MITSUBISHI ELECTRIC

ecodan hydrodan

Water to Water Heat Pump

EHWT17D-MHEDW

INSTALLATION MANUAL

FOR INSTALLER

For safe and correct use, read this manual before installing the heat pump unit, which is installed indoors.

English

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For safe and correct use, read this manual before installing the heat pump unit.

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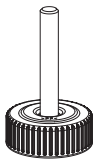
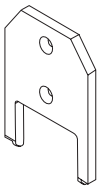
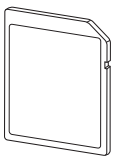
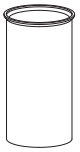
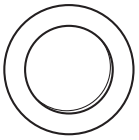
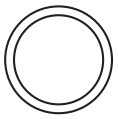
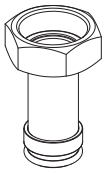
Accessories (Included)						
Adjustable feet	Immersion heater boss tool	SD memory card	Copper liner for DHW pipe	Gasket	O-ring	Joint for install PICV into Module
						
4	1	1	4	4	4*	1

*For 3-Way valve: O-ring Inner diameter 15.8 mm
For Heating return: O-ring Inner diameter 25.7 mm
For installing PICV into Module: O-ring Inner diameter 21.8 mm and 25.7 mm

Abbreviations and glossary

No.	Abbreviations/Word	Description
1	Compensation curve mode	Space heating incorporating outdoor ambient temperature compensation
2	COP	Coefficient of Performance the efficiency of the heat pump
3	Heat pump	Abbreviations for Water/Brine source heat pump Indoor unvented DHW tank and component plumbing parts
4	DHW mode	Domestic hot water heating mode for showers, sinks, etc
5	Flow temperature	Temperature at which water is delivered to the primary circuit
6	Freeze stat. function	Heating control routine to prevent water pipes freezing
7	FTC	Flow temperature controller, the circuit board in charge of controlling the water circuit
8	C.B.	Controller board, the circuit board in charge of controlling the refrigerant and ambient loop
9	Heating mode	Space heating through radiators or Underfloor heating
10	Legionella	Bacteria potentially found in plumbing, showers and water tanks that may cause Legionnaires disease
11	LP mode	Legionella prevention mode – a function on systems with water tanks to prevent the growth of legionella bacteria
12	PRV	Pressure relief valve
13	Return temperature	Temperature at which water is delivered from the primary circuit
14	TRV	Thermostatic radiator valve – a valve on the entrance or exit of the radiator panel to control the heat output
15	Brine	Mixture of antifreeze and water
16	Module	Casing with built-in refrigerant circuit
17	Ambient loop	Piping between WTW and Local system 2 Filled with brine or water
18	Ambient temp./ Ambient temperature	Outdoor temperature
19	PICV	Pressure Independent Control Valve

Please read the following safety precautions carefully.

⚠ WARNING:	⚠ CAUTION:
Precautions that must be observed to prevent injuries or death.	**Precautions that must be observed to prevent damage to unit.**

This installation manual along with the user manual should be left with the product after installation for future reference.
Mitsubishi Electric is not responsible for the failure of locally-supplied parts.

- **Be sure to perform periodical maintenance.**
- **Be sure to follow your local regulations.**
- **Be sure to follow the instructions provided in this manual.**

MEANINGS OF SYMBOLS DISPLAYED ON THE UNIT

	WARNING (Risk of fire)	This unit uses a flammable refrigerant. If refrigerant leaks and comes in contact with fire or heating part, it will create harmful gas and there is risk of fire.
	Read the OPERATION MANUAL carefully before operation.	
	Service personnel are required to carefully read the OPERATION MANUAL and INSTALLATION MANUAL before operation.	
	Further information is available in the OPERATION MANUAL, INSTALLATION MANUAL, and the likes.	

⚠ WARNING

Mechanical

- The heat pump unit must not be installed, disassembled, relocated, altered or repaired by the user. Ask an authorised installer or technician. If the unit is installed improperly or modified after installation, water leakage, electric shock or fire may result.
- The heat pump unit should be positioned on a hard level surface capable of supporting its filled weight to prevent excessive sound or vibration.
- Do not position furniture or electrical appliances below the unit.
- The discharge pipework from the emergency devices of the heat pump unit should be installed according to local law.
  All such safety relief valve connections shall NOT be used for any other purpose.
- Only use accessories and replacement parts authorised by Mitsubishi Electric ask a qualified technician to fit the parts.

Electrical

- All electrical work should be performed by a qualified technician according to local regulations and the instructions given in this manual.
- The units must be powered by a dedicated power supply and the correct voltage and circuit breakers must be used.
- Wiring should be in accordance with national wiring regulations. Connections must be made securely and without tension on the terminals.
- Earth unit correctly.

General

- Do not smoke during work and transportation.
- Keep children and pets away from the heat pump unit.
- Do not use the hot water produced by the heat pump directly for drinking or cooking. This could cause illness to the user.
- Do not stand on the units.
- Do not touch switches with wet hands.
- Annual maintenance checks on the heat pump unit should be conducted by a qualified person.
- Do not place containers with liquids on top of the heat pump unit. If they leak or spill onto the heat pump unit damage to the unit and/or fire could occur.
- Do not place any heavy items on top of the heat pump unit.

⚠ WARNING
When installing, relocating, or servicing the heat pump unit, use tools and pipe components specifically made for use with R32 refrigerant and use only the specified refrigerant (R32) to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines. If air is mixed with the refrigerant, then it can be the cause of abnormal high pressure in the refrigerant line, and may result in an explosion and other hazards. The use of any refrigerant other than that specified for the system will cause mechanical failure or system malfunction or unit breakdown. In the worst case, this could lead to a serious impediment to securing product safety.
In heating mode, to avoid the heat emitters being damaged by excessively hot water, set the target flow temperature to a minimum of 2ºC below the maximum allowable temperature of all the heat emitters. For Zone2, set the target flow temperature to a minimum of 5ºC below the maximum allowable flow temperature of all the heat emitters in Zone2 circuit.
Do not install the unit where combustible gases may leak, be produced, flow, or accumulate. If combustible gas accumulates around the unit, fire or explosion may result.
Do not use means 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.
Pipe-work shall be protected from physical damage.
The installation of pipe-work shall be kept to a minimum.
Compliance with national gas regulations shall be observed.
The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
Keep gas-burning appliances, electric heaters, and other fire sources (ignition sources) away from the location where installation, repair, and other air conditioner work will be performed. If refrigerant comes into contact with a flame, poisonous gases will be released.

