OFF	External thermistor	Built-in thermistor	Upon 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	Supplies power	Any time
	7	Remote water-temp. setting	Enables or disables the water temp. to be set using external analog signals from a remote location	OFF	Disabled	Enabled	Upon reset
	8	Water temp. control option	Selects the thermistor to be used to control water temp.	OFF	Built-in thermistor on the unit	External thermistor	Upon reset
	9	Individual/Multiple system	Selects between individual and multiple systems	OFF	Individual system	Multiple system	Upon reset
	10	Display mode 7	Used to set or view the settings when performing a test run or changing system configuration	OFF	-	-	Any time
SW 6	1	Remote reset	Enables or disables an error to be reset remotely	ON	Disabled	Enabled	Upon reset
	2	Auto recovery after power failure	Automatic recovery of operation after power failure (in the mode before power failure)	ON	Displays an alarm	Automatically restores operation	Upon reset
	3	Water temp. control	Switches between inlet- and outlet-water-temp-based control.	OFF	Outlet	Inlet	Upon reset
	4	Pump-thermistor interlock	Interlocks or does not interlock the operation of pump with external thermistor (Effective only when SW5-8 is set to ON)	OFF	Pump operates when turned on, regardless of Thermo-ON/OFF status	Pump operation is interlocked with Thermo-ON/OFF status	Upon reset
	5	Display mode 1	Used to set or view the settings when performing a test run or changing system configuration	OFF	Changes the 7-segment LED display mode		Any time
	6	Display mode 2		OFF	Same as above		Any time
	7	Display mode 3		OFF	Same as above		Any time
	8	Display mode 4		OFF	Same as above		Any time
	9	Display mode 5		OFF	Same as above		Any time
	10	Display mode 6		OFF	Same as above		Any time

-: Do not change the settings.

5-3. Configuring the Settings

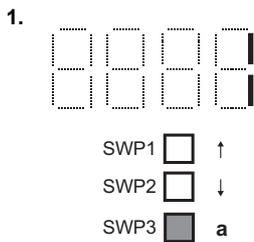
5-3-1. Switch function table

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		
				Max. peak-demand capacity	2	100%	
				Peak-demand control start time	3	13:00	
				Peak-demand control end time	4	13:00	
				Enable/disable schedule	5	0	Set to "1" to enable
				ON-time 1 (schedule mode w/o remote signal input)	6	0:00	
				OFF-time 1 (schedule mode w/o remote signal input)	7	0:00	
				ON-time 2 (schedule mode w/o remote signal input)	8	0:00	
				OFF-time 2 (schedule mode w/o remote signal input)	9	0:00	
				ON-time 3 (schedule mode w/o remote signal input)	18	0:00	
				OFF-time 3 (schedule mode w/o remote signal input)	19	0:00	
				Temp. settings D, E for analog input	11 13	D=45°C; E=65°C	When SW5-7 is set to ON
				Temp. setting A (Heating mode)	11	45°C	Range 24-70
				Temp. setting B (Hot water mode)	13	65°C	Range 24-70
				Remote water temp. input signal type	21	0	0: 4-20 mA; 1: 0-10 V; 2: 1-5 V; 3: 2-10 V
				Temp. settings C1, C2, C3, C4 for Heating ECO mode	22-25	C1=34°C; C2=-7°C C3=24°C; C4=12°C	
Water temp./Capacity control	1051	0	0: Water temp. input 4-20 mA 1: Capacity control input 4-20 mA 2: Water temp. 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 temp. 1 for emergency signal 1				
TAL1	1058	-10	Outdoor temp. 1 for emergency signal 1				
OFF	ON	OFF	OFF	Thermo differential 2	1016	2.0	Range 0-8
				Multiple System Thermo-ON/OFF prohibition period	1020	1	Range 1-5
				Outdoor temp. input source	1080	0	0: Outdoor temp. thermistor (TH9) 1: IT terminal
				Control sensor selection (Target temp. A)	1215	TH14	Selectable from TH14 or TH15
				Control sensor selection (Target temp. B)	1216	TH14	Selectable from TH14 or TH15
				Control sensor selection (Target temp. C)	1217	TH14	Selectable from TH14 or TH15
				Pre-set temp. selection 1 (ON-time 1-OFF-time 1)	1218	A (1)	A=1; B=2; C=3
				Pre-set temp. selection 2 (ON-time 2-OFF-time 2)	1219	A (1)	A=1; B=2; C=3
Pre-set temp. selection 3 (ON-time 3-OFF-time 3)	1220	A (1)	A=1; B=2; C=3				

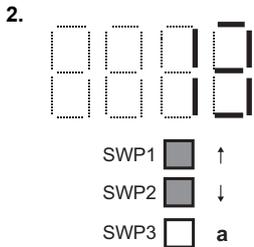
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5-3-2. Setting configuration procedures

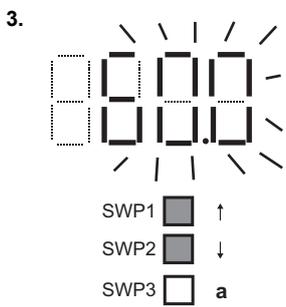
Use push switches SWP1, SWP2, and SWP3 to change or view the current settings on the circuit board.



Normally, the LED shows an item code. ("1" in the left figure)
 Press SWP3 to advance the item code to the desired code.

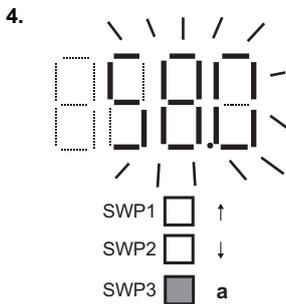


Press SWP1 or SWP2 to display the current setting for the selected item code. ("13" in the left figure)



Current setting will blink. ("60.0" in the left figure)
 To change the setting, press SWP1 to increase and SWP2 to decrease the value while the LED is blinking.

- Some settings cannot be changed.
- Press and hold to fast-forward.

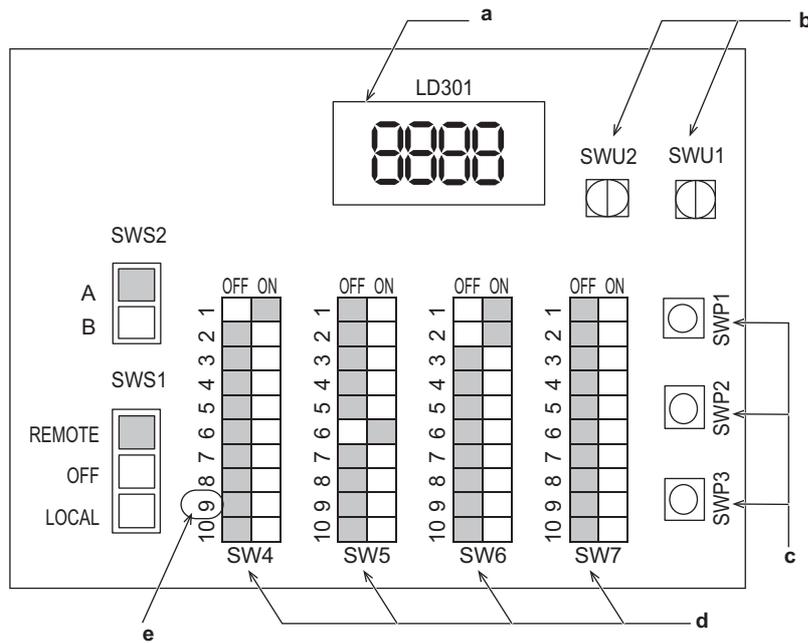


To save the change, press SWP3 while the item code is blinking. The LED will stop blinking and the change will be saved.

- If SWP3 is not pressed within one minute, the change will not be saved, and the LED will display the item code.
- If no buttons are pressed within one minute, the LED will automatically stop blinking, and an item code will stay lit.
- To change the values of other items, repeat the steps above.

a Enter

5-3-3. LED and switches on the control board



- a LD301
- b Rotary switches SWU1, SWU2: Use SWU1 to set the ones place of the address and use SWU2 to set the tens place.
- c Push switches SWP1, SWP2, SWP3
- d Dip switches SW4, SW5, SW6, SW7
- e (Dip switch name example: SW4-9)

en

5-3-4. System configuration procedures: Individual system

(1) Set the dip switches on the control board for the items below.

- ♦ Water temp. control based on external water temp.
- ♦ Water temp. control based on inlet water temp.

Refer to the following page(s) for detail. "Default dip switch settings" (p. 24)

(2) Switch on the power to the unit.

[EEEE] will appear on LD301.

(3) Set the values for individual item codes as necessary.

- 1) Press SWP1, SWP2, or SWP3. [EEEE] will disappear and [101] will appear on LD301.
- 2) Press SWP3 to toggle through and select an item code.
 ([101]→[102]→[105]→[107]→[108]→Back to [101])
- 3) Press SWP1 to increase and SWP2 to decrease the value.
- 4) Press SWP3 to save the change.

(4) Perform an initial setup on the main unit

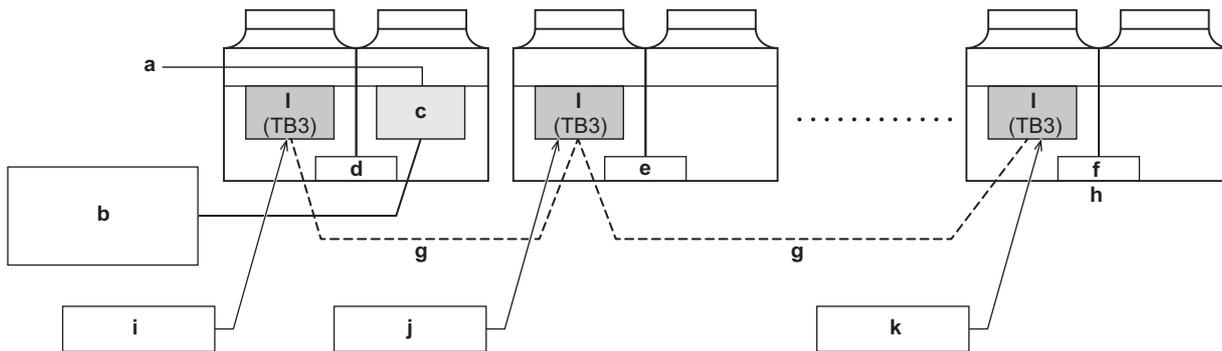
- 1) Set SW7-1, -2, -3, and -4 to ON.
 [EEEE]^{*1} will appear on LD301.
- 2) Press and hold SWP3 for one second.
 While the system is starting up, [9999] will appear on LD301.
- 3) Set SW7-1, -2, -3, and -4 to OFF.

The step above completes the initial setup, and the settings for clock, peak-demand control, schedule, and thermistor, etc. can now be set.

*1: If the start-up process has already been completed, [FFFF] will appear.

5-3-5. System configuration procedures: Multiple system

(1) Schematic of a multiple system



- | | |
|--|------------------------------------|
| a External water temp. thermistor | g M-NET lines |
| b Dry contact switch/relay or remote controller (not supplied) | h "n"th unit |
| c Sub control box | i SW5-8: ON, SW5-9: ON, Address: 1 |
| d Main unit | j SW5-9: ON, Address: 2 |
| e Sub unit | k SW5-9: ON, Address: 1 + n |
| f Sub unit(s) | l PCB |

(2) Set the switches on the main unit

- 1) Ensure that the address of the main unit is set to "1."
- 2) Set SW5-8 to ON. (external water temp. thermistor)
- 3) Set SW5-9 to ON. (multiple unit control)

Refer to the following page(s) for detail. "Default dip switch settings" (p. 24)

(3) Set the switches on all sub units

- 1) Set SW5-9 to ON. (multiple unit control)
- 2) Set the ones place of the address with SWU1 and tens place with SWU2. Assign sequential addresses to all sub units starting with 2.

(4) Switch on the power to the unit.

Check for proper wiring, and switch on the power to all units.
The following codes will appear on LD301.

- ♦ [EEEE] on the main unit
- ♦ [9999] on sub units

(5) Set the values with the switches on the control board.

- 1) Press SWP1, 2, or 3.
[EEEE] will disappear, and an item code ([101]) will appear on LD301.
- 2) Press SWP3 to toggle through and select an item code.
[101]→[102]→[105]→[107]→[108]→Back to [101]
- 3) Press SWP1 to increase and SWP2 to decrease the value.
- 4) Press SWP3 to save the change.

Set the item [107] setting (total number of main and sub units in the system) when connecting multiple units to a system.

Leave the item [108] setting (secondary FTC unit group) to the default setting = 0.

(6) Perform an initial setup on the main unit

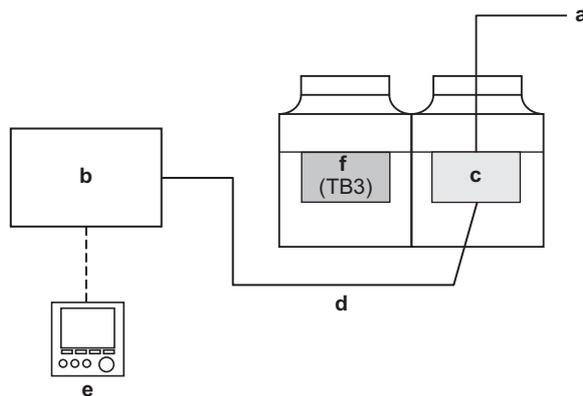
- 1) Set SW7-1, -2, -3, and -4 to ON.
[EEEE]^{*1} will appear on LD301.
- 2) Press and hold SWP3 for one second.
While the system is starting up, [9999] will appear on LD301.
- 3) Set SW7-1, -2, -3, and -4 to OFF.

The step above completes the initial setup, and the settings for clock, peak-demand control, schedule, and thermistor, etc. can now be set.

*1: If the start-up process has already been completed, [FFFF] will appear.

5-3-6. System configuration procedures: Individual system (with connection to FTC)

(1) Schematic of an individual system with FTC connection



- a External water temp. thermistor
- b FTC6 (Primary)
- c Sub control box
- d Outdoor unit
- e Main RC
- f PCB

The unit connects to a primary FTC unit.

(2) Set the switches on the control board

Set SW6-1 on the primary FTC board to ON.

(3) Switch on the power to the unit.

Check for proper wiring, and switch on the power to all units.

[EEEE]^{*1} will appear on LD301.

(4) Set the values with the switches on the control board.

1) Press SWP1, 2, or 3.

[EEEE] will disappear, and an item code ([101]) will appear on LD301.

2) Press SWP3 to toggle through and select an item code. [101]→[102]→[105]→[107]→[108]→Back to [101]

3) Press SWP1 to increase and SWP2 to decrease the value.

4) Press SWP3 to save the change.

Leave the item [107] setting (number of units in the system) to the default setting = 1.

Leave the item [108] setting (secondary FTC unit group) to the default setting = 0.

(5) Perform an initial setup

1) Set SW7-1, -2, -3, and -4 to ON.

[EEEE]^{*1} will appear on LD301.

2) Press and hold SWP3 for one second.

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

3) Set SW7-1, -2, -3, and -4 to OFF.

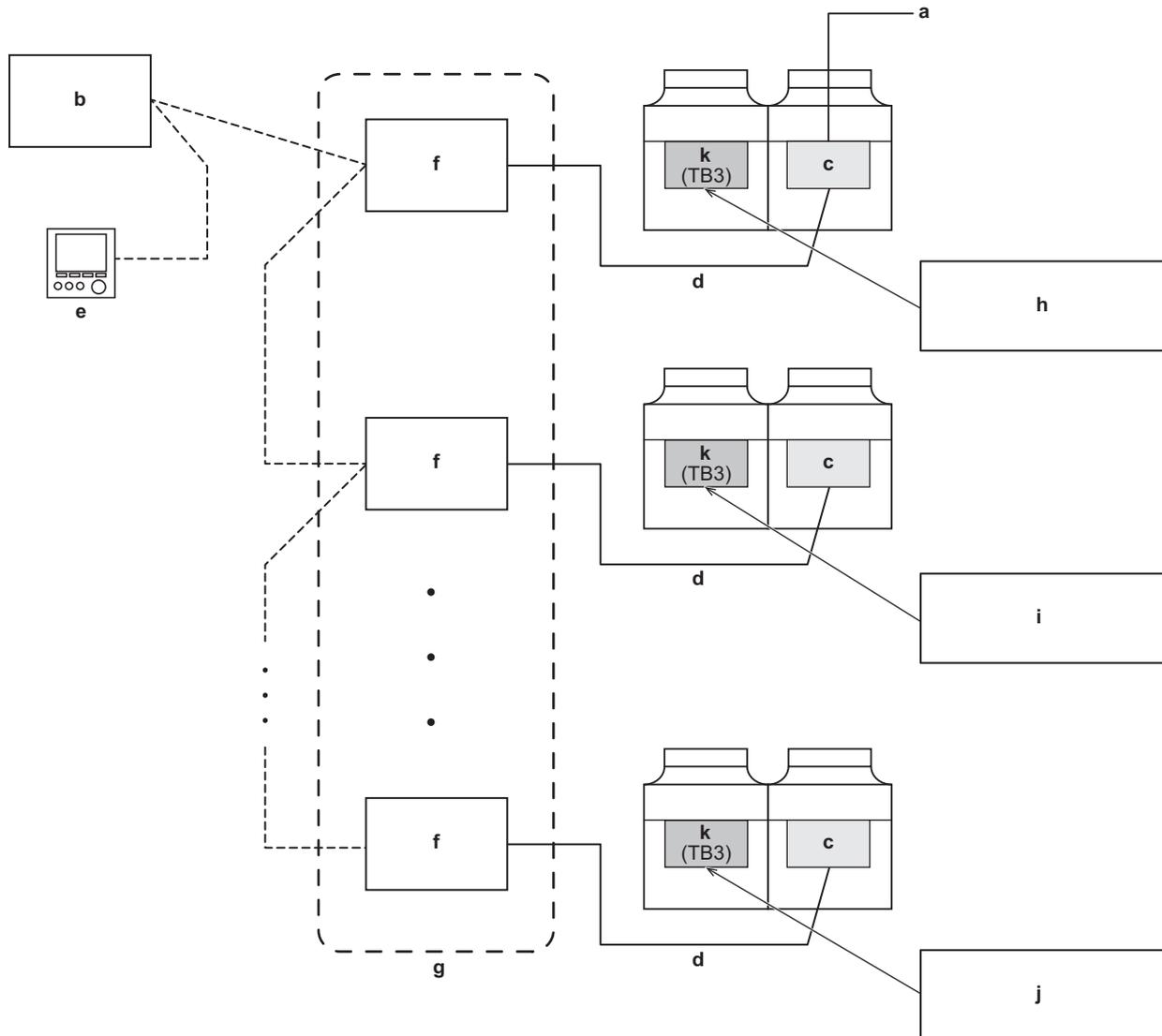
The step above completes the initial setup, and the settings for clock, peak-demand control, schedule, and thermistor, etc. can now be set.

*1: If the start-up process has already been completed, [FFFF] will appear.

Refer to the FTC manual for detail.

5-3-7. Multiple system with FTC connection For 2 ~ 6 units

(1) Schematic of a multiple system with FTC connection



- a External water temp. thermistor
- b FTC6 (Primary)
- c Sub control box
- d Outdoor unit
- e Main RC
- f FTC6 (Secondary)
- g Max. six sub units
- h Address: 1 secondary FTC unit group: 1
- i Address: 1 secondary FTC unit group: 2
- j Address: 1 secondary FTC unit group: 6
- k PCB

- The main unit is the unit with connection to an external water temp. thermistor.
- Each unit connects to a secondary FTC unit.

(2) Set the switches on all units

1) Make sure the address of the main unit is set to "1."

2) Set SW5-8 to ON. (external water temp. thermistor)

Refer to the following page(s) for detail. "Default dip switch settings" (p. 24)

3) Set SW6-1 on both the primary and secondary FTC boards to ON.

(3) Switch on the power to the unit.

Check for proper wiring, and switch on the power to all units.

[EEEE]^{*1} will appear on LD301 of the main unit

(4) Set the values with the switches on the control board.

1) Press SWP1, 2, or 3.

[EEEE] will disappear, and an item code ([101]) will appear on LD301.

2) Press SWP3 to toggle through and select an item code.

[101]→[102]→[105]→[107]→[108]→Back to [101]

3) Press SWP1 to increase and SWP2 to decrease the value.

4) Press SWP3 to save the change.

Leave the item [107] setting (number of units in the system) to the default setting =1

Set the item [108] setting (secondary FTC unit group) when connecting multiple units to a system.

(5) Perform an initial setup on the unit

1) Set SW7-1, -2, -3, and -4 to ON.

[EEEE]^{*1} will appear on LD301.

2) Press and hold SWP3 for one second.

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

3) Set SW7-1, -2, -3, and -4 to OFF.

The step above completes the initial setup, and the settings for clock, peak-demand control, schedule, and thermistor, etc. can now be set.

*1: If the start-up process has already been completed, [FFFF] will appear.

Refer to the FTC manual for detail.

5-3-8. SWS1 settings

(1) Individual system

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

(2) 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 to the main unit
	OFF		Ignores the input signal
	LOCAL		Follows the input signal to the main unit
OFF	REMOTE	Ignores the input signal	Ignores the input signal
	OFF		
	LOCAL		
LOCAL	REMOTE	Follows the input signal to the main unit	Follows the input signal to the sub unit
	OFF		Ignores the input signal
	LOCAL		Follows the input signal to the sub unit

5-3-9. Re-initializing the system

Changing the settings for the items below requires system re-initialization.

- ♦ SW5-8 (use or non-use of external water temp. thermistor) (Applicable only to multiple systems)
- ♦ SW5-9 (multiple unit control)
- ♦ SW6-3 (water temp. control method)
- ♦ System setting [107] (total number of units in the system)
- ♦ SWU1 and SWU2 (unit address)

Steps

1) Set SW7-1, 2, 3, 4 to ON.

[FFFF] will appear on LD301.

2) Press and hold SWP3 for 5 seconds.

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

3) Set SW7-1, 2, 3, 4 to OFF.

5-3-10. Resetting the system

Follow the steps below to reset the system or an error.

Note that errors must be reset on the main unit.

When an error on the main unit is reset, all sub units will stop.

Steps

1) Set SW7-1, 2, 3, 4 to ON.

[FFFF] will appear on LD301.

2) Press and hold SWP3 for one second.

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

3) Set SW7-1, 2, 3, 4 to OFF.

5-3-11. Priority order of the water-temp-setting-input-signal sources

Water temperature can be controlled by signals from different types of input sources. The setting for the item with higher priority will override the settings for the items with lower priorities. Water temperature will be controlled based on the temperature setting in the "Target water temperature" column.

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

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

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

5-3-12. Water-temperature setting

[1] Setting the individual water temp. for item codes 11, 13, and 22-27

Steps

Step 0

Set SWS1 to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.

The settings for items 22 through 27 cannot be changed unless SWS1 is set to OFF (except from the optional remote controller).

Step 1

Select the outdoor temp. input source.

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

Settable item	Item Code	Initial value	Unit	Limits and increments			Notes	Setting change from optional remote controller
				Increments	Lower limit	Upper limit		
Outdoor temp. input source	1080	OFF	OFF	OFF	ON	OFF	OFF	No

0: Outdoor temp. thermistor (TH9)

1: IT terminal

Step 2

Set SW5 and SW6 as follows.

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

Step 3

Press SWP3 to select an item code.

Step 4

Press SWP1 to increase and SWP2 to decrease the value.

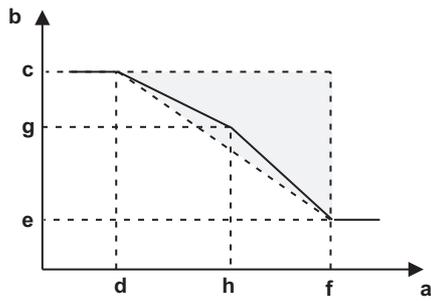
Settable item	Item Code	Initial value	Unit	Setting	Limits		Setting change from optional remote controller
				Increments	Lower limit	Upper limit	
Water temp. setting A (Heating mode)	11	45	°C	0.1°C	24	OFF	Yes
Water temp. setting B (Hot water mode)	13	65	°C	0.1°C	24	OFF	Yes
Heating ECO/Water temp. setting C1 *1	22	34	°C	0.1°C	24	OFF	No
Heating ECO/Outdoor temp. setting C2 *1	23	-7	°C	0.1°C	-20	OFF	No
Heating ECO/Water temp. setting C3 *1	24	24	°C	0.1°C	24	OFF	No
Heating ECO/Outdoor temp. setting C4 *1	25	12	°C	0.1°C	-20	OFF	No
Heating ECO/Water temp. setting C5 *1	26	30	°C	0.1°C	24	OFF	No
Heating ECO/Outdoor temp. setting C6 *1	27	2	°C	0.1°C	-20	OFF	No

*1: Need not be set when only a single water temp. setting is used

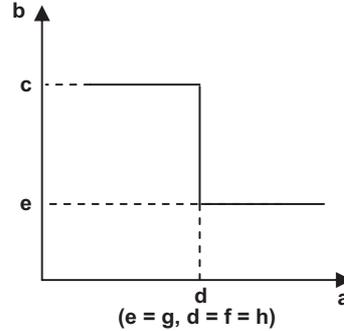
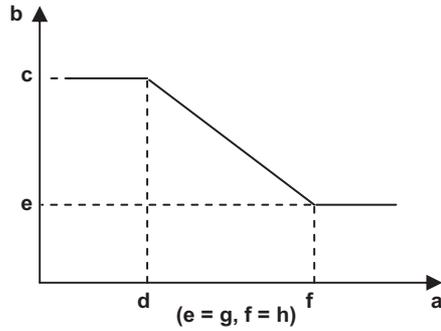
When a signal through a dry contact is used to switch between the Heating, Hot water, and Heating ECO modes, the water temp. setting will be as shown in the figures below.

The ranges for water temp. settings A, B, C1, and C3 are shown in the figures below.

Setting ranges for water temp. settings A, B, C1-C6



- a Outdoor temp.
- b Water temp.
- c Water temp. setting C1
- d Outdoor temp. setting C2
- e Water temp. setting C3
- f Outdoor temp. setting C4
- g Water temp. setting C5
- h Outdoor temp. setting C6



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

- ♦ When the outdoor temp. is 5°C or below, and the water temp. is set as follows, the unit may operate at a temp. above the pre-set temp.
Outlet temp. 35°C/Inlet temp. 30°C.

Step 5

Press SWP3 to save the change.

The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

If SWP3 is not pressed within one minute, the change will not be saved, and an item code will appear on the LED.

en

[2] Scheduled operation

Three sets of start/end times can be set for a day.

A single mode (pre-set temp.) can be selected for each period.

Refer to the following page(s) for detail. "Setting the temperatures for different operation periods" (p. 40)

The function is valid only when SWS1 is set to "REMOTE."

Steps

Step 0

Set SWS1 to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.

Settings cannot be changed unless SWS1 is set to OFF (except from the optional remote controller).

Step 1

Set SW5 and SW6 as follows.

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

Step 2

Press SWP3 to select an item code.

Set item code 5 to 1, and set the times for item codes 1, 6 through 9, 18, and 19 as necessary.

Step 3

Press SWP1 to increase and SWP2 to decrease the value.

Settable item	Item Code	Initial value	Unit	Limits and increments		
				Increments	Lower limit	Upper limit
Current time	1	0000	Hour: minute	1 min.	0000	2359
Enable or disable schedule (ON/OFF)	5	0	Enable: 1 Disable: 0	1	0	1
Start time 1	6	0000	Hour: minute	1 min.	0000	2359
End time 1	7	0000	Hour: minute	1 min.	0000	2359
Start time 2	8	0000	Hour: minute	1 min.	0000	2359
End time 2	9	0000	Hour: minute	1 min.	0000	2359
Start time 3	18	0000	Hour: minute	1 min.	0000	2359
End time 3	19	0000	Hour: minute	1 min.	0000	2359

Step 4

Press SWP3 to save the change.

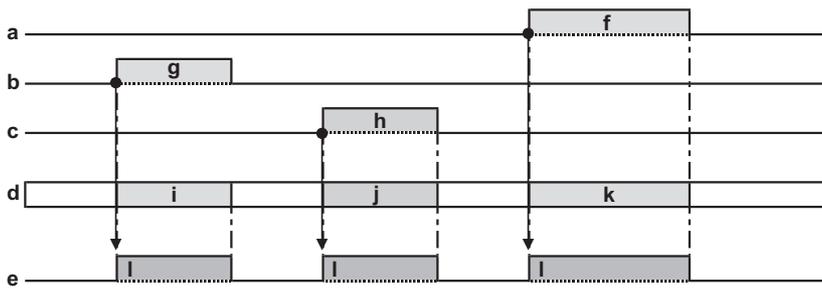
The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

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

Note: Setting code 5 to "1" will lock the remote controller's schedule function.

(1) Effective/ineffective settings for overlapping and non-overlapping periods

[No overlapping periods]



- a Period 1
- b Period 2
- c Period 3
- d Set temp.
- e Operation command signal
- f Period 1
- g Period 2
- h Period 3
- i Item code 1219 setting
- j Item code 1220 setting
- k Item code 1218 setting
- l ON

[Overlapping periods 1 and 2](Period 2 setting will be ineffective.)

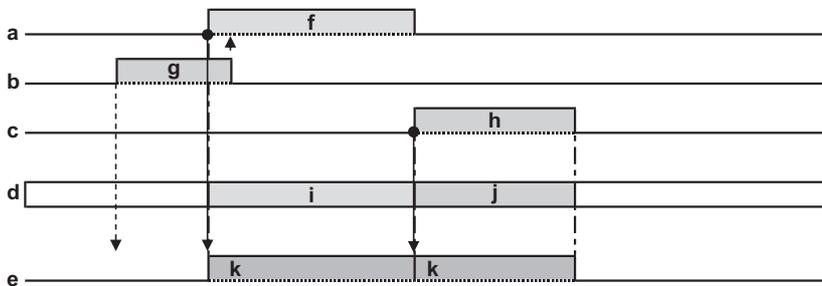
Note:

If two or more operation periods overlap, the settings for the period with a smaller number will be effective.

If End time 1 and Start time 3 are set to the same value, the setting for Start time 3 will be ineffective.

Set Start time 3 to a time at least one minute after End time 1.

Note that once the compressor stops at End time 1, the restart delay function will keep the compressor from restarting for three minutes.

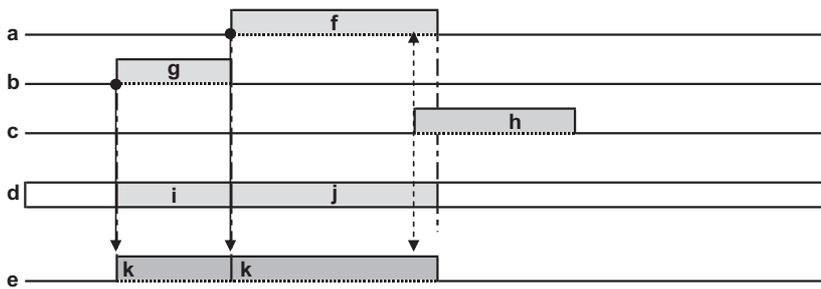


- a Period 1
- b Period 2
- c Period 3
- d Set temp.
- e Operation command signal
- f Period 1
- g Period 2
- h Period 3
- i Item code 1218 setting
- j Item code 1220 setting
- k ON

[Overlapping periods 1 and 3](Period 3 setting will be ineffective.)