⚠ WARNING
Brine
The selection of the brine MUST be in accordance with the applicable legislation.
Take sufficient precautions in case of brine leakage. If brine leaks, ventilate the area immediately and contact your local dealer.
The ambient temperature inside the unit can get much higher than that of the room, e.g. 70°C. In case of a brine leak, hot parts inside the unit can create a hazardous situation.
The use and installation of the application MUST comply with the safety and environmental precautions specified in the applicable legislation.

⚠ CAUTION
Use clean water that meets local quality standards on the primary circuit and ambient loop (When not using Brine).
The heat pump unit should be located indoors to minimise heat loss.
Remove as much air as possible from the primary and DHW circuits
Refrigerant leakage may cause suffocation. Provide ventilation in accordance with EN378-1.
Be sure to securely fit insulation around the piping. Direct contact with the bare piping may result in burns or frostbite.
Never put batteries in your mouth for any reason to avoid accidental ingestion.
Battery ingestion may cause choking and/or poisoning.
Install the unit on a rigid structure to prevent excessive sound or vibration during operation.
Do not transport the heat pump unit with water inside the DHW tank. This could cause damage to the unit.
If power to the heat pump unit is to be turned off (or system switched off) for a long time, the water should be drained.
If unused for a long period, before operation is resumed, DHW tank should be flushed through with potable water, and sterilised accordinaly.
Preventative measures should be taken against water hammer, such as installing a Water Hammer Arrestor on the primary water circuit, as directed by the manufacturer.
Do not use refrigerant other than R32 refrigerant.
Servicing shall be performed only as recommended by the manufacturer.
Use the following tools specifically designed for use with R32 refrigerant. The following tools are necessary to use R32 refrigerant. Contact your nearest dealer for any questions.
Be sure to install circuit breakers. If not installed, electric shock may result.
For the power lines, use standard cables of sufficient capacity. Otherwise, a short circuit, overheating, or fire may result.
When installing the power lines, do not apply tension to the cables. If the connections are loosened, the cables can snap or break and overheating or fire may result.
Be sure to ground the unit. Do not connect the ground wire to gas or water pipes, lightning rods, or telephone grounding lines. If the unit is not properly grounded, electric shock may result.

⚠ CAUTION

Use circuit breakers (ground fault interrupter, isolating switch (+B fuse), and molded case circuit breaker) with the specified capacity. If the circuit breaker capacity is larger than the specified capacity, breakdown or fire may result.

Tools (for R32)	
Gauge manifold	Flare tool
Charge hose	Size adjustment gauge
Gas leak detector	Vacuum pump adapter
Torque wrench	Electronic refrigerant charging scale

2 Introduction

The purpose of this installation manual is to instruct competent persons how to safely and efficiently install and commission the heat pump unit system. The target readers of this manual are competent heating, plumbing and/or refrigeration engineers who have attended and passed the requisite Mitsubishi Electric product training and have appropriate qualifications for installation of an unvented hot water heat pump unit specific to their country.

3 Technical Information

■ Product specification

Model name				**EHWT17D-MHEDW**
Nominal domestic hot water volume				170 L
Overall unit dimensions				1750 × 595 × 680 mm (Height × Width × Depth)
Weight (empty)				166 kg
Weight (full)				345 kg
Refrigerant				R32
The amount of refrigerant				0.9 kg
Water volume of heating circuit in the unit *1				5.47 L
Water volume of ambient loop in the unit				3.16 L
Safety device	Water circuit (Primary)	Control thermistor	Heating	1 to 80°C
		Pressure relief valve		0.3 MPa (3 bar)
		Flow sensor		Min. flow 5.0 L/min
	DHW tank	Control thermistor		40 to 70°C
		Temperature/Pressure relief valve		90°C / 0.7 MPa (7 bar)
	Immersion heater	Manual reset		85°C
	Ambient loop	Control thermistor		−8 to 30°C
		Flow switch		Min. flow 5.5 L/min
	Refrigerant circuit	Control thermistor (High)		−20 to 125°C
		Control thermistor (Low)		−40 to 90°C
		Pressure switch		4.14 ± 0.1 MPa
		Pressure sensor		0 to 5.0 MPa
Primary circuit circulating Pump				DC motor
Sanitary circuit circulating Pump				AC motor
Connections		Water (Primary/DHW circuits)		28 mm compression primary circuit/ 22 mm compression DHW circuit
		Water (Ambient loop)		22 mm compression
Guaranteed operating range		Ambient *2		0 to 35°C (≦ 80 %RH)
		Water inlet temperature (Ambient loop)		10 to 30°C
		Min. Water outlet temperature (Ambient loop)		4°C
Operating range		Heating	Room temperature	10 to 30°C
			Flow temperature	20 to 60°C
		DHW		40 to 60°C
		Legionella prevention		60 to 70°C
Flow rate range		Primary circuit	Max.	27.7 L/min
			Min.	7.1 L/min
		Ambient loop	Max.	24.0 L/min
			Min.	7.2 L/min
DHW tank performance		Maximum allowable hot water temperature		70°C
		Declared load profile		L
		Average climate	Water heating energy efficiency class	A+
		Time to reheat 70% of DHW tank to 65°C *4		19.3 min
		Time to raise DHW tank temp. 15 to 65°C *4		22.8 min
Electrical data		Heat pump	Power supply (Phase, voltage, frequency)	~/N 230 V 50 Hz
			Breaker	16 A
		Immersion heater *3	Power supply (Phase, voltage, frequency)	~/N 230 V 50 Hz
			Capacity	3 kW
			Current	13 A
			Breaker	16 A
Sound power level at W10W35 (EN12102)				38 dB(A)

<Table 3.1>

Optional extras

- Wireless Remote Controller PAR-WT50R-E
- Wireless Receiver PAR-WR51R-E
- Remote Sensor PAC-SE41TS-E
- Thermistor PAC-TH011-E
- High temperature thermistor PAC-TH012HT-E
- ecodan Wi-Fi Interface MAC-567IF-E1
- 2-zone kit PAC-TZ02-E
- Expansion vessel (12L) PAC-EVP12-E

*1 Volume of sanitary water circuit is not included in this value
*2 The environment must be frost-free.
*3 Do not fit immersion heaters without thermal cut-out. Use only Mitsubishi Electric service parts as a direct replacement.
*4 Tested under BS7206 conditions.