Note:

Refer to the following page(s) for detail. "[Overlapping periods 1 and 2](Period 2 setting will be ineffective.)" (p. 37)

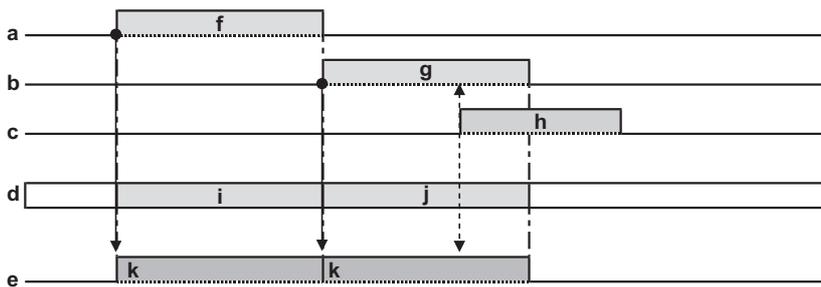


- a Period 1
- b Period 2
- c Period 3
- d Set temp.
- e Operation command signal
- f Period 1
- g Period 2
- h Period 3
- i Item code 1218 setting
- j Item code 1219 setting
- k ON

[Overlapping periods 2 and 3](Period 3 setting will be ineffective.)

Note:

Refer to the following page(s) for detail. "[Overlapping periods 1 and 2](Period 2 setting will be ineffective.)" (p. 37)

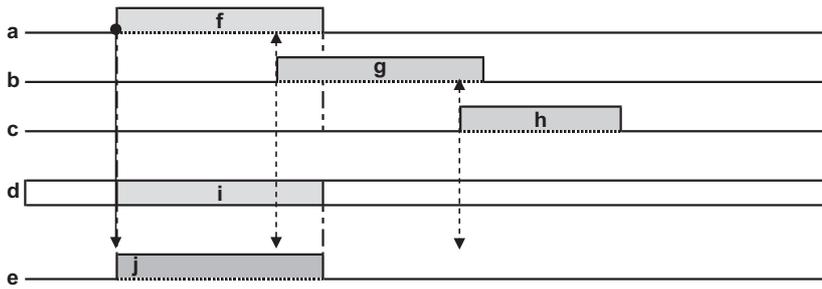


- a Period 1
- b Period 2
- c Period 3
- d Set temp.
- e Operation command signal
- f Period 1
- g Period 2
- h Period 3
- i Item code 1218 setting
- j Item code 1219 setting
- k ON

[Overlapping periods 1 and 2, and 2 and 3](Period 2 and 3 settings will be ineffective.)

Note:

Refer to the following page(s) for detail. "[Overlapping periods 1 and 2](Period 2 setting will be ineffective.)" (p. 37)



- a Period 1
- b Period 2
- c Period 3
- d Set temp.
- e Operation command signal
- f Period 1
- g Period 2
- h Period 3
- i Item code 1218 setting
- j ON

en

[3] Setting the temperatures for different operation periods

Steps

Step 0

Set SWS1 to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.

Settings cannot be changed unless SWS1 is set to OFF (except from the optional remote controller).

Step 1

Set SW5 and SW6 as follows.

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

Step 2

Press SWP3 to select an item code (1215-1220), and set the temperature for each item.

Step 3

Press SWP1 to increase and SWP2 to decrease the value.

Settable item	Item Code	Initial value	Unit	Limits and increments			Setting change from optional remote controller
				Increments	Lower limit	Upper limit	
Pre-set temp. A (Heating)	1215	14	TH	1	14	15	Yes
Pre-set temp. B (Hot Water)	1216	14	TH	1	14	15	Yes
Pre-set temp. C (Heating ECO)	1217	14	TH	1	14	15	No
Start/End time 1 (ON/OFF) water temp. setting *1	1218	1		1	1	3	No
Start/End time 2 (ON/OFF) water temp. setting *2	1219	1		1	1	3	No
Start/End time 3 (ON/OFF) water temp. setting *3	1220	1		1	1	3	No

*1:Pre-set temp. A (Heating)

*2:Pre-set temp. B (Hot Water)

*3:Pre-set temp. C (Heating ECO)

Step 4

Press SWP3 to save the change.

The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

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

Temp. settings for periods 1, 2, and 3 are selectable from pre-set temp. A, B, or C.

Item code 1218: Period 1

Item code 1219: Period 2

Item code 1220: Period 3

Item code 1215: Pre-set temp. A (Item code 11: Heating)

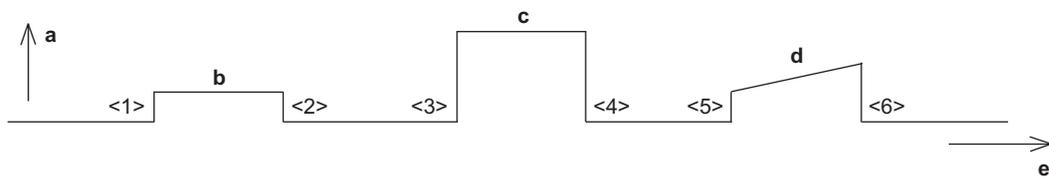
Item code 1216: Pre-set temp. B (Item code 13: Hot Water)

Item code 1217: Pre-set temp. C (Item codes: 22-25: Heating ECO)

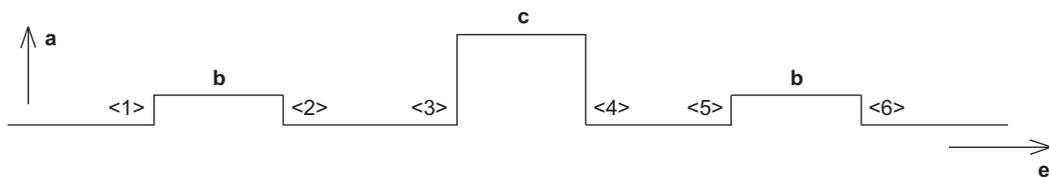
Temp. settings for each period

	Item code 1218-1220	Item code 1215-1217	Ex. 1	Ex. 2	Ex. 3
<1>	Start time 1	Operation 1 (Select pre-set temp. from A, B, or C)	Heating	Heating	Hot Water
<2>	End time 1				
<3>	Start time 2	Operation 2 (Select pre-set temp. from A, B, or C)	Hot Water	Hot Water	Heating ECO
<4>	End time 2				
<5>	Start time 3	Operation 3 (Select pre-set temp. from A, B, or C)	Heating ECO	Heating	Hot Water
<6>	End time 3				

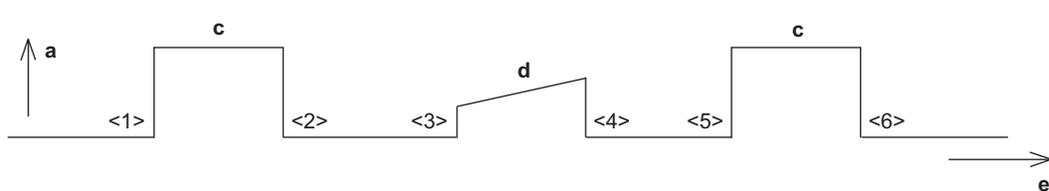
Ex. 1



Ex. 2



Ex. 3



- a Temperature
- b Heating
- c Hot Water
- d Heating ECO
- e Time

en

[4] Peak-demand control

The peak-demand control function controls the maximum compressor frequency and the number of units in operation during high loads according to the peak demand control signal.

Individual system	Multiple system
Max.	Compressor frequency

Steps

(1) Setting the maximum frequency setting

Step 0

Set SWS1 to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.

Settings cannot be changed unless SWS1 is set to OFF (except from the optional remote controller).

Step 1

Set SW5 and SW6 as follows.

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

Step 2

Press SWP3 to select item code 2, 3, or 4.

Step 3

Press SWP1 to increase and SWP2 to decrease the value.

Settable item	Item Code	Initial value	Unit	Limits and increments			Setting change from optional remote controller
				Increments	Lower limit	Upper limit	
Max. frequency ratio	2	100	%	5%	0	100	No
Peak-demand control start time	3	1300	Hour: minute	1	0000	2359	No
Peak-demand control end time	4	1300	Hour: minute	1	0000	2359	No

Step 4

Press SWP3 to save the change.

The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

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

- ♦ When the peak-demand control contact is ON, units will operate at the max. capacity set in the steps above.

[5] Setting the total number of units for a multiple system

Step 0

Set SWS1 to OFF.

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

Step 1

Set SW5 and SW6 as follows to select the type of external inputs.

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

Step 2

Press SWP3 to select item code 107.

Step 3

Press SWP1 to increase and SWP2 to decrease the value.

Item Code	Increments	Lower limit	Upper limit	Initial value
107	1	1	16	1

*1: Including the main unit. Applicable only to the main unit.

Step 4

Press SWP3 to save the change.

The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

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

Step 5

Turn the power back on to re-initialize the system.

Refer to the following page(s) for detail. "Re-initializing the system" (p. 32)

The new setting will not be saved unless re-initialization is performed.

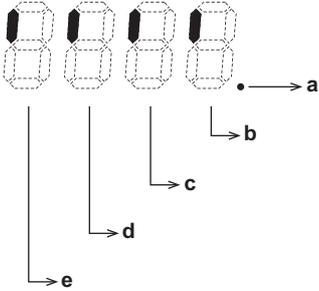
Setting the unit addresses

Refer to the following page(s) for detail. "System configuration procedures: Multiple system" (p. 28)

[6] Selecting the item to display on the LED

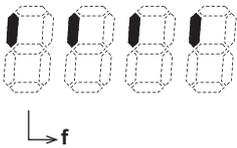
SW5	SW6						Display content
10	5	6	7	8	9	10	
OFF	OFF	OFF	ON	OFF	OFF	OFF	Displays operation mode 1
OFF	OFF	ON	ON	OFF	OFF	OFF	Displays operation mode 2
OFF	ON	ON	OFF	OFF	OFF	OFF	Displays the current water temp.
OFF	ON	OFF	OFF	OFF	OFF	OFF	Displays the water-temp. setting
OFF	Displays the high and low refrigerant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

Operation mode 1



- a** Lights up when the operation command signal is ON
Lights off when the operation command signal is OFF
- b** A: Compressor in operation
S: Compressor is stopped.
- c** S: Fan is forced to operate.
-: Function is disabled.
- d** d: Demand control is enabled
-: Function is disabled.
- e** Displays the operation mode
H: Water heating operation
F: Pump in freeze-up protection operation

Operation mode 2



- f** Displays the system control mode
S: Multiple system control
A: Individual system control

[7] Selecting the remote water temp. setting input signal type

The following four external analog input signals can be used to set water temperatures by setting SW5-7.

"0": 4-20 mA

"1": 0-10 V

"2": 1-5 V

"3": 2-10 V

Steps

Step 1

Set SW501-1, SW501-2, SW5, and SW6 as follows.

	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
OFF	OFF	OFF	OFF	OFF	ON	OFF

en

Step 2

Press SWP3 to select item code 21.

Step 3

Press SWP1 or SWP2 to select the input signal type.

Settable item	Item Code	Initial value *1	Limits and increments			Setting change from optional remote controller
			Increments	Lower limit	Upper limit	
Water temp. setting input signal type	21	0	1	0	3	No

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

Step 4

Press SWP3 to save the change.

The LED will stop blinking and stay lit. Then, an item code will appear on the LED.

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

[8] Setting the water temperature using analog signal input

For how to set the settings, refer to the following section. "Selecting the remote water temp. setting input signal type" (p. 45)

When SW5-7 is set to ON (enable external input), target water temp. will be determined based on the pre-set temp. A and B and the type of analog input signal.

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

Settable item	Item Code	Initial value	Unit	Limits and increments			Note	Setting change from optional remote controller
				Increments	Lower limit	Upper limit		
Analog input signal	1051	0		1	0	3		No

0: Water temp. input 4-20 mA

1: Capacity control input 4-20 mA

2: Water temp. input IT terminal

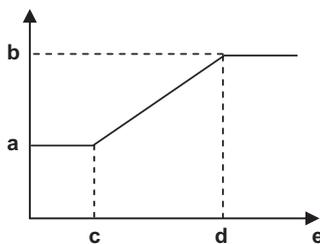
3: Capacity control input IT terminal

(1) Input signal type 0 (4-20 mA)

- External analog input signal of 5.9 mA: Pre-set temp. A (Item code 11)
- External analog input signal of 18.3 mA: Pre-set temp. B (Item code 13)
- External analog input signal of between 5.9 and 18.3 mA: Pre-set temp. will be linearly interpolated.

Pre-set temp. = $(B - A) * (\text{Input current} - 5.9 \text{ mA}) / 12.4 \text{ mA} + A$

Change of 0.12 mA or less is not recognized.



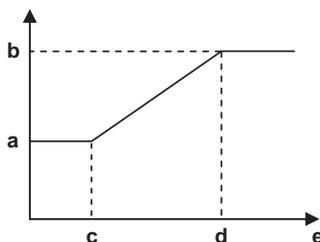
- a Pre-set temp. A
- b Pre-set temp. B
- c 5.9 mA
- d 18.3 mA
- e Input current

(2) Input signal type 1 (0-10 V)

- External analog input signal of 1.0 V: Pre-set temp. A (Item code 11)
- External analog input signal of 9.1 V: Pre-set temp. B (Item code 13)
- External analog input signal of between 1.0 and 9.1 V: Pre-set temp. will be linearly interpolated.

Pre-set temp. = $(B - A) * (\text{Input voltage} - 1.0 \text{ V}) / 8.1 \text{ V} + A$

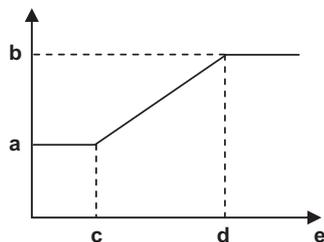
Change of 59 mV or less is not recognized.



- a Pre-set temp. A
- b Pre-set temp. B
- c 1.0 V
- d 9.1 V
- e Input voltage

(3) Input signal type 2 (1-5 V)

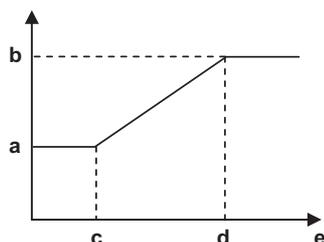
- External analog input signal of 1.5 V: Pre-set temp. A (Item code 11)
- External analog input signal of 4.5 V: Pre-set temp. B (Item code 13)
- External analog input signal of between 1.5 and 4.5 V: Pre-set temp. will be linearly interpolated.
Pre-set temp. = $(B - A) * (\text{Input voltage} - 1.5 \text{ V}) / 3.0 \text{ V} + A$
Change of 29 mV or less is not recognized.



- a** Pre-set temp. A
- b** Pre-set temp. B
- c** 1.5 V
- d** 4.5 V
- e** Input voltage

(4) Input signal type 3 (2-10 V)

- External analog input signal of 2.9 V: Pre-set temp. A (Item code 11)
- External analog input signal of 9.1 V: Pre-set temp. B (Item code 13)
- External analog input signal of between 2.9 and 9.1 V: Pre-set temp. will be linearly interpolated.
Pre-set temp. = $(B - A) * (\text{Input voltage} - 2.9 \text{ V}) / 6.2 \text{ V} + A$
Change of 59 mV or less is not recognized.



- a** Pre-set temp. A
- b** Pre-set temp. B
- c** 2.9 V
- d** 9.1 V
- e** Input voltage

[9] Setting the capacity control ratio using analog signal input

For how to set the settings, refer to the following section. "Selecting the remote water temp. setting input signal type" (p. 45)

(Set item code 1051 instead of 21.)

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

Settable item	Item Code	Initial value	Unit	Limits and increments			Note	Setting change from optional remote controller
				Increments	Lower limit	Upper limit		
Analog signal input	1051	0		1	0	3		No

0: Water temp. input 4-20 mA

1: Capacity control input 4-20 mA

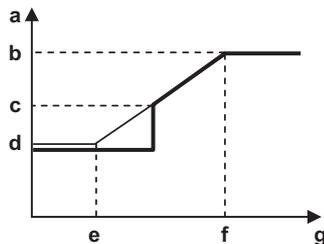
2: Water temp. input IT terminal

3: Capacity control input IT terminal

When SW5-7 is set to ON (Enable external input), the capacity control ratio will be determined based on the type of analog input signal.

(1) Input signal type 0 (4-20 mA)

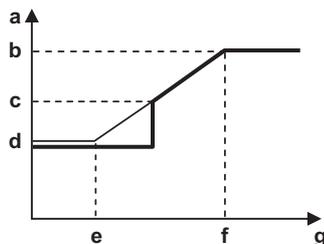
- External analog input signal of 5.9 mA: 0%
 - External analog input signal of 18.3 mA: 100%
 - External analog input signal of between 5.9 and 18.3 mA: Percentage will be linearly interpolated.
- Pre-set temp. = $100\% \times (\text{Input current} - 5.9 \text{ mA}) / 12.4 \text{ mA}$
 Change of 0.12 mA or less is not recognized.



- a Load ratio
- b 100%
- c *
- d 0%
- e 5.9 mA
- f 18.3 mA
- g Input current

(2) Input signal type 1 (0-10 V)

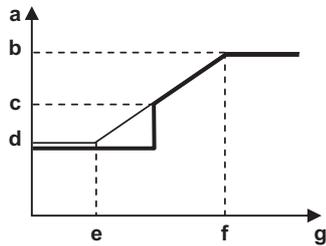
- External analog input signal of 1.0 V: 0%
 - External analog input signal of 9.1 V: 100%
 - External analog input signal of between 1.0 and 9.1 V: Percentage will be linearly interpolated.
- Pre-set temp. = $100\% \times (\text{Input voltage} - 1.0) / 8.1 \text{ V}$
 Change of 59 mV or less is not recognized.



- a Load ratio
- b 100%
- c *
- d 0%
- e 1.0 V
- f 9.1 V
- g Input voltage

(3) Input signal type 2 (1-5 V)

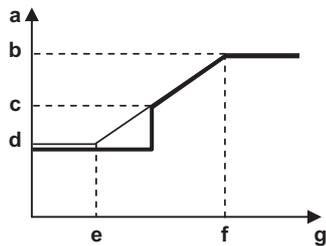
- ♦ External analog input signal of 1.5 V: 0%
- ♦ External analog input signal of 4.5 V: 100%
- ♦ External analog input signal of between 1.5 and 4.5 V: Percentage will be linearly interpolated.
Pre-set temp. = $100\% * (\text{Input voltage} - 1.5)/3.0 \text{ V}$
Change of 29 mV or less is not recognized.



- a Load ratio
- b 100%
- c *%
- d 0%
- e 1.5 V
- f 4.5 V
- g Input voltage

(4) Input signal type 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: Percentage will be linearly interpolated.
Pre-set temp. = $100\% * (\text{Input voltage} - 2.9 \text{ V})/6.2 \text{ V}$
Change of 59 mV or less is not recognized.



- a Load ratio
- b 100%
- c *%
- d 0%
- e 2.9 V
- f 9.1 V
- g Input voltage

* %: Compressor will stop when the compressor frequency drops below the low frequency limit, depending on the outside and water temperatures.

[10] Setting the booster heater 1 operation conditions

Set the booster heater 1 trigger temperatures for item codes 1057 and 1058 (TWL1 and TAL1).

Booster heater 1 start conditions

(1) Individual system

Operation command signal is ON, and at least one of the following two conditions is met.

- 1) Water temp. control is set to OFF, water temp. drops below TWL1, and outdoor temp. drops below TAL1.
- 2) Water temp. control is set to ON, external water temp. thermistor reading drops below TWL1, and outdoor temp. drops below TAL1.

(2) Multiple system

Operation command signal is ON, and the following conditions are met.

External water temp. thermistor readings (TH14 and TH15) drop below TWL1, and the reading of the outdoor temp. thermistor connected to the main unit drops below TWL1.

Booster heater 1 stop conditions

Operation command signal is OFF, or both of the following conditions are met.

- 1) Water temp. is at or above TWL1+2°C, or outdoor temp. is at or above TAL1+2°C.
- 2) External water temp. thermistor readings (TH14 and TH15) are at or above TWL1+2°C, or the reading of the outdoor temp. thermistor (TH9) connected to the main unit exceeds TAL1+2°C.

Steps

Step 1

Set SW5 and SW6 as follows to select the outdoor temp. input source.

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

Settable item	Item Code	Initial value	Unit	Limits and increments			Note	Setting change from optional remote controller
				Increments	Lower limit	Upper limit		
Outdoor temp. input source	1080	0		1	0	1		No

0: Outdoor temp. thermistor (TH9)

1: IT terminal

Step 2

Set SW5 and SW6 as follows to select the output temp. input source.

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

Settable item	Item Code	Initial value	Unit	Limits and increments			Setting change from optional remote controller
				Increments	Lower limit	Upper limit	
Booster heater 1 trigger water temp. (TWL1)	1057	40	°C	0.1	0	70	No
Booster heater 1 trigger outdoor temp. (TAL1)	1058	-10	°C	0.1	-30	50	No

Step 3

Press SWP3 to save the change.

The LED will stop blinking and stay lit.

Then, an item code will appear on the LED.

If SWP3 is not pressed within one minute, the change will not be saved, and an item code will appear on the LED.

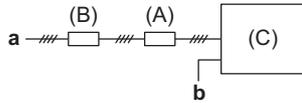
6. Electrical Wiring Installation

6-1. Power Supply, Breaker, and Cable Requirements

Wiring schematic

a 3N~380–415 V
L1, L2, L3, N

b PE (Protective Earth)



(A) Current breaking switch
(B) Earth leakage breaker (ELB)
(C) Outdoor unit

Wire size, switch capacity, and system impedance

Model	Min. wire size (mm ²)			ELB	Local switch (A)		Overcurrent breaker (A)	Max. permissive system impedance
	Main	Branch	Ground		Capacity	Fuse		
CAHV-R450YA-HPB	14	-	14	50 A 100 mA 0.1 sec. or less	50	50	50	0.16 Ω

To minimize the risk of electrical leakage, electric shock, noise interference, malfunction, overheating, smoke, or fire, electrical work must be conducted only by a certified electrician, following all relevant local wiring regulations and the instructions detailed below and in the Installation Manual. Consider the ambient conditions, and consult the power company as necessary.

Power supply

- This equipment complies with IEC 61000-3-12, provided the short-circuit power S_{SC} at the interface point is greater than or equal to the S_{SC} value (MVA) of 3.80. Ensure the equipment is connected only to a power supply with a short-circuit power S_{SC} greater than or equal to this value.
- Ensure each unit has its own dedicated power supply and is individually wired.
- Connect this device to a power supply system that has a maximum permissive system impedance at the user's supply interface point as shown in the table.
- Maintain a power supply voltage drop of no more than 10%. The table provides the minimum wire size for use with a metal conduit. If voltage drop is a problem, consider increasing the wire size.

Breaker/ground

- Only use properly rated breakers and fuses, including an earth leakage breaker, a local switch (switch + fuse), or an overcurrent breaker that matches the unit capacity, leakage current limit, and current breaking threshold.
- Use breakers with at least 3.0 mm contact separation in each pole.
- When using an earth leakage breaker without an overcurrent breaker, combine it with a local switch and a molded case circuit breaker.
- Install an earth leakage breaker for each unit's power supply.
- For INV circuits, use a Mitsubishi Electric NV-S series earth leakage breaker or its equivalent.
- A large electric current due to malfunction or faulty wiring can trigger the earthleakage breakers on both the unit side and the upstream side of the power supply. Either separate the power supply system or coordinate breaker protection to provide higher protection.
- Some installation sites may require an additional earth leakage breaker for the inverter.
- Provide proper grounding, avoiding connections to gas pipes, water pipes, lightning rods, or telephone wires.

Cable/connector

- Only use standard power supply cable of sufficient capacity.
- For outdoor use, power supply cables should be no lighter than polychloroprene sheathed flexible cord (design 60245 IEC57).
- Include some slack in the power supply cable.
- Replace the power supply cable immediately if damaged.
- Grounding wire should be longer than the power supply cable.
- Use specified cables and avoid straining terminal connections.
- Tighten all terminal screws to the specified torque.

Misc.

Avoid installing a phase advancing capacitor on the motor as it could cause damage and potentially start a fire.

[1] Control cable specifications

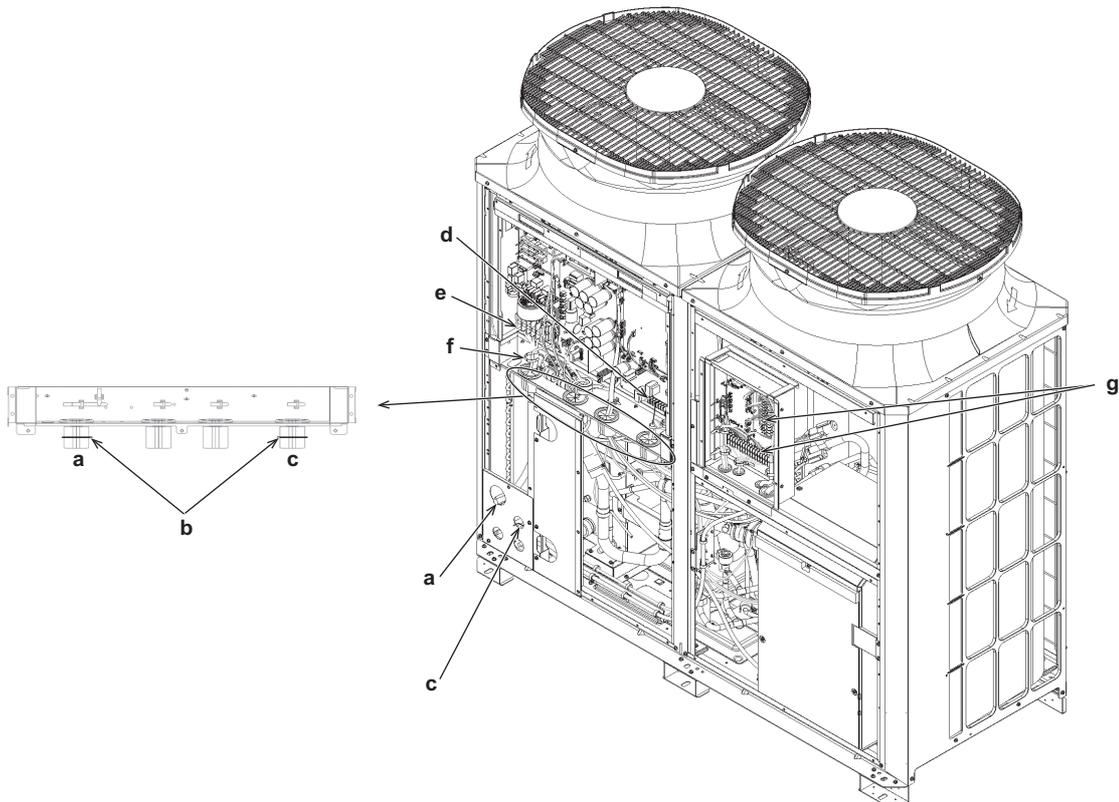
Remote controller cable	Size	0.3 - 1.25 mm ² (Max. 200 m)
	Recommended cable	CVV
M-NET cable between units *1	Size	Min. 1.25 mm ²
	Recommended cable	Shielded CVVS, CPEVS, or MVVS cable (Max. 200 m)
External input wire size *2	Size	Min. 0.3 mm ²
	Recommended cable	Shielded CVVS, CPEVS or MVVS cable
External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

*1: Use a CVVS or CPEVS cable if a source of noise interference is nearby.

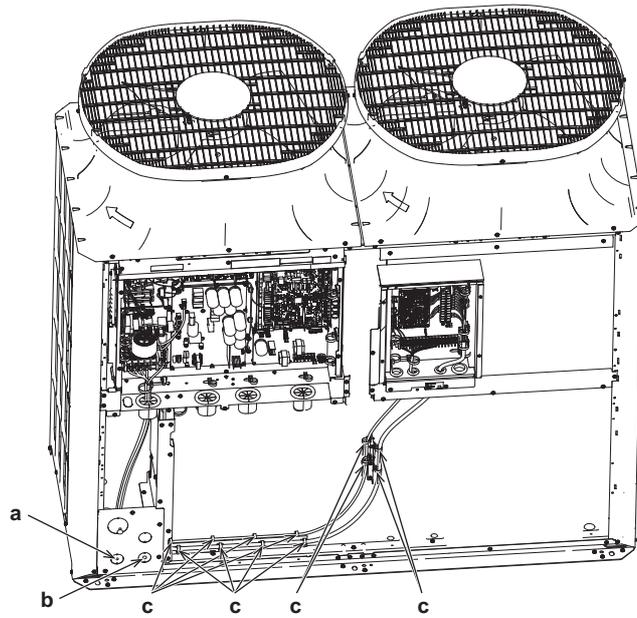
*2: With at least 1-mm-thick supplementary insulation

6-2. Schematics of a Unit and Its Terminal Blocks

Front panels of the control box are removable by unscrewing the four screws and pulling the panels forward and down.