■ Component Parts

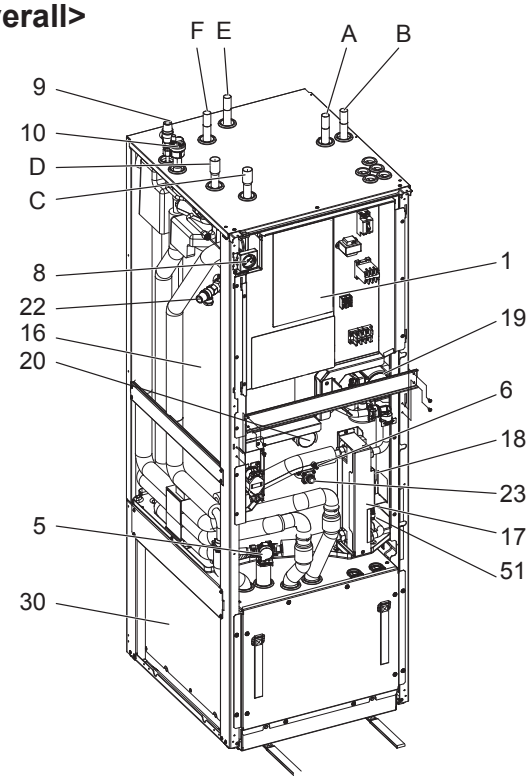
No.	Part name
A	DHW outlet pipe
B	Cold water inlet pipe
C	Water pipe (Space heating return connection (to heat pump))
D	Water pipe (Space heating flow connection (from heat pump))
E	Water/Brine pipe (Ambient loop return connection (to heat pump))
F	Water/Brine pipe (Ambient loop flow connection (from heat pump))
1	Control and electrical box
2	Main remote controller
3	Plate heat exchanger (Refrigerant - Primary circuit)
4	Low-pressure sensor
5	3-way valve
6	Manual air vent
7	Drain cock (Primary circuit)
8	Manometer
9	Pressure relief valve (3 bar) (Primary circuit)
10	Automatic air vent
11	Expansion vessel (Primary circuit) (Local supply)
12	Flow sensor
13	Strainer valve
14	Water circulation pump 1 (Primary circuit)
15	Pump valve
16	DHW tank
17	Plate heat exchanger (Primary circuit (water) - Sanitary circuit (water))
18	Scale trap
19	Water circulation pump (Sanitary circuit)
20	Immersion heater
21	Magnetic filter (Ambient loop) (Local supply)
22	Temperature and pressure relief valve
23	Drain cock (DHW tank)
24	Pressure relief valve (10 bar) (Ambient loop) (Local supply)
25	Flow water temp. thermistor (THW1)
26	Return water temp. thermistor (THW2)
27	DHW tank water temp. thermistor (THW5A)
28	DHW tank water temp. thermistor (THW5B)
29	Refrigerant liquid temp. thermistor (TH2)
30	Module
31	Drain pipe (Local supply)
32	Expansion vessel (Sanitary circuit (water)) *1
33	Isolating valve (Local supply)
34	Magnetic filter (Local supply) (Recommended)
35	PICV (Pressure Independent Control Valve) (Local supply)
36	Compressor
37	High-pressure sensor
38	Linear expansion valve
39	Charge plug
40	Liquid temp. thermistor (TH3)
41	Discharge temp. thermistor (TH4)
42	Ambient temp. thermistor (TH7)
43	Heat sink temp. thermistor (TH8)
44	Plate heat exchanger (Water/Brine - Refrigerant)
45	Drain cock (Ambient loop)
46	Inlet control group *1
47	Flow switch
48	Water inlet temperature (Ambient loop) thermistor (TH32)
49	Water outlet temperature (Ambient loop) thermistor (TH34)
50	Muffler
51	Drain cock (Sanitary circuit)
52	Filling loop (Ball valves, check valves and flexible hose) *1
53	High-pressure switch
54	Compressor surface temperature (TH33)

<Table 3.2>

*1 Supplied with UK model ONLY.
Please refer to PAC-WK02UK-E Installation Manual for more information on accessories.

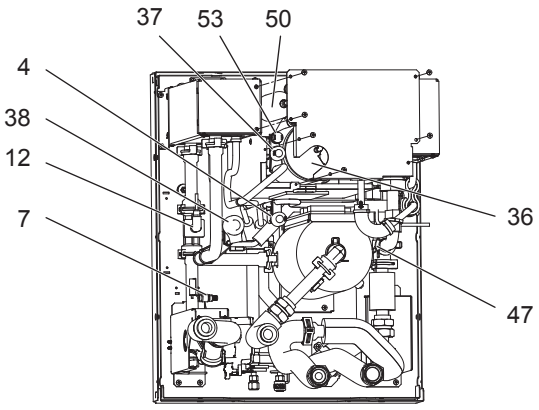
Note: For parts not shown on this page, please refer to 'Circuit diagram <Figure 3.2>'.

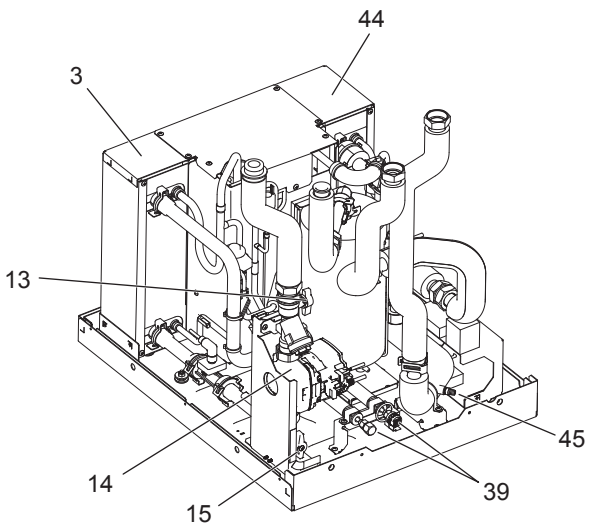
<Overall>



Note:
For installation, make sure to install a suitably sized primary-side expansion vessel. (See figure 3.2 and 4.3.2 for further guidance)

<Module>

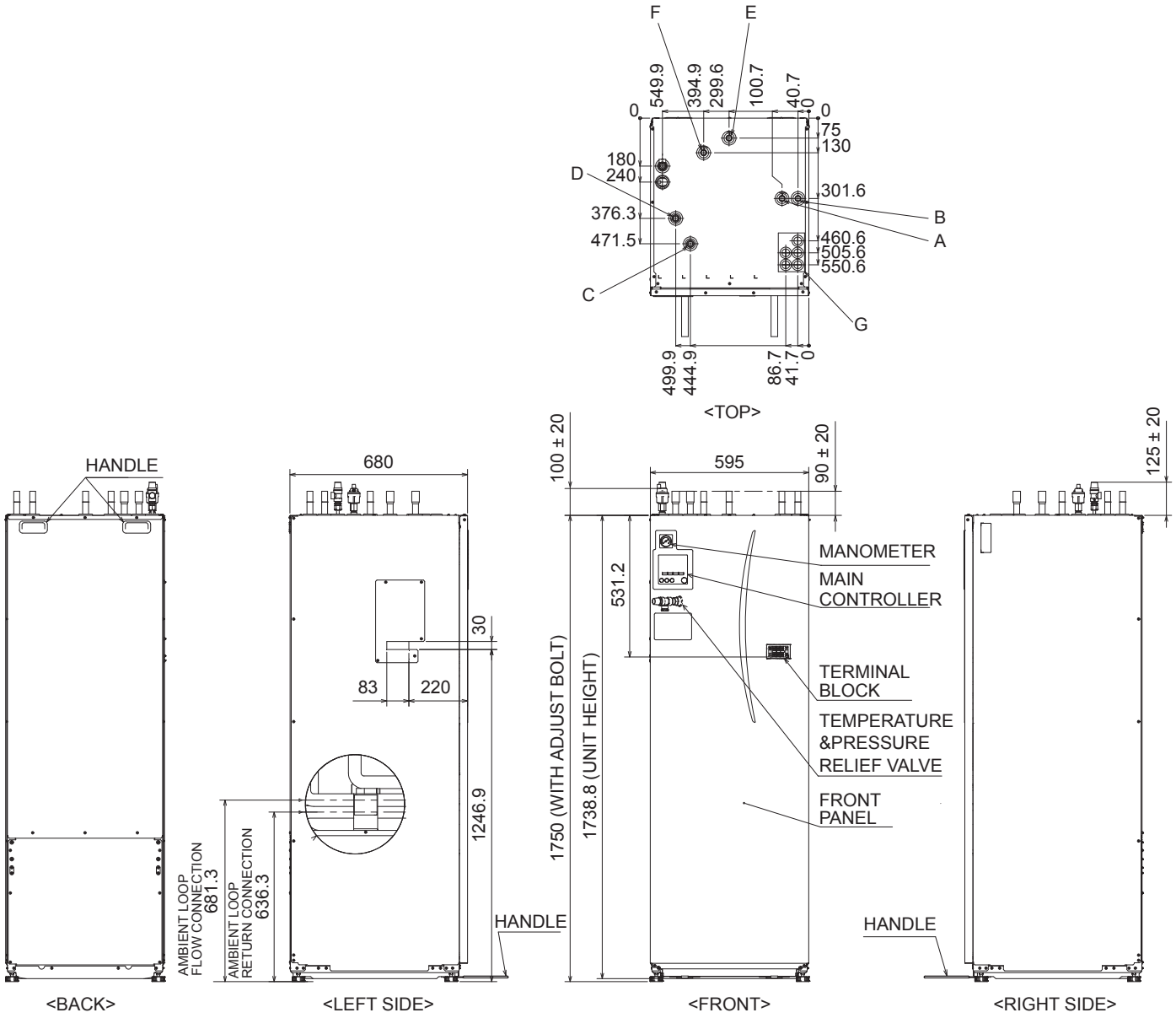




<Figure 3.1>

<Unit: mm>

■ Technical Drawings

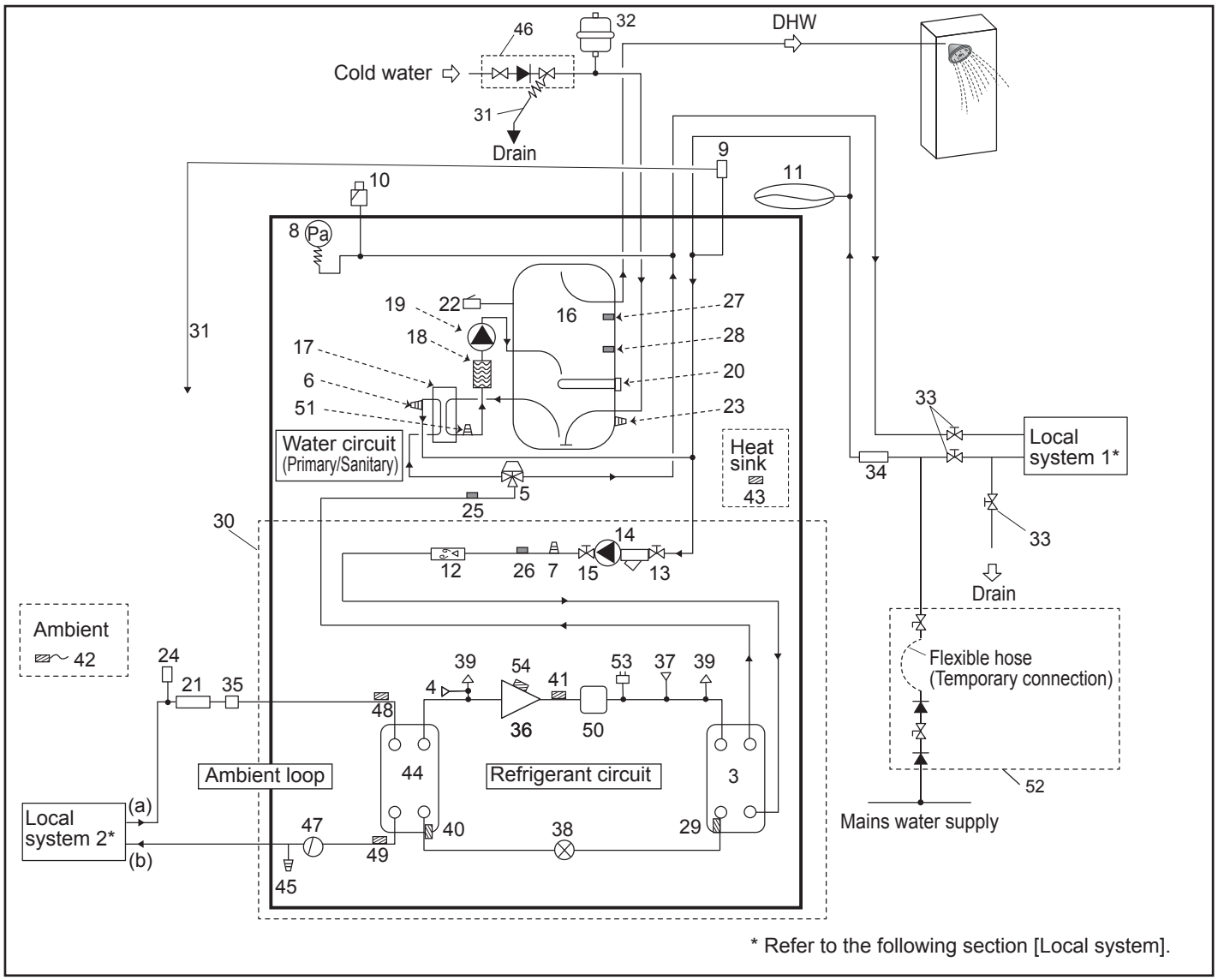


Letter	Pipe description	Connection size/type
A	DHW outlet connection	22 mm/Compression
B	Cold water inlet connection	22 mm/Compression
C	Space heating return connection	28 mm/Compression
D	Space heating flow connection	28 mm/Compression
E	Ambient loop return connection	22 mm/Compression
F	Ambient loop flow connection	22 mm/Compression
G	Electrical cable inlets ①②③④⑤	For inlets ① and ②, run low-voltage wires including external input wires and thermistor wires. For inlets ③, ④ and ⑤, run high-voltage wires including power cable, and external output wires. *For a wireless receiver (option) cable and ecodan Wi-Fi interface (option) cable, use inlet ①.

<Table 3.3>

■ Circuit diagram

• Refer to <Table 3.2> for the part names.



<Figure 3.2>

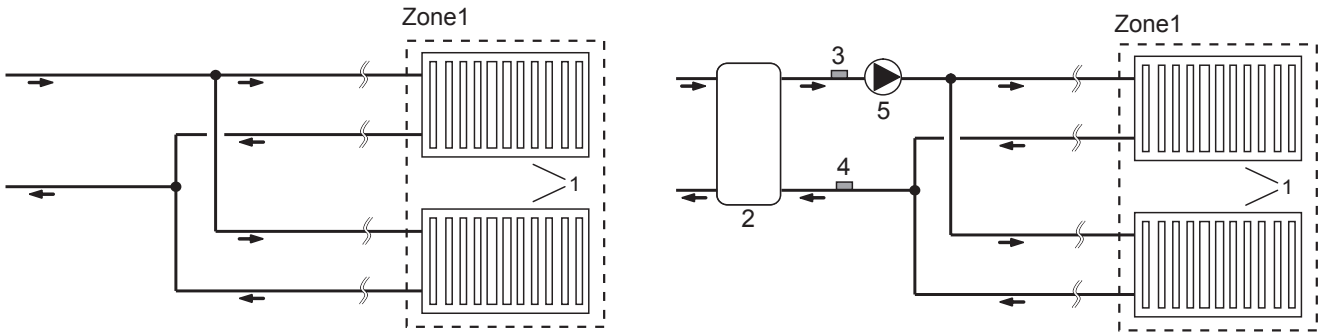
Note
- To enable draining of water circuit an isolating valve should be positioned on both the inlet and outlet pipework. No valve should be fitted between the expansion valve (part of item 46) and the heat pump unit (safety matter).
- For space heating (primary) circuit a suitable expansion vessel MUST be supplied and fitted by installer. (See figure 4.3.2) Be sure to install a magnetic filter (item 34) on the inlet pipework to the heat pump unit.