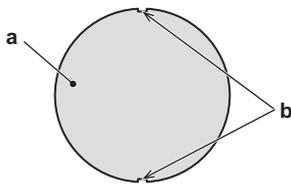
- a Power wire
- b Fasten with cable ties
- c Transmission cable
- d Transmission terminal block
- e Power supply terminal block (TB1)
(Power supply cables larger than 25 mm² are not connectable to TB1. Use a pull box to connect them.)
- f Cable tie
- g Control terminal block (TB5, TB6)



- a < 24 V
- b > 100 V
- c Cable tie

6-3. Wire Knockout Hole and Conduit

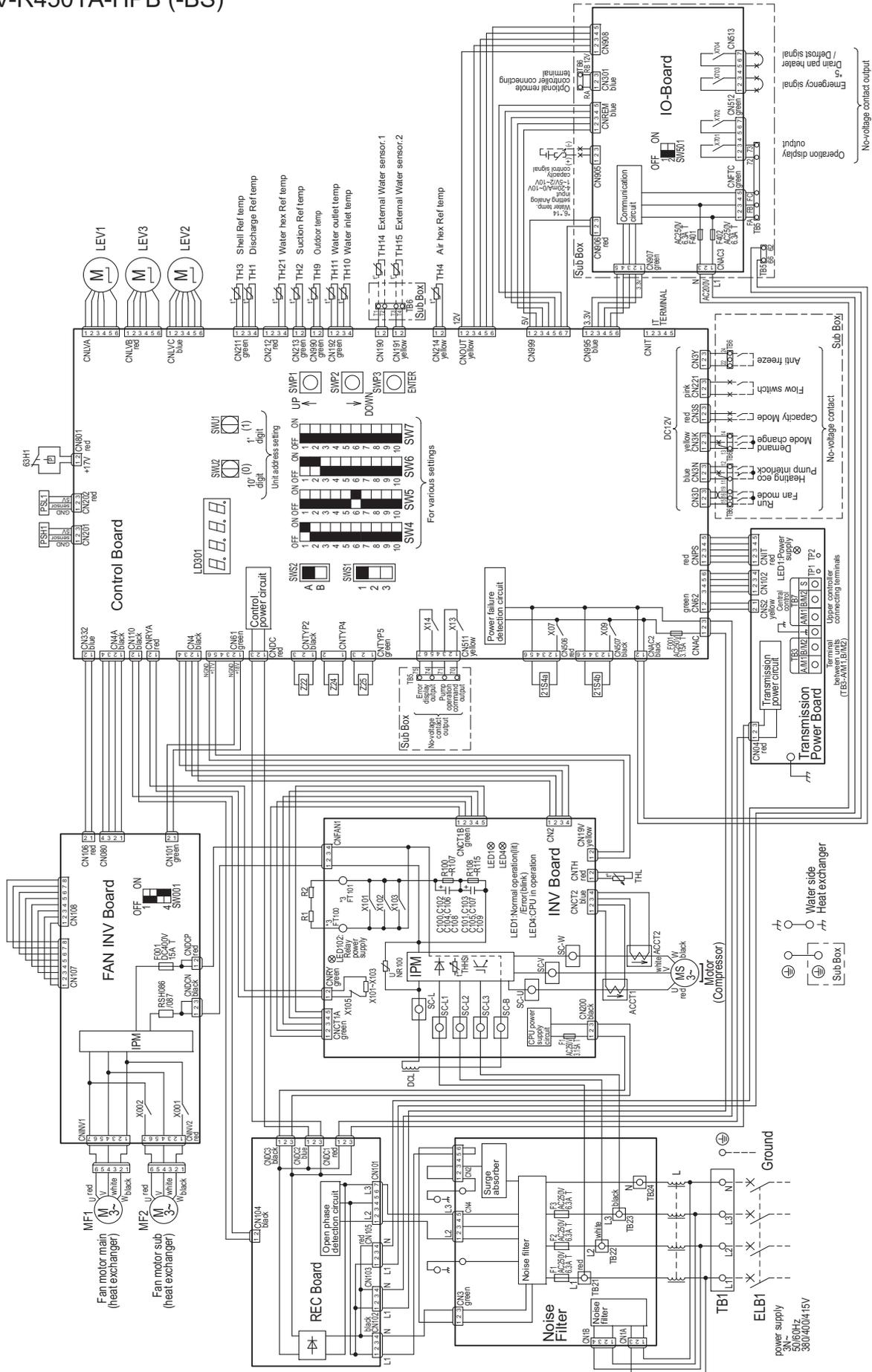
- ♦ Punch out the wire knockout hole at the bottom of the front panel with a hammer.
- ♦ Consider using a conduit if damage to wires by animals is a concern.
- ♦ If not using a conduit, deburr the knockout hole, and wrap the wires with protective tape.



- a Knockout hole
- b Burr

6-4. Electrical Wiring Diagram

CAHV-R450YA-HPB (-BS)



- Note 1. The broken lines indicate the optional parts, field-supplied parts, and field work.
 2. Dashed lines indicate Sub box.
 3. Faston terminals have a locking function.
 Press the tab in the middle of the terminals to remove them.
 Check that the terminals are securely locked in place after insertion.
 4. The symbols of the field connecting terminals are as follows.
 ○ : Terminal block × : Connection by cutting the short circuit wire
 5. Selects either Drain pan signal or Defrost signal by SW5 and SW6 settings.
 (Item code 1056)
 6. Selects either Water temperature setting input signal or Capacity control input signal by SW5 and SW6 settings. (Item code 1051)
 7. Make sure to connect a pump interlock contact.
 A short-circuit may cause abnormal stop or malfunctions.
 8. The preset temperature setting can be switched from the no-voltage contact or by setting time ranges.
 9. The method of input signal of operation can choose one of optional remote controller or no-voltage input.
 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 cable tray as this will damage the circuit board.
 11. When cable tray cable is used for the control cable wiring, use a separate cable tray for the following wiring.
 Using the same cable tray 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
 12. Use a contact that takes 12VDC 1mA for no-voltage contact input.
 13. Need to select 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

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

Symbol explanation

Symbol	Explanation
ACCT1	AC current sensor
ACCT2	DC reactor
DCL	
F1 (Noise Filter)	
F2 (Noise Filter)	
F3 (Noise Filter)	
F1 (INV Board)	Fuse
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 Cooling/Heating switching
21S4b	
THL	DC reactor temperature
TH1~4,9~11,21	Thermistor
Z22,24,25	Function setting connector
63H1	High pressure switch
72C	Electromagnetic relay (Inverter main circuit)
*TH14,15	Thermistor
<ELB1>	Earth leakage breaker

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

6-5. External Input/Output

Available signals for local controllers

Input

Dry contact		ON (Close)	OFF (Open)	Terminal block/ connector
(a) UNIT OPERATION	ON/OFF	Unit will start when water temp. drops below the pre-set temp.	Unit will stop except when in the Anti-Freeze mode.	TB6 15-16
(b) MODE CHANGE 2	Heating ECO/ Heating	Unit will start when water temp. drops below water temp. setting C. (Heating ECO mode)	Unit will start when water temp. drops below water temp. setting A. (Heating mode)	CN3N 1-2
(c) PRIORITY MODE	COP/Capacity	Unit will operate in the energy-efficient mode (COP priority).	Unit will operate at the max. capacity setting (Capacity priority).	CN3S 1-2
(d) MODE CHANGE 1	Hot water/Heating	Unit will operate when water temp. drops below water temp. setting B.	Unit will start when water temp. drops below water temp. setting A. (Heating)	TB6 13-14
(e) ANTI FREEZE	ON/OFF	Unit will operate in the Anti-Freeze mode (target temp. 25°C) when the contact status of unit operation (item (a)) is Stop, or the ON/OFF button on the remote controller is off.	Unit will operate based on the status of the unit operation contact (item (a)) or the ON/OFF command from the remote controller.	TB6 22-24
(f) FAN MODE	Forced/Normal	Fan will stay in operation after the compressor has stopped (incl. when the operating status is Stop).	Fan will stop when compressor stops.	TB6 15-19
(g) FLOW SWITCH	Normal/Error	Unit is allowed to operate.	Unit will not operate.	CN221 1-3
(h) PUMP INTERLOCK	Normal/Error	Unit is allowed to operate.	Unit will not operate.	TB6 11-12
(i) PEAK-DEMAND CONTROL	ON/OFF	Unit will operate at or below the max. capacity setting for peak-demand control. (If the setting for Priority mode (Item (c)) is lower, unit will operate based on the Priority mode setting.	Unit will operate at or below the max. capacity setting for either the Capacity Priority mode or the COP priority mode selected for Priority mode (item (c)).	CN3K 1-2
Analog				Terminal block/ connector
Input type		Action		
(j) WATER TEMP SETTING/CAPACITY CONTROL		Settable by using external analog input to CN905 on IO board. Available analog inputs: 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

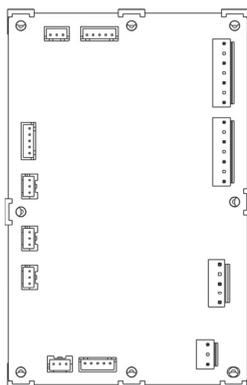
Output

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	Unit has stopped abnormally.	During normal operation	TB5 74-75
(n) OPERATION INDICATOR	Close/Open	Unit operation contact (item (a)) or the ON/OFF button on the remote controller is ON.	Unit operation contact (item (a)) 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 Pump will operate based on Thermo-ON/OFF status. (2) When SW5-8 is set to OFF Pump will operate based on the status of the unit operation contact or the ON/OFF button on the remote controller.	All conditions other than the ones at left	TB5 70-71
(p) EMERGENCY SIGNAL	Close/Open	Water temp. below booster heater operation water temp. (TWL1 value) (Item code 1057) and outdoor temp. (TAL1 value) (Item code 1058).	Water temp. \geq TWL1 + 2°C or Outdoor temp. \geq TAL1 + 2°C	CN513 1-3
(q) DRAIN PAN HEATER SIGNAL/ DEFROST SIGNAL	Close/Open	Item code 1056 set to "1": Defrost signal Item code 1056 set to "0": Drain pan water signal "Outdoor temp. > 1°C" or "Outdoor temp. rise after contact-ON conditions were met > 3°C"	-	CN513 5-7

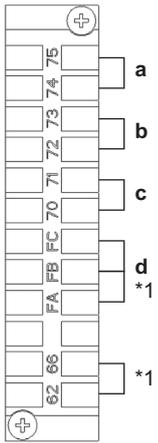
RC/M-NET

REMOTE CONTROLLER	PAR-W31MAA	TB6 RA-RB
M-NET	Transmission line	TB3 A/M1-B/M2
Centralized controller	AE-200	TB7 A/M1-B/M2
Internal/external A-control signal Flow temp. controller	Flow temp. controller (FTC) PAC-IF071B-E PAC-IF072B-E PAC-IF073B-E PAC-SIF051B-E	TB5 FA-FB-FC

[1] IO board



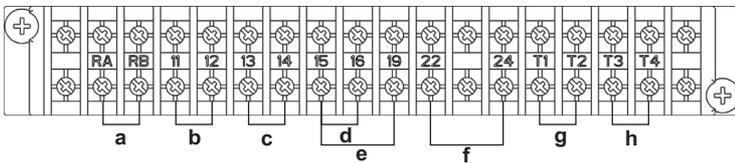
[2] TB5



- a Error display output
 - b Operation display output
 - c Pump operation command output
 - d Optional FTC terminal
Refer to the FTC manual for detail.
- *1:CAUTION: High voltage

Outdoor unit	FA	FB	FC
FTC control board	S1	S2	S3

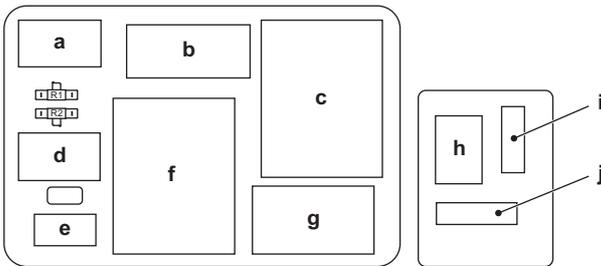
[3] TB6



- a Optional remote controller terminal
- b Pump interlock
- c Mode change 1
- d Run
- e Fan mode
- f Anti-freeze
- g External water temp. thermistor (option) TH14
- h External water temp. thermistor (option) TH15

- Wire color**
- Heating ECO: Black
 - Demand: Brown
 - Capacity mode: Blue
 - Flow switch: White

[4] Inside the control box (front view)



- a Rec board
- b Fan INV board
- c Control board
- d Noise filter
- e TB1
- f INV board
- g Transmission power board
- h IO board
- i TB5
- j TB6

[5] Display setting

Control board display	Control board SW setting *1	
Pre-set 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	SW6-8: OFF
	SW6-5: OFF	SW6-9: OFF
	SW6-6: OFF	SW6-10: OFF
	SW6-7: 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 pre-set water temperature display option.

7. Troubleshooting

Troubleshooting must be performed only by Mitsubishi Electric certified personnel.

7-1. Diagnosing Problems with No Available Error Codes

Resolve the issue causing the unit to stop before resuming operation to prevent possible damage to the unit.

Problem	Symptom		Cause	Solution
Unit does not operate.	Fuse in the control box is intact.	Power lamp on the circuit board is not lit.	Main power is off.	Turn on the power.
		Power lamp on the circuit board is lit.	Pump interlock circuit is disconnected. Flow switch is disconnected.	Connect the circuit. Connect the switch.
	Blown fuse in the control box	Improper circuit resistance or ground resistance	Short circuit or ground fault	Resolve the cause, and replace the fuse.
	Automatic Start/ Stop thermistor trip	Water temp. too high	-	Normal
		Water temp. too low	Automatic Start/Stop thermistor set too low	Increase the setting.
Unit operates, but water temp. does not change.	Water temp. too low	Normal water inlet/ outlet temp. differential	Water-heating load too high	Increase the number of outdoor units.
			Refrigerant shortage due to a leak	Check for and repair any leakage, evacuate the system, and recharge the refrigerant.
		Water inlet/outlet temp. differential too small	LEV fault	Replace the LEV.
	Compressor fault		Replace the compressor.	
	High pressure too high, or low pressure too low		Operate the units within the specified pressure range.	
	Water temp. too high		Low water flow	Increase the flow rate.
		Problem with external devices	Repair the devices.	

7-2. Diagnosing Problems Using Error Codes

If a problem occurs, refer to the table below for troubleshooting before calling for service.

- A: Errors resettable regardless of switch settings
- B: Errors resettable when the remote reset setting on the unit is set to Enable (default)
Errors non-resettable when the remote reset setting on the unit is set to Disable
- C: Errors non-resettable
- : Errors auto-canceled when the cause is removed

Error code *1 (PCB *2)	Preliminary error code	Error (preliminary) detail code	Error type	Cause (Installation/Setting error) (Component problems)	Error reset	
					Unit (PCB)	Remote controller
					SWS1	Operation SW
A000	-	-	Unreset errors *4	Some errors have not been reset.	-	-
4106 A-P0	-	-	Power failure *3	Power failure occurred while the operation switch is on.	A	A
2501 AFSA	-	-	Water supply interruption (Flow switch trip)	Water flow rate dropped below the flow switch threshold. Water supply interruption Open-circuited flow switch Broken flow switch wiring	B	B
1302 AHP1	-	-	High-pressure fault	Water supply interruption LEV fault High-pressure sensor fault	B	B
1502 AdSH	-	-	Compressor flooding	Fan motor fault/broken fan motor wiring Low-pressure sensor fault Shell temp. thermistor fault High-pressure sensor fault Discharge refrigerant temp. thermistor fault LEV fault	B	B
1505	-	-	Suction pressure fault	Outdoor temp. below the operating range Clogged air-side HEX due to sudden frosting or heavy snow Low-pressure sensor fault Air-side HEX inlet thermistor fault Suction refrigerant temp. thermistor fault LEV fault Fan motor fault/broken fan motor wiring Refrigerant shortage (gas leak)	B	B
1103	-	-	Shell temp. fault	Outdoor temp. above the operating range Excessive oil flow Shell temp. thermistor fault LEV fault	B	B