- Suitable drain pipework should be attached to the relief valves instructed to be connected to it in Figure 3.2 in accordance with your country's regulations.
- When using components made from different metals or connecting pipes made of different metals insulate the joints to prevent any corrosive reaction taking place which may damage the pipework. Filling loop's flexible hose must be removed following the filling procedure. This flexible hose (Item 52) is included in PAC-WK02-E.
- Install the inlet control group (item 46) above the level of the T&P relief valve (item 22).
  This will ensure DHW tank will not require drain down to service/maintain the inlet control group.

Model name	EHWT17D-MHEDW
Maximum supply pressure to the pressure reducing valve	16 bar
Operating pressure (Sanitary side)	3.5 bar
Expansion vessel charge setting pressure (Sanitary side)	3.5 bar
Expansion valve setting pressure (Sanitary side)	6.0 bar
Immersion heater specification (Sanitary side) *	3000 W, 230 V
DHW tank capacity	170 L
Mass of the unit when full	345 kg
Maximum primary working pressure	2.5 bar
Maximum sanitary-side working pressure	5.5 bar
Maximum ambient loop working pressure	9.5 bar

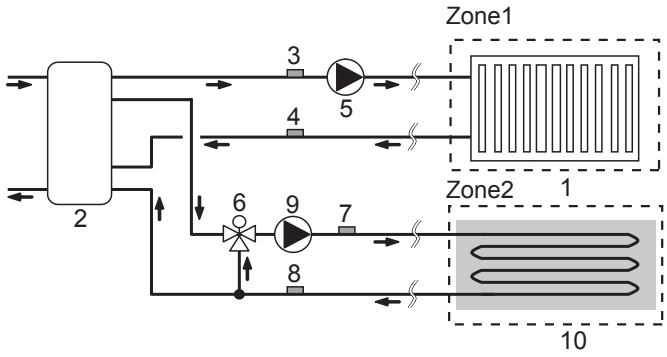
* EN60335/Type 3000W single phase 230V 50Hz, length 460 mm.
Use only Mitsubishi Electric service parts as a direct replacement.

■ Local system 1

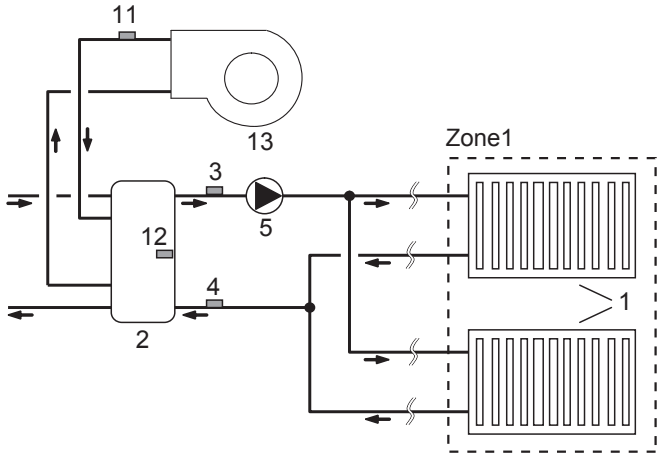
1-zone temperature control



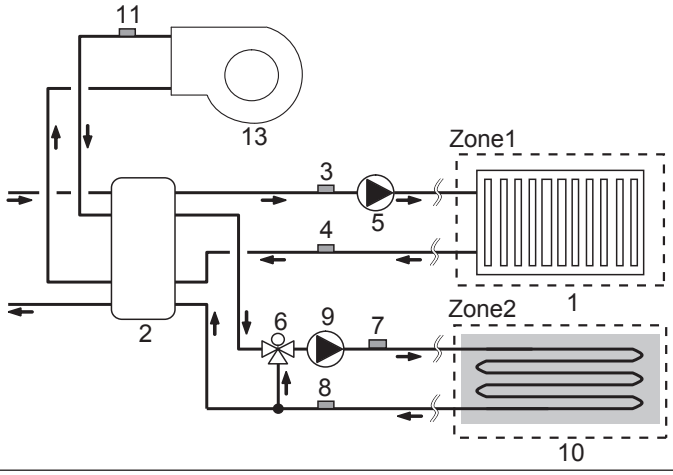
2-zone temperature control



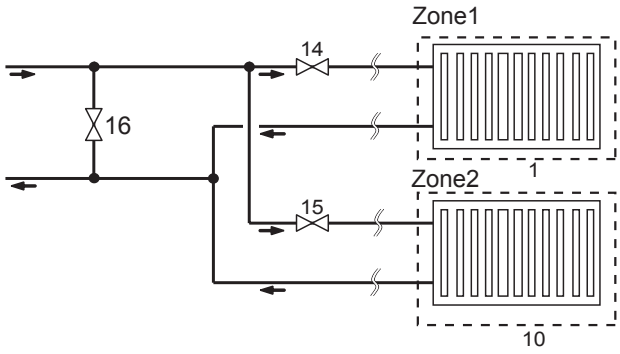
1-zone temperature control with boiler



2-zone temperature control with boiler

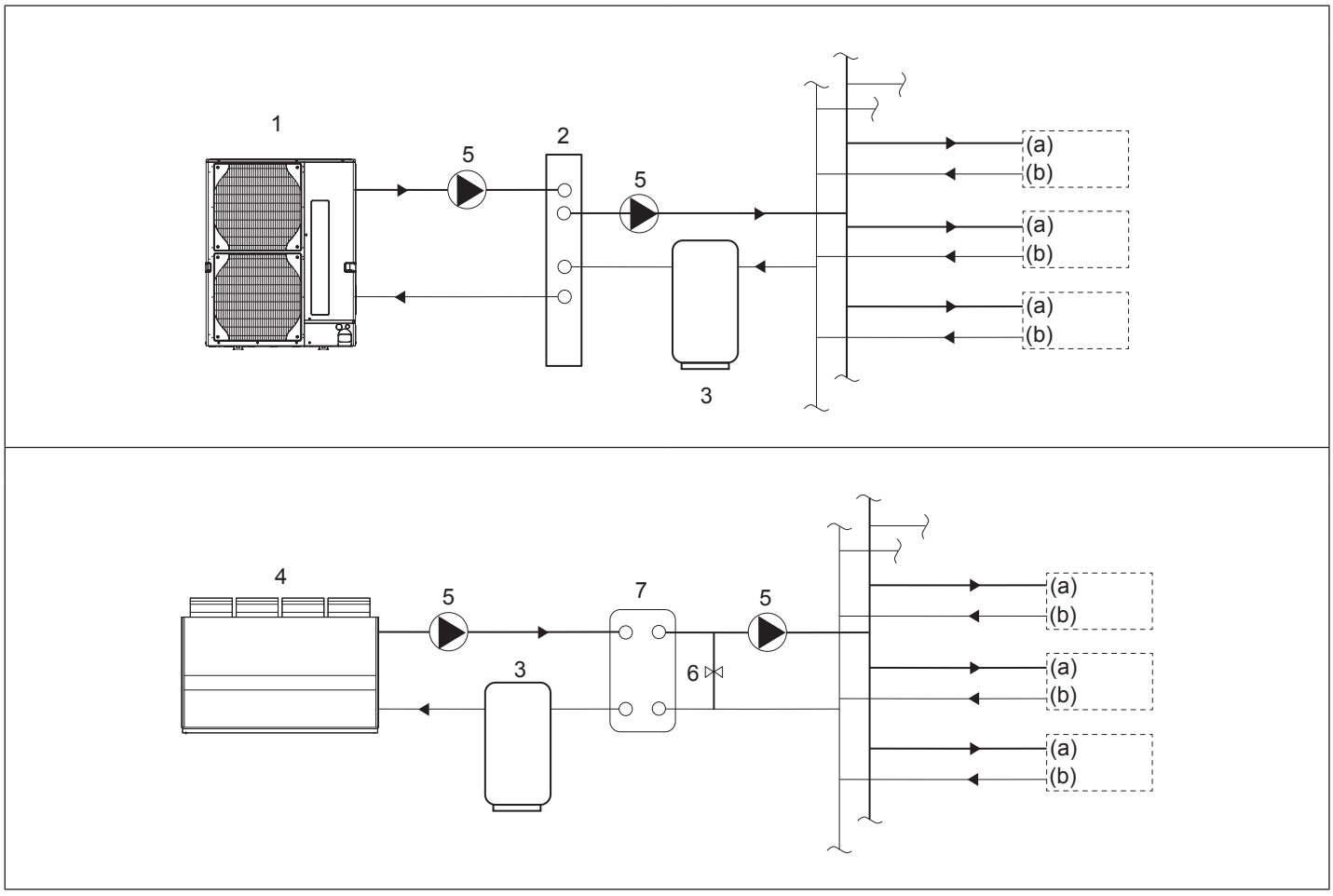


1-zone temperature control (2-zone valve ON/OFF control)