Error code *1 (PCB *2)	Preliminary error code	Error (preliminary) detail code	Error type	Cause (Installation/Setting error) (Component problems)	Error reset	
					Unit (PCB)	Remote controller
					SWS1	Operation SW
Thermistor fault (5101, 5102, 5103, 5104, 5109, 5116, 5111, 5114, 5115, 5121)						
5101	-	-	Discharge refrigerant temp. (TH1)	Broken or short-circuited thermistor wiring	B	B
5102	-	-	Suction refrigerant temp. (TH2)	Same as above	B	B
5103	-	-	Shell temp. (TH3)	Same as above	B	B
5104	-	-	Air-side HEX outlet refrigerant temp. (TH4)	Same as above	B	B
5109	-	-	Outdoor temp. (TH9)	Same as above	B	B
5116	-	-	Inlet water temp. (TH10)	Same as above	B	B
5111	-	-	Outlet water temp. (TH11)	Same as above	B	B
5114	-	-	External water temp. 1 (TH14)	Same as above	B	B
5115	-	-	External water temp. 2 (TH15)	Same as above	B	B
5121	-	-	Water-side HEX refrigerant temp. thermistor fault (TH21)	Same as above	B	B
5201	-	-	High-pressure sensor fault/high-pressure fault	Broken or short-circuited pressure sensor wiring	B	B
5202	-	-	Low-pressure sensor fault/low-pressure fault	Same as above	B	B
7113	-	-	Model setting error 1	Dip switches on the PCB set incorrectly during maintenance	B	B
7117	-	-	Model setting error 2	Resistor Z22, 24 or 25 fault (connected to the main control board)	B	B
4115	-	-	Power supply frequency fault	Frequency other than 50 Hz or 60 Hz	B	B
4102 A471	-	-	Open phase	Power supply fault Open phase Voltage drop Circuit board fault Wiring fault	B	B
4106 (255)	-	-	Power supply fault	Transmission power supply PCB fault	-	-
1102 AC61	1202	-	Discharge temp. fault (Discharge temp. $\geq 120^{\circ}\text{C}$ for 30s while compressor is in operation) Brief discharge temp. rise to $\geq 125^{\circ}\text{C}$ while the compressor is in operation	No water Sudden change in water temp. ($\geq 5 \text{ K/min.}$) Pump fault High-pressure sensor fault LEV fault (main circuit, injection) Refrigerant shortage (gas leak)	B	B
1503	-	-	HEX freeze-up *6	Drop in water flow or water supply interruption during defrost cycle Water temp. drop during defrost cycle Four-way valve switching fault	B	B
INV fault						
Electric current related errors during operation (101, 107, 106, 104, 105, 137, 121, 128, 122)						
4250 4255 4256 *7	4350 4355 4356	(101)	IPM error	INV board fault Compressor ground fault Compressor coil fault IPM error (loose terminal screws, cracking) Fan motor fault Fan board fault	B	B
		(107)	Overcurrent during operation (effective value)	Inter-phase voltage drop (≤ 180)	B	B
		(106)	Momentary overcurrent during operation	INV board fault	B	B
		(104)	Short-circuited IPM/ground fault during operation	Compressor ground fault Compressor coil fault	B	B
		(105)	Overcurrent due to short-circuit during operation	IPM error (loose terminal screws, cracking) Fan motor fault Fan board fault	B	B
4255 4256 *7	4355 4356	(137)	Step-out fault	Motor desynchronization Fan motor fault Fan board fault	B	B
4250	4350	(121) (128)	DCL overcurrent (H/W)	DCL overcurrent INV board fault	B	B
4250	4350	(122)	DCL overcurrent (S/W)	Compressor ground fault Compressor coil fault	B	B
INV fault						
Electric current related errors during operation (101, 107, 106)						
4250 4255 4256 *7	4350 4355 4356	(101)	IPM error	INV board fault Compressor ground fault Compressor coil fault IPM error (loose terminal screws, cracking) Fan motor fault Fan board fault	B	B
		(107)	Overcurrent at start-up (effective value)	INV board fault	B	B
		(106)	Momentary overcurrent at start-up	Compressor ground fault Compressor coil fault IPM error (loose terminal screws, cracking) Fan motor fault Fan board fault	B	B

Error code *1 (PCB *2)	Preliminary error code	Error (preliminary) detail code	Error type	Cause (Installation/Setting error) (Component problems)	Error reset	
					Unit (PCB)	Remote controller
					SWS1	Operation SW
INV fault						
Voltage related problems during operation (108, 109, 110, 111, 112)						
4220 4225 4226 *7	4320 4325 4326	(108)	Bus voltage drop protection (S/W)	(Momentary) power failure Power supply voltage drop (interphase voltage ≤ 248 V) Voltage drop INV board fault 72C fault Noise filter coil (L) fault Wiring fault between noise filter board and INV board Wiring fault between fan board and INV board Resistor (R1, R2) fault	B	B
4220	4320	(109)	Bus voltage rise protection (S/W)	Incorrect power supply voltage INV board fault	B	B
4220	4320	(110)	Bus voltage error (H/W)	VDC error INV board fault	B	B
4220 4225 4226 *7	4320 4325 4326	(111) (112)	Logic error	Malfunction due to noise interference Faulty grounding Improper transmission wiring and external wiring installation (Use of non-shielded cable) Low-voltage signal wire and high-voltage wire in contact (Signal and power wires in the same conduit) INV board fault Fan board fault	B	B
4220 4225 4226 *7	4320 4325 4326	(131)	Voltage meter fault at start up (Bus voltage drop protection at start up (detected by the main unit))	Voltage drop INV board fault 72C fault Noise filter coil (L) fault Wiring fault between noise filter board and INV board Wiring fault between fan board and INV board Resistor (R1, R2) fault	B	B
4220	4320	(129)	Control power supply fault	Control power supply fault INV board, main control board fault Broken wiring between INV and main control boards Contact fault	B	B
4220	4320	(123)	Voltage boost control error	Voltage drop Poor installation condition INV board fault Compressor ground fault	B	B
4230 4235 4236 *7	4330 4335 4336		Heatsink fault (Heatsink overheat protection)	Power supply voltage drop (interphase voltage ≤ 180 V) Clogged heatsink cooling air passage Fan motor fault INV and fan board fault THHS sensor fault IPM error (loose terminal screws, cracking)	B	B
4230	4320	(126)	DCL temp. fault	Above 150°C Contact or connector fault (CNTH) INV board fault	B	B
4240 4245 4246 *7	4320 4325 4326	-	Overload protection	Short-cycling (reduced air flow) Clogged heatsink cooling air passage Power supply voltage drop (interphase voltage ≤ 180 V) THHS sensor fault Fan motor fault Current sensor fault Compressor fault INV and fan board fault	B	B
5301	4301	(115)	ACCT sensor fault	INV board fault Compressor ground fault and IPM error	B	B
		(117)	ACCT sensor/circuit fault	Poor INV board CNCT2 contact (ACCT) ACCT sensor fault	B	B
		(119)	Open-circuited IPM/loose ACCT sensor	ACCT sensor (CNCT2) disconnection ACCT sensor fault Broken compressor wiring INV circuit fault (IPM error etc.)	B	B
		(120)	Wiring fault	Wrong ACCT sensor phase Wrong ACCT sensor orientation	B	B
5110	1214	(01) (05) (06)	THHS sensor/circuit fault	THHS sensor contact fault THHS sensor fault INV board fault	B	B

Error code *1 (PCB *2)	Preliminary error code	Error (preliminary) detail code	Error type	Cause (Installation/Setting error) (Component problems)	Error reset	
					Unit (PCB)	Remote controller
					SWS1	Operation SW
5301	4300	(127)	DCL electric current circuit fault	Contact fault between CNCT1A and CNCT1B INV board fault	B	B
5305 5306 *7	4305 4306	(135)	Current sensor fault	Fan board fault Fan motor fault	B	B
		(136)	Current sensor/circuit fault	Fan board fault	B	B
5120	1248	(01)	THL sensor/circuit fault	THL sensor contact fault (CNTH) THL sensor fault INV board fault	B	B
0403	4300 4305 4306	(01) (05) (06)	Serial communication error	Communication error between control board and INV board (noise interference, broken wiring)	B	B
-	-	-	IPM system error	INV board switch setting error Loose wiring or connectors on IPM-driven power supply circuit INV board fault	B	B
Remote controller error (incl. remote controller wiring fault)(6830, 7109, 6831, 6832, 6834)						
6830	-	-	Address overlap	Duplicate addresses	C	C
7109	-	-	Non-consecutive address, system error	Address setting error (non-consecutive address)	C	C
6831	-	-	Remote controller signal reception error 1	Remote controller cable disconnection Broken wiring Broken remote controller wiring Main control board communication circuit fault	-	-
6832	-	-	Remote controller signal transmission error	Communication error due to noise interference Main control board communication circuit fault	-	-
6834	-	-	Remote controller signal reception error 2	Same as above	-	-
Multiple system error (7105, 7130, 7102)						
7105	-	-	Address setting error	Address setting error (non-consecutive address)	C	C
7130	-	-	Incompatible unit combination	Incompatible units in the same system	C	C
7102	-	-	Connected unit setting error	The number of connected unit setting is incorrect (main unit)	C	C
6500	-	-	Communication error between main and sub units		-	-
6600	-	-	Transmission line power supply PCB fault	Communication error due to noise interference	C	C
6602 6603 6606 6607 6608	-	-	Communication error between main and sub units (Simple multiple unit control mode) *4	Broken transmission power supply circuit board wiring Transmission power supply PCB communication circuit fault	-	-
0100	2-digit code *8		FTC error		C	C

*1: Parenthesized codes in the Error code column are detail codes.

*2: Error codes will appear in the PCB's 4-digit digital display.

Power failure will be detected as an error only when the Automatic recovery after power failure setting on the unit is set to Disable.
(Default: Enable)

*3: Depending on the system configuration, unit may stop abnormally when the communication error lasts for 10 minutes.
Reset the error by setting SWS1 on the PCB of the unit or the remote operation switch.

*4: This error code will appear when multiple errors occur that are reset in different ways and when one or more of these errors have not been reset.

*5: Before resetting this error, resolve its causes to prevent possible damage to the heat exchanger.

*6: Last digit 5: MF2 (Top left fan motor when seen from front)
Last digit 6: MF2 (Top right fan motor when seen from front)

*7: Refer to the FTC installation manual.

*8: Operable only from the main remote controller connected to FTC

7-3. Calling for Service

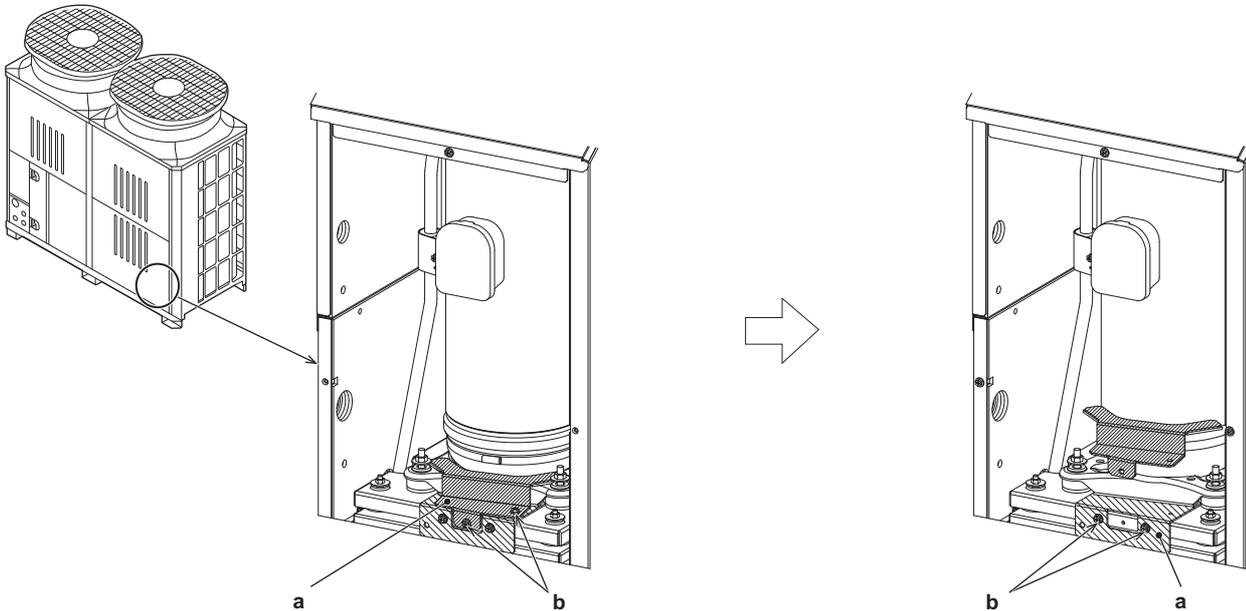
If the issue persists, please contact your dealer or service provider along with the necessary information.

- ♦ Model name
Indicated on the lower left of the unit (Starts with CAHV)
- ♦ Serial number
Ex: 75W00001
- ♦ Error code
- ♦ Nature of the problem in detail

8. Operating the Unit

8-1. Initial Operation

- 1) Ensure the unit ON/OFF switch on the local control panel is turned off.
- 2) Remove the metal plates from the compressor by unscrewing the four screws (circled in the figure).



- a Shipping bracket
b Unscrew to remove the brackets

- 3) Turn on the main power. Perform an initial setup. The compressor will not be activated until the initial setup is completed. Refer to the following page(s) for detail. "Setting configuration procedures" (p. 26)
- 4) Keep the main power turned on for at least 12 hours to heat the compressor.
- 5) Turn on the unit ON/OFF switch on the control panel.

*1: Production in and before December 2025 (Serial No.: Up to 5ZW****)

The compressor heater is not activated before the initial setup is completed.

*2: Production in and after January 2026 (Serial No.: 51W**** and on)

The compressor heater is activated after turning on the main power.

Production number nomenclature

$\frac{0 \ 1 \ W \ 00001}{(1) \ (2) \ (3) \ (4)}$

- (1) Last digit of the production year
(cycles back in 10 years)
*0 = Produced in FY2020 (April 2020 – March 2021)
*1 = Produced in FY2021 (April 2021 – March 2022)
*5 = Produced in FY2025 (April 2025 – March 2026)
- (2) 1 = Production month
(1 – 9 = Jan. – Sept.; X = Oct.; Y = Nov.; Z = Dec.)
- (3) W = Standard product
- (4) Serial number

8-2. Daily Operation

[1] Daily Operation

To start an operation

Switch on the unit ON/OFF switch on the local control panel, or press the ON/OFF button on the remote controller. Refer to the following pages for how to use the remote controller.

The unit described in this manual features a circuit that protects the compressor from short-cycling. Once the compressor stops, it will not restart for up to 10 minutes. If the unit does not start when the ON/OFF switch is turned on, leave the switch turned on. The unit will automatically start within 10 minutes.

To stop an operation

Switch off the unit ON/OFF switch on the control panel, or press the ON/OFF button on the remote controller.

en

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 outdoor 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 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 the clock on the unit is correct.

8-3. Using Units in Cold Climates

[1] Using units in cold climates

In sub-freezing conditions, take measures to prevent water in the water circuit from freezing, bursting pipes, and damaging water leaks.

- ♦ Remove any snow off the unit before turning on the unit.
- ♦ Operate the unit frequently enough to reduce the chance of water freeze-ups.
- ♦ Blow the water out of the pipes, or fill them with anti-freeze before a long period of non-operation.
- ♦ Ensure that the water circuit has an anti-freeze feature, and keep the main power turned on.
- ♦ If the water circulation circuit is connected to a separate circuit from the unit, keep its power on as well.

8-4. Remote Controller Operation

Button functions



: Returns to the menu screen



: Saves the settings

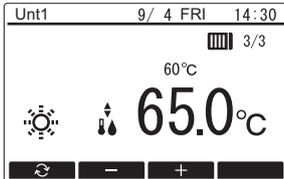


: Returns to the previous screen



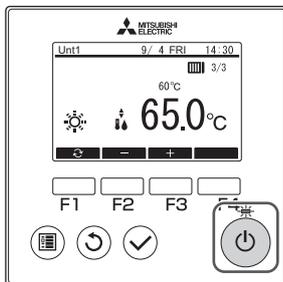
: Turns on/off the power

Main screen



Refer to the FTC installation manual for how to use the main remote controller with connection to FTC.

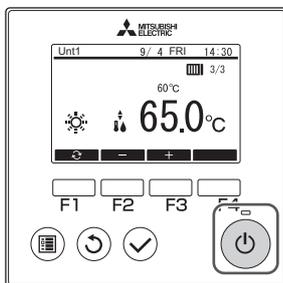
8-4-1. Power ON/OFF



To start

Press [F4].

The LED above [F4] will light up in green, and operation will start.



To stop

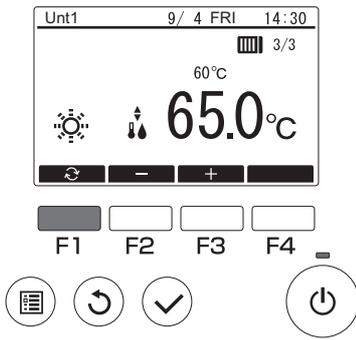
Press [F4].

Press [F3] on the confirmation screen.

[F4] will light off, and the operation will stop.

8-4-2. Setting the operation mode and temperature

[1] Operation mode



Press [F1] to select the operation mode from Heating, Heating ECO, Hot water and Anti-Freeze.

Each press advances the mode.



Heating



Heating ECO

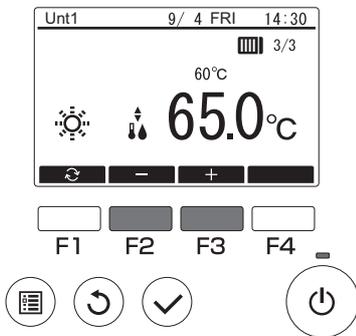


Hot water



Anti-Freeze

[2] Temperature



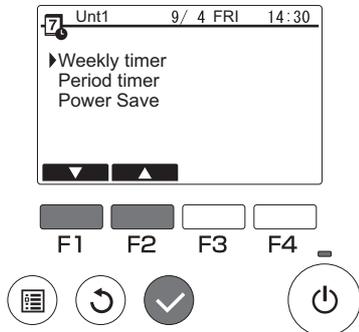
Press [F2] to decrease the temperature, and [F3] to increase.

8-4-3. Using the Weekly timer

Use the Weekly timer to set the ON/OFF schedule, operation mode, and temperature for each day of the week. Weekly timer will be disabled when the schedule function is disabled and when the period timer is enabled. Weekly timer may not be executed under certain system configurations.

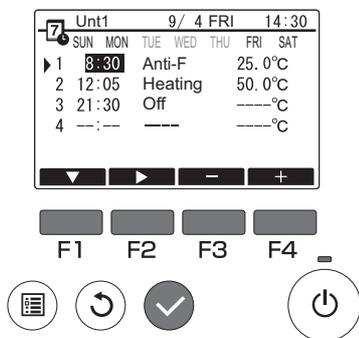
Steps

Step 1



Press [F1].
 Press [F3] to select [Weekly timer].
 Press [F3].
 On the Schedule menu, press [F3] to select Weekly timer.

Step 2

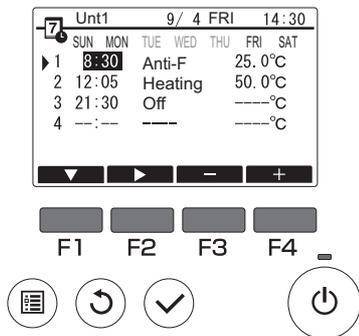


Weekly timer screen will appear.

To view the settings:
 Press [F1] or [F2] to view the settings for each day.
 Press [F4] to see the next page.

To change the settings:
 Press [F1] or [F2] to toggle through the days. Press [F3] select a day, and press [F3].
 Multiple days are selectable by repeating the steps above.

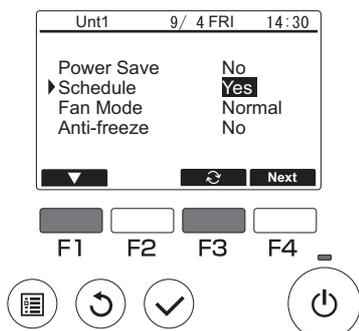
Step 3



Pattern setting screen will appear.
 Press [F1] to select a pattern to be set.
 Press [F2] to select the item to change its settings.
 Press [F3] or [F4] to change the setting for the selected item.

- 1) Time**
 Set in 5-minute increments.
 Hold down the button to fast-forward.
- 2) Operation selection mode or Off**
 Available options vary with the connected unit.
 Connected unit will operate unless set to Off.
- 3) Temperature**
 Settable in 0.5°C increments
 Press [F3] to save the change.

Step 4



To enable schedule
 Return to the main screen, and press [F4].
 Press [F1] to move the cursor to Schedule.
 Operation setting screen will appear.
 Press [F3] to select Yes.

8-4-4. Using the Period timer

Use the Period timer to set the daily operation schedule (ON/OFF, operation mode, temperature) for specific periods.

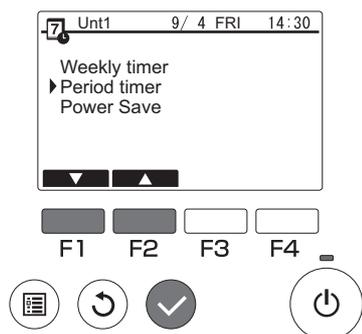
If the periods 1 and 2 overlap, only period 1 will be valid.

Weekly timer will be disabled when the Schedule function is disabled:

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

Steps

Step 1

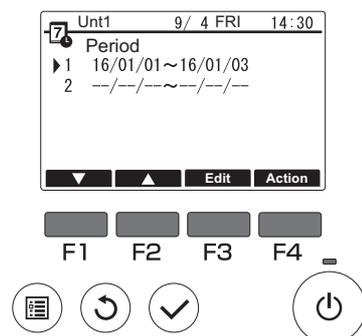


From the Schedule menu press [F1] or [F2] to select Period timer, and press [✓].

Refer to the following page(s) for detail. "Using the Weekly timer" (p. 66)

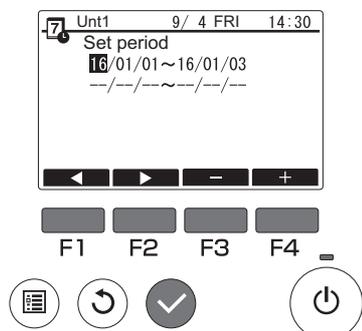
en

Step 2



Pre-set periods will appear, if any.

Step 3



To select a period

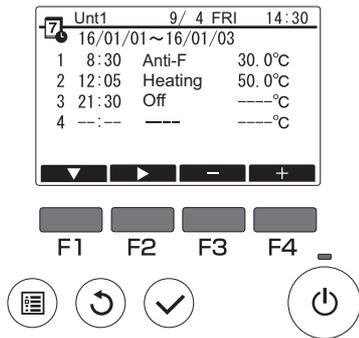
Press [F1] or [F2] to select a period to set, and press [F3].

Press [F1] or [F2] to select the year, month, or date.

Press [F3] or [F4] to change the year, month, or date.

Press [✓] to save the setting.

Step 4



To set the operation

Press [F1] or [F2] to select a period to set, and press [F4].

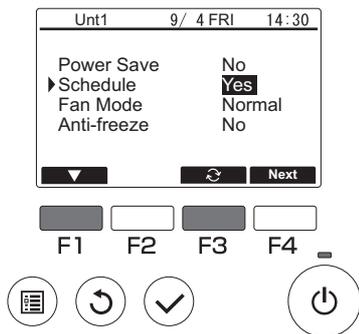
Operation pattern setting screen will appear.

Set the time, mode, and temp.

(Select an item with [F1] and [F2]. Change the value with [F3] and [F4].)

Press [✓] to save the change.

Step 5



To enable schedule

Refer to the following section. "Using the Weekly timer" (p. 66)

8-4-5. Fan mode

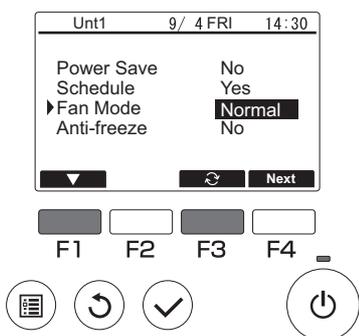
- ♦ The following two fan modes are available.

Normal: Fan stops when compressor stops.

Snow: Fan keeps operating after compressor has stopped to keep snow off the unit.

Steps

Step 1



Press [F4] on the Menu screen.

Operation setting screen will appear.

Press [F1] to select Fan mode.

Press [F3] to select Normal or Snow.

8-4-6. Using power save

Power save is a function that regulates the compressor's rotation count and reduces power consumption during high load on a daily schedule, during specific time periods, or based on the regulated unit capacity.

Definition of a Day in using power save

Each Day starts with the time specified by the user. No periods can be specified that spans the Day. Refer to "Unit Setting" in the Remote controller Installation Manual for detail.

Ex. 1: When the start of the day is specified as 22:00 on August 1 and 2, and the power save period is set to the period between 22:00 and 8:00

Actual date July 31						Actual date August 1						Actual date August 2						Actual date August 3			
0	4	8	12	16	20	0	4	8	12	16	20	0	4	8	12	16	20	0	4	8	12
User-specified start of the day						August 1						August 2						August 3			

en

Ex. 2: When the start of the day is specified as 22:00 on August 1 and 2, and the power save period is set to the period between 22:00 and 8:00

Actual date July 31						Actual date August 1						Actual date August 2						Actual date August 3			
0	4	8	12	16	20	0	4	8	12	16	20	0	4	8	12	16	20	0	4	8	12
User-specified start of the day						August 1						August 2									

Shaded areas in the figure show when power save is enabled.

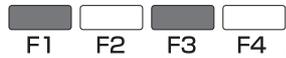
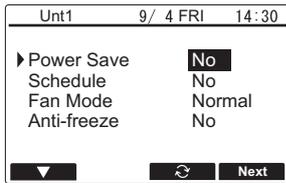
Power save will be disabled when a system controller is connected to the system or when power save is disabled.

Using demand control on the connected units

(1) Using the demand control (contact point) of the connected units without using power save on the remote controller

Steps

Step 1



Press [F4] on the Menu screen.

Press [F1] to access power save.

Press [F3] to select No.

- ◆ Do not set the power save settings on the remote controller.
- ◆ Some items may not be available for selection.
- ◆ Refer to the Instruction Book of the connected units for details on demand control.

(2) Using both the demand control (contact point) of the connected units and power save on the remote controller

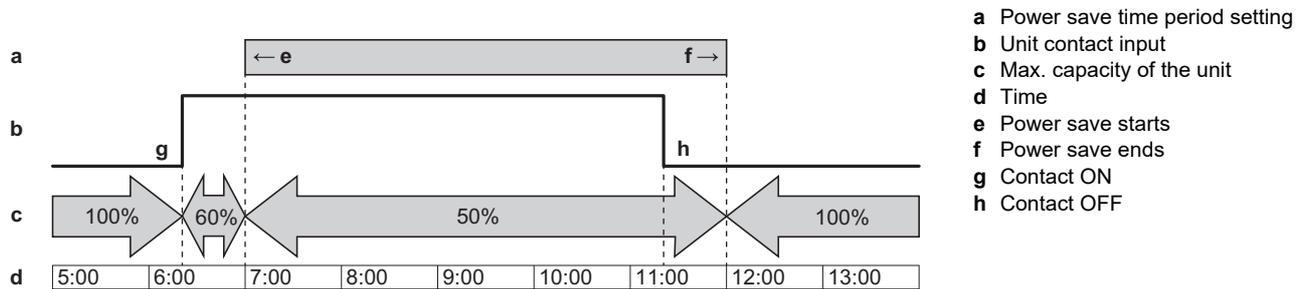
The system will be controlled based on the lower of the following: demand control setting and power save control capacity.

If the contact-ON time and the power save start time are set to different times, whichever the earlier will be valid. Refer to the table below.

Control values for using power save and demand control

Period	Power save value	Demand control value	Actual control target capacity
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%

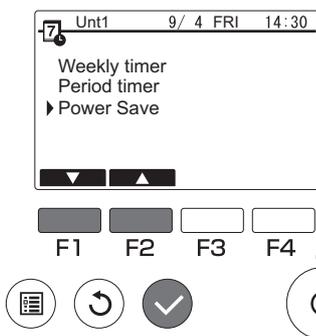
Ex, When power save is enabled between 7:00 and 12:00 at the control capacity of 50%, and the contact for the connected unit is on (capacity setting of 60%)



- While the contact is on or power save is enabled, the maximum capacity will be limited to whichever is the lower between the power save and demand control settings.
- While the contact is off and power save is disabled, units will operate at 100% capacity.
- Units will operate at up to 100% capacity during non-power-saving periods.

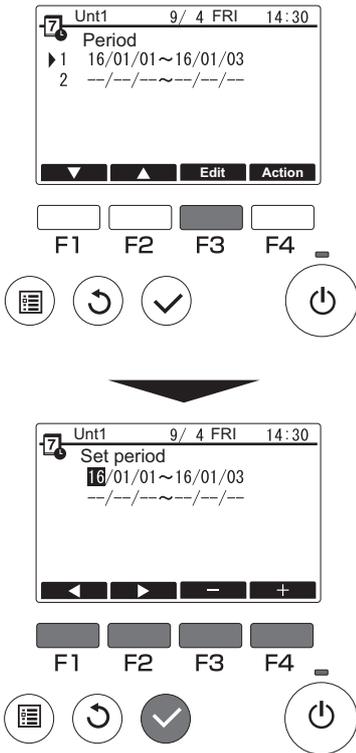
Steps

Step 1



From the Menu screen, select Schedule, then power save. Press [✓].

Step 2



Two different periods can be set by specifying the start and end dates.

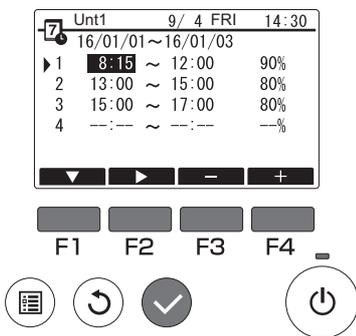
- ◆ If the dates specified in periods 1 and 2 overlap, only the dates specified in period 1 will be valid.

Refer to Step 3 of the section on using the period timer for how to set the periods.

Refer to the following page(s) for detail. "Using the Period timer" (p. 67)

en

Step 3

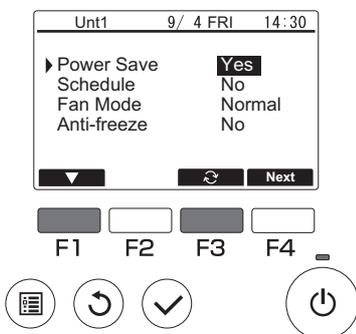


Refer to Step 4 of the section on using the period timer for how to set the power save start/end time and the demand control value.

Refer to the following page(s) for detail. "Using the Period timer" (p. 67)

Press [✓] to save the change.

Step 4



Refer to Step 4 of the section on using the weekly timer for how to enable power save.

Refer to the following page(s) for detail. "Using the Weekly timer" (p. 66)

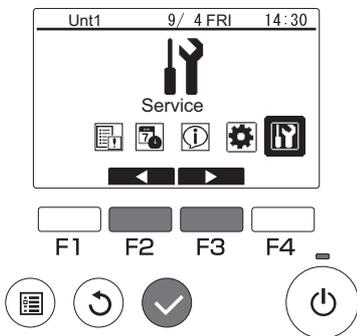
8-4-7. Setting the functions

Set the functions for each connected unit from the remote controller as necessary.

Record any changes made to the functions of the connected units to allow for proper management.

Steps

Step 1



From the Menu screen, select Service, and press [✓].