1. Zone1 heat emitters (e.g. radiator, fan coil unit) (local supply)
2. Mixing tank (local supply)
3. Zone1 flow water temp. thermistor (THW6) } Optional part : PAC-TH011-E
4. Zone1 return water temp. thermistor (THW7) }
5. Zone1 water circulation pump (local supply)
6. Motorized mixing valve (local supply)
7. Zone2 flow water temp. thermistor (THW8) } Optional part : PAC-TH011-E
8. Zone2 return water temp. thermistor (THW9) }
9. Zone2 water circulation pump (local supply)
10. Zone2 heat emitters (e.g. underfloor heating) (local supply)
11. Boiler flow water temp. thermistor (THWB1) } Optional part : PAC-TH012HT-E
12. Mixing tank thermistor (THW10) }
13. Boiler (local supply)
14. Zone1 2-way valve (local supply)
15. Zone2 2-way valve (local supply)
16. Bypass valve (local supply)

Local system 2



1. Air to Water Heat Pump
2. Header
3. Buffer Tank
4. Central plate Heat source / Heat pump
5. Pump
6. Valve
7. Heat exchanger

■ Energy monitor

End user can monitor accumulated*1 'Consumed electrical energy' and 'Delivered heat energy' in each operation mode*2 on the main remote controller.
*1 - Monthly and Year to date
*2 - DHW operation
- Space heating

Refer to "5.1.9 Main remote controller" for how to check the energy, and "5.1.1 DIP switch function" for the details on DIP-SW setting.
Either one of the following two method is used for monitoring.
Note: Method 1 should be used as a guide. If a certain accuracy is required, the 2nd method should be used.

1. Calculation internally
Electricity consumption is calculated internally based on the energy consumption of refrigerant and ambient loop, electric heater, water pump(s) and other auxiliaries.
Delivered heat is calculated internally by multiplying delta T (Flow and Return temp.) and flow rate measured by the factory fitted sensors.
Set the electric heater capacity and water pump(s) input and specs of additional pump(s) supplied locally. (Refer to the menu tree in "5.1.9 Main remote controller")

	Immersion heater	Pump 1*1	Pump 2	Pump 3
EHWT17D-MHEDW	3 kW	***(factory fitted pump)	When additional pumps supplied locally are connected as Pump 2/3, change setting according to specs of the pumps.	

<Table 3.4>

*1 "***" displayed in the energy monitor setting mode means the factory fitted pump is connected as Pump 1 so that the input is automatically calculated.

When anti-freeze solution (propylene glycol) is used for primary water circuit, set the delivered energy adjustment if necessary.
For further detail of above, refer to "5.1.9 Main remote controller".

2. Actual measurement by external meter (locally supplied)
FTC has external input terminals for 2 'Electric energy meters' and a 'Heat meter'.
If two 'Electric energy meters' are connected, the 2 recorded values will be combined at the FTC and shown on the main remote controller.
(e.g. Meter 1 for H/P power line, Meter 2 for heater power line)
Refer to the [Signal inputs] section in "5.1.2 Connecting inputs/outputs" for more information on connectable electric energy meter and heat meter.

<Preparation before the installation and service>

- Prepare the proper tools.
- Prepare the proper protection.
- Allow parts to cool before attempting any maintenance.
- Provide adequate ventilation.
- After stopping the operation of the system, turn off the power-supply breaker and remove the power plug.
- Discharge the capacitor before commencing work involving the electric parts.

<Precautions during service>

- Do not perform work involving electric parts with wet hands.
- Do not pour water or liquid into the electric parts.
- Do not touch the refrigerant.
- Do not touch the hot or cold surfaces in the refrigerant cycle.
- When the repair or the inspection of the circuit needs to be carried out without turning off the power, exercise great caution NOT to touch any LIVE parts.

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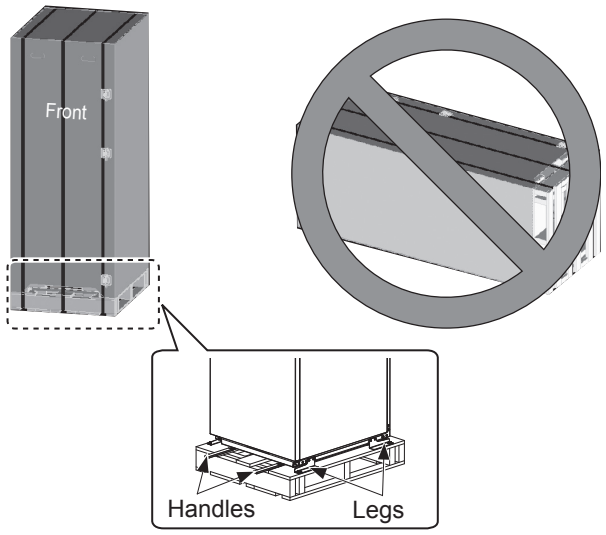
4.1 Location

■ Transportation and Handling



<Figure 4.1.1>

The heat pump unit is delivered on a wooden pallet base with cardboard protection.

Care should be taken when transporting the heat pump unit that the casing is not damaged by impact. Do not remove the protective packaging until heat pump unit has reached its final location. This will help protect the structure and control panel.

- The heat pump unit can be transported **ONLY** vertically. **The maximum allowable inclination is 45°.**

Module MUST be separated if it can only be transported/ carried horizontally.*

<see How to remove the module>. (during installation)

- The heat pump unit should ALWAYS be moved by a minimum of 2 people.
- When carrying the heat pump unit use the handles provided.
- Before using the handles, make sure they are securely attached.
- **Please remove fixing legs, wooden base and any other packaging once the unit is in installation location.**

* Module removal, carrying and reassembling are installer's responsibility.