Step 2



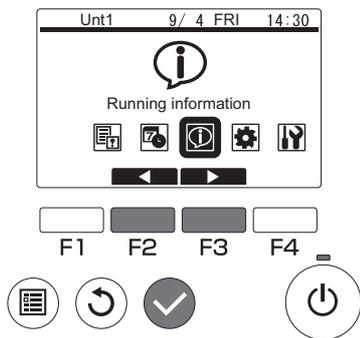
A password screen will appear.

Enter the current maintenance password (a 4-digit number), and press [✓] to access the Service menu.

8-4-8. Monitoring the operating status from the remote controller

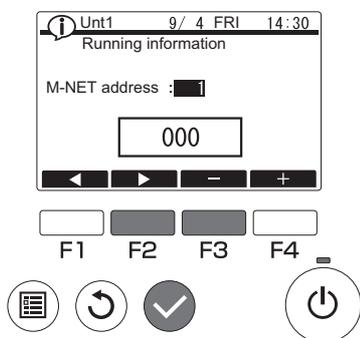
Steps

Step 1



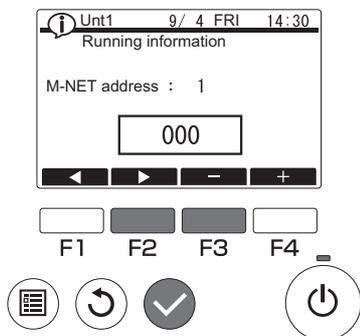
From the Menu screen, select Running information, and press [✓].

Step 2

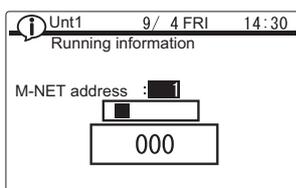


Set the M-NET address with [F2] and [F3], and press [✓].

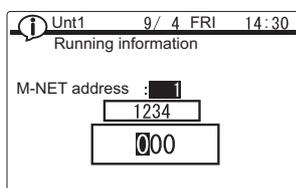
Step 3



Enter a 3-digit running inf. number, and press [✓].



The setting-inf.-send screen will appear.



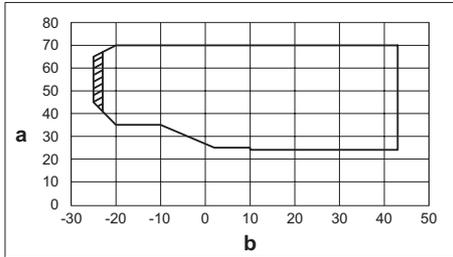
If sent successfully, the running inf. will appear on the screen.
Press [⊙] to return to the screen shown in Step 2.
Set other M-NET address and running inf. number in the same way.

9. 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 *5	Outlet water temperature		24-70°C
	Outdoor temperature		D.B. -25-43°C
Circulating water volume range *8			1.5 m ³ /h-15.0 m ³ /h
Sound pressure level (measured at 1 m below the unit in an anechoic room) *1 *7		dB (A)	64
Sound pressure level (measured at 1 m below the unit in an anechoic room) *4 *7		dB (A)	72
Water pipe diameter and type	Inlet	mm (in)	38.1 (1 1/2"), housing joint
	Outlet	mm (in)	38.1 (1 1/2"), housing joint
External finish		Acrylic painted steel sheet <Munsell 5Y 8/1 or similar>	
External dimensions H × W × D		mm	1710 × 1750 × 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 × 2
		L/s	2500 × 2
		cfm	5297 × 2
	External static pressure		10 Pa (1 mm H ₂ O)
	Type and quantity		Propeller fan × 2
	Control and driving mechanism		Inverter control, direct driven by motor
Motor output	kW	0.92 × 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 *6		148
	Flow and temperature control		LEV and HIC circuit

- *1: Under normal heating conditions at the outdoor temperature of 7°CDB/6°CWB, the outlet water temperature of 45°C, and the inlet water temperature of 40°C
- *2: Under normal heating conditions at the outdoor temperature of 7°CDB/6°CWB and the outlet water temperature of 70°C
- *3: Under normal heating conditions at the outdoor temperature of -5°C and the outlet water temperature of 55°C
- *4: Under normal heating conditions at the outdoor temperature of 7°CDB/6°CWB when the unit is set to the "Capacity Priority" mode through the dry NC-contact

*5:



a outlet water temp (°C)
b outdoor temp (°CDB)

- Outdoor temp. -25°CDB/Outlet water temp. 45~65°C
- Outdoor temp. -20°CDB/Outlet water temp. 35~70°C
- Outdoor temp. 43°CDB/Outlet water temp. 24~70°C
- ♦ Do not start up the unit at or below the outdoor temperature of -23°C.
- ♦ Stops operation at the outdoor temperature of -28°C or below

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- *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 m³/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.
 When entering defrosting operation, ensure that the flow rate is within 6°C of the inlet/outlet temperature difference. (If flow rate of 66 L/min or more is provided, the inlet/outlet temperature difference during defrosting will be within the allowable range over the entire operation range.)

- ♦ 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 32°C.
- ♦ The water circuit must be a closed circuit.

Unit converter

Kcal = kW × 860
 BTU/h = kW × 3,412
 cfm = m³/min × 35.31
 Lb = kg/0.4536

10.Maintenance

The table below details regular inspection and preventive maintenance, including inspection items, methods, criteria, and schedules.

Component parts	Parts		Regular inspection		Preventive maintenance	
	Parts	Item	Method/tool	Criteria <Reference>	Item	
Refrigerant circuit	Compressor		• Sound and vibration at start-up, during operation, during compressor stoppage • Insulation resistance • Terminals, wiring	Visual, auditory, tactile 500 VDC ohmmeter Screwdriver, visual	• No abnormal sound and vibration • $\geq 1 \text{ M}\Omega$ • No loose terminals and wiring contacts	• Replace if abnormal sound or vibration was detected • Replace if "insulation resistance $\leq 1 \text{ M}\Omega$ " • Retighten terminals and reconnect connectors
	Electronic expansion valve		• Operation • Operating sound (pressure)	Tactile Auditory and tactile By turning ON/OFF the unit	• Normal refrigerant circulation • Normal operating sound and temp. change	• Replace if stuck
	Refrigerant system	Inner piping	• Sympathetic vibration, contact, corrosion of inner piping • Sympathetic vibration, capillary tubes in contact	Visual Visual	• No abnormal sympathetic vibration, sound, and corrosion • No abnormal sympathetic vibration and contact wear	• Replace or repair if pipes are severely corroded or worn • Replace if "insulation resistance $\leq 1 \text{ M}\Omega$ " • Paint any corroded surface.
		Solenoid valve, four-way valve	• Operation, insulation • Corrosion, noise	500 VDC ohmmeter Visual, auditory	• Insulation resistance $\geq 1 \text{ M}\Omega$ • No abnormal sound and corrosion	
		Container	• Corrosion of accumulator or oil separator	Visual	• No corrosion	
	Protection device	High-pressure switch	• Operating pressure, refrigerant leak, insulation resistance	Pressure gauge	• Operates at the set value • Measured value within the specified range	• Replace regularly
		Fusible plug	• Swollen soluble metal	Visual	• Soluble metal in the normal position	
	Heat exchanger	Air	• Clogging, damage • Refrigerant leak	Visual Refrigerant leak detector	• No clogging and damage • No leaks	• Clean air inlet if clogged • Repair or replace HEX if leaking
		Water	• Water volume, temperature • Refrigerant leak • Drain water in the HEX or pipes	• Thermometer, flowmeter, differential pressure gauge • Refrigerant leak detector	• Tolerance • No refrigerant leaks • Proper installation	• Adjust valve and valve operation settings • Repair or replace HEX if leaking • Install a drain valve
	Electrical/ Electronic parts	Fan motor		• Noise • Insulation resistance	Auditory 500 VDC ohmmeter	• No abnormal sound • Insulation resistance $\geq 1 \text{ M}\Omega$
Switch (incl. FFB and ELB)		Solenoid switch	• Operation and appearance	Visual	• No deformation	• Replace switches if malfunctioning, deformed, or discolored
		Overcurrent relay Auxiliary relay	• Contact		• Normal operation, no deformation • No deformation and discoloration	
Oil heater		• Energization • Insulation resistance	• Tester or ammeter • Visual • 500 VDC ohmmeter	• Heats up normally • $> 1 \text{ M}\Omega$	• Replace	
Crankcase heater		• Energization • Insulation resistance	Tester 500 VDC ohmmeter	• Crankcase heater is powered during compressor stoppage, and heats up normally. • Insulation resistance $\geq 1 \text{ M}\Omega$	• Reconnect wiring • Replace crankcase heater if "insulation resistance $\leq 1 \text{ M}\Omega$ "	
Fuse		• Appearance	Visual	• No deformation and discoloration	• Replace fuse if blown	
Control box (incl. inverter)		• Insulation resistance • Dust on circuit board • Terminals, connectors • Appearance of electrolytic capacitor	500 VDC ohmmeter Visual Screwdriver, visual Visual	• Insulation resistance $\geq 1 \text{ M}\Omega$ • No dust • All connectors properly connected • No liquid leaks and deformation	• Clean dust with a brush • Replace circuit board if malfunctioning • Re-tighten terminals and reconnect connectors • Replace electrolytic capacitor if leaking.	
Electrolytic capacitor		• Appearance of electrolytic capacitor	Visual	• Insulation resistance \geq specified value	• Replace regularly	
Smoothing capacitor		• Capacitance, insulation resistance	Electrostatic meter, 500 VDC ohmmeter	• Insulation resistance \geq specified value	• Replace regularly	
Electric box (incl. circuit board)		• Insulation resistance of circuit, appearance of capacitor • Terminals, connectors • Self-diagnosis mode, appearance	500 VDC ohmmeter Visual Visual	• Insulation resistance $\geq 1 \text{ M}\Omega$ • All connectors properly connected • No errors appear on the display.	• Replace circuit board if malfunctioning • Re-tighten terminals and reconnect connectors • Replace circuit board if leaking	
Pressure sensor, thermistor		• Open- or short-circuit, appearance	Tester, visual	• Within the specified value, no discoloration	• Replace if short-circuited or disconnected	
SW power source		• Output voltage	Tester	• Within the specified range	• Replace SW if voltage is abnormal	
Structural parts		Decorative part		• Grime and damage	Visual	• No dirt, damage, and deformation
	Frame, bottom plate		• Rust, insulation material • Peeling coating	Visual	• No rust and insulation damage	• Repair frame or bottom plate if insulation is torn. • Paint the surface
	Propeller fan		• Vibration, appearance	Visual	• No propeller runout and catching	• Replace if propeller runout or balance problem exists
	Drain pan		• Clogging • Peeling paint	Visual	• No clogging • No rust and holes	• Clean drain pan, and check for tilt. • Touch up paint
	Guard panel		• Peeling coating	Visual	• No rust	• Paint the surface
External parts	Remote controller switch		• Controllability	Visual	• Display follows the commands.	• Replace if the display does not follow the commands or wrong display appears
	Central control system		• Controllability • Loose terminal, wiring contact • Insulation resistance	• Visual • 500 VDC ohmmeter	• Display follows the commands • No loose contacts • $> 1 \text{ M}\Omega$	• Re-tighten terminals and reconnect connectors • Replace if "resistance $< 1 \text{ M}\Omega$ "
	Flow switch		• Controllability • Water leak • Insulation resistance	• Visual • 500 VDC ohmmeter	• Display follows the commands • No water leaks • $> 1 \text{ M}\Omega$	• Replace
	Phase-advance capacitor Elapsed time integrator Ammeter		• Insulation resistance	• 500 VDC ohmmeter	• $> 1 \text{ M}\Omega$	• Replace if "resistance $< 1 \text{ M}\Omega$ "
Water circuit	Strainer		• Clogging	• Visual	• No stain and clogging	• Clean
	Water pipe		• Water leak • Presence of air • Open air-vent valve	• Visual • Sensory	• No water leaks • No abnormal sound	• Re-tighten terminals and reconnect connectors • Release air, or replace and adjust valve
	Flow regulating valve		• Water temp. difference (flow rate)	• Thermistor	• Proper temp. difference range	• Replace and adjust
	Pump		• Vibration • Insulation resistance • Water leak • Loose terminal, wiring contact • Strainer	• Visual, audibility, tactile • 500 VDC ohmmeter • Visual	• No abnormal sound • $> 1 \text{ M}\Omega$ • No water leaks • No loose contacts • No clogging	• Replace • Re-tighten terminals and reconnect connectors • Reconnect wiring • Clean strainer
	Pressure gauge		• Displayed value	• Visual	• Correct display	• Replace if wrong values are displayed
	Thermistor		• Displayed value	• Surface thermistor	• Correct display	• Replace if wrong values are displayed
	Water		• Water quality	• Water quality analysis	• Water quality standards	• Improve water quality

Note1) Unexpected failure is a sudden and unpredictable failure that occurs randomly before parts or device reaches its lifespan. It is difficult to apply technical measures, leaving applying statistical measures as the only solution.

Note2) Elapsed year refers to the time period in which a given product has been used for 10 hours a day and 2500 hours a year without frequent start-stops.

Note3)  shows that the likelihood of wear-out and failure increases over time.

- Nomenclature
- : Annual
 - : Clean or adjust as needed
 - ▲ : Replace or repair as needed
 - ◆ : Replace regularly

Inspection schedule		Maintenance schedule		Preventive maintenance															Remarks		
Yearly	Others	Hour of use	Period of use	Elapsed year*																	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
●		20,000Hr																			
●		20,000Hr																			
●		20,000Hr			Unexpected failure							▲	Wear-out failure								
●		25,000Hr			Unexpected failure										◆	Unexpected failure					Consumable parts
		15,000Hr			Unexpected failure				◆	Unexpected failure				◆	Unexpected failure			Consumable parts			
●			5 years		Unexpected failure		●	Unexpected failure			●			●			●				Parts to be cleaned Dirt caused by being exposed to the air
●			5 years		Unexpected failure		●	Unexpected failure			●			Unexpected failure			●				Parts to be cleaned
●		20,000Hr			Unexpected failure							▲	Wear-out failure								
●		25,000Hr			Unexpected failure										▲	Wear-out failure					
●			8 years		Unexpected failure								Unexpected failure							Consumable parts	
●			8 years		Unexpected failure							◆	Unexpected failure							Consumable parts	
●			10 years		Unexpected failure							◆	Unexpected failure							Consumable parts	
●		25,000Hr			Unexpected failure							▲	Wear-out failure								
			10 years		Unexpected failure							◆	Unexpected failure							Consumable parts	
●		25,000Hr			Unexpected failure							▲	Wear-out failure								
●			5 years		Unexpected failure		▲	Wear-out failure													
●			10 years		Unexpected failure							▲	Wear-out failure								
●			8 years		Unexpected failure							●	Wear-out failure							Parts to be cleaned	
●			10 years		Unexpected failure							◆	Wear-out failure								
●			8 years		Unexpected failure							●	Wear-out failure							Parts to be cleaned	
●		25,000Hr			Unexpected failure							▲	Wear-out failure								
			10 years		Unexpected failure							▲	Wear-out failure								
●			5 years		Unexpected failure		▲	Unexpected failure			▲	Wear-out failure									
●			8 years		Unexpected failure							▲	Wear-out failure								
●			10 years		Unexpected failure							▲	Unexpected failure							Parts to be cleaned	
●			5 years		Unexpected failure		●	Unexpected failure			●	Unexpected failure					●	Parts to be cleaned			
●			5 years		Unexpected failure		▲	Wear-out failure													
●			3 years		▲	Unexpected failure		▲	Unexpected failure		▲	Unexpected failure		▲	Unexpected failure		▲	Unexpected failure		▲	
●			5 years		Unexpected failure		▲	Unexpected failure			▲	Unexpected failure					▲	▲			
●					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		

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

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

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

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

mitsubishi electric corporation

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