■ Suitable Location

Before installation the heat pump unit should be stored in a frost-free weatherproof location. Units must **NOT** be stacked.

- The heat pump unit should be installed indoors in a frost free weather proof location.
- The heat pump unit should be positioned on a level surface capable of supporting 'it's **FILLED** weight. (Adjustable feet (accessory parts) can be used to ensure unit l level)
- When using the adjustable feet, ensure that the floor is strong enough.
- Care should be taken that minimum distances around and in front of the unit for service access are observed <Figure 4.1.2>.
- Secure the heat pump unit to prevent it being knocked over.
- Install the heat pump unit where it is not exposed to water/ excessive moisture.

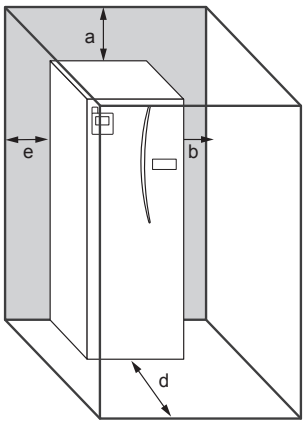
■ Service access diagrams

Service access	
Parameter	Dimension (mm)
a	300
b	150
c (distance behind unit not visible in Figure 4.1.2)	10
d	700**
e	150*

<Table 4.1.1>

* An additional space is required, when ambient loop pipe connecting to the side.
** Including service space for Module removal.

Sufficient space MUST be left for the provision of discharge pipework as detailed in National and Local Building Regulations.



<Figure 4.1.2>
Service access

The heat pump unit must be located indoors and in a frost-free environment, for example in a utility room, to minimise heat loss from stored water.

■ Room thermostat

If fitting a new room thermostat for this system;

- Position it out of direct sunlight and draughts
- Position it away from internal heat sources
- Position it in a room without a TRV on the radiator/heat emitter.
- Position it on an internal wall

Note:

Do not position the thermostat excessively close to the external wall.

The thermostat may detect the temperature of the wall, which could affect appropriate control of the room temperature.

- Position it approx. 1.5 m from floor level

■ Ambient temperature thermistor (TH7)

Please install the ambient temperature thermistor (TH7) in a place where external influences such as wind and sunlight are minimized. Please install the ambient temperature thermistor (TH7) cable in a place where people cannot touch. Run the cable inside the wall or above the ceiling when installing the ambient temperature thermistor (TH7) cable. Use a fixable wiring cover to secure the wiring from the top of the unit to the wall or ceiling.

■ Repositioning

If you need to move the heat pump unit to a new position FULLY DRAIN the heat pump unit before moving to avoid damage to the unit. (See earlier instruction transportal handling.)

⚠ **Warning**

Refrigerant pipes connection shall be accessible for maintenance purposes.

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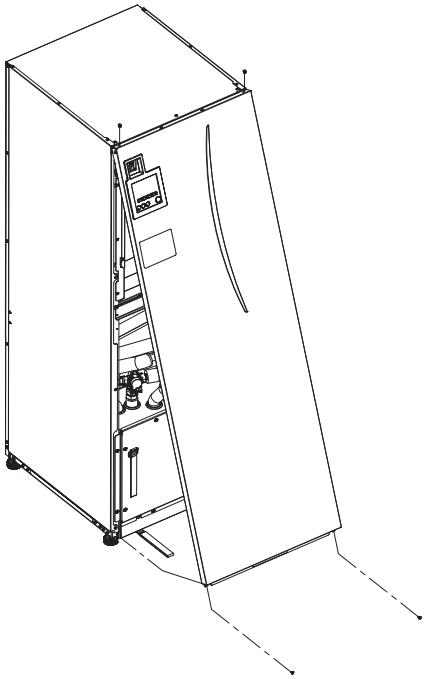
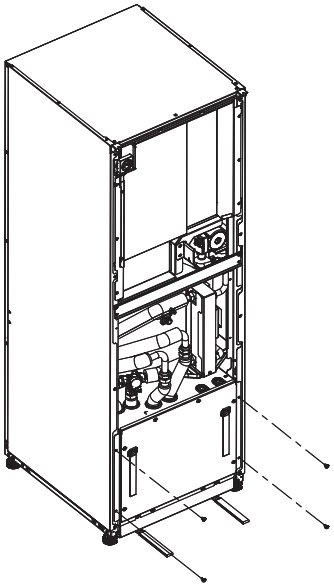
■ How to remove the module

1. Remove the FRONT PANEL (four screws)



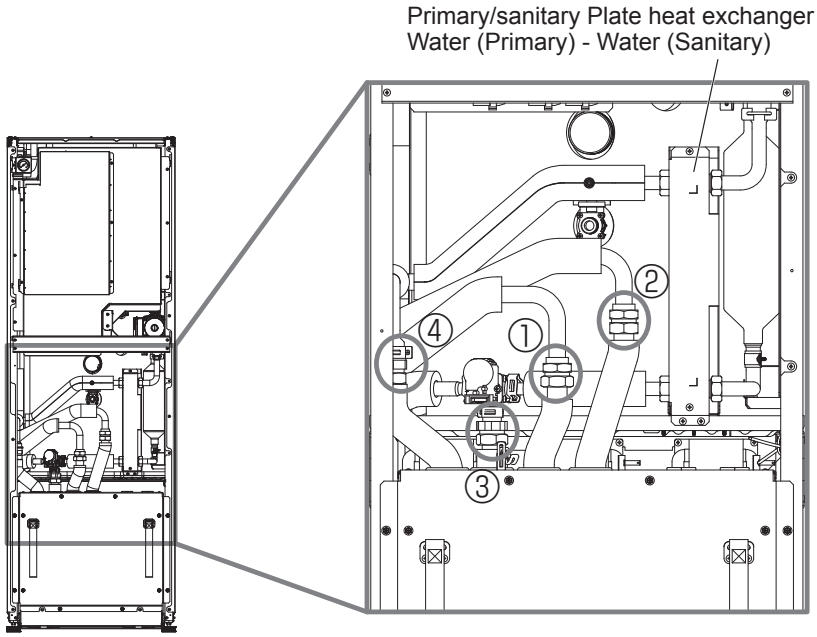
2. Remove the four screws that fix the MODULE FRONT and FRAME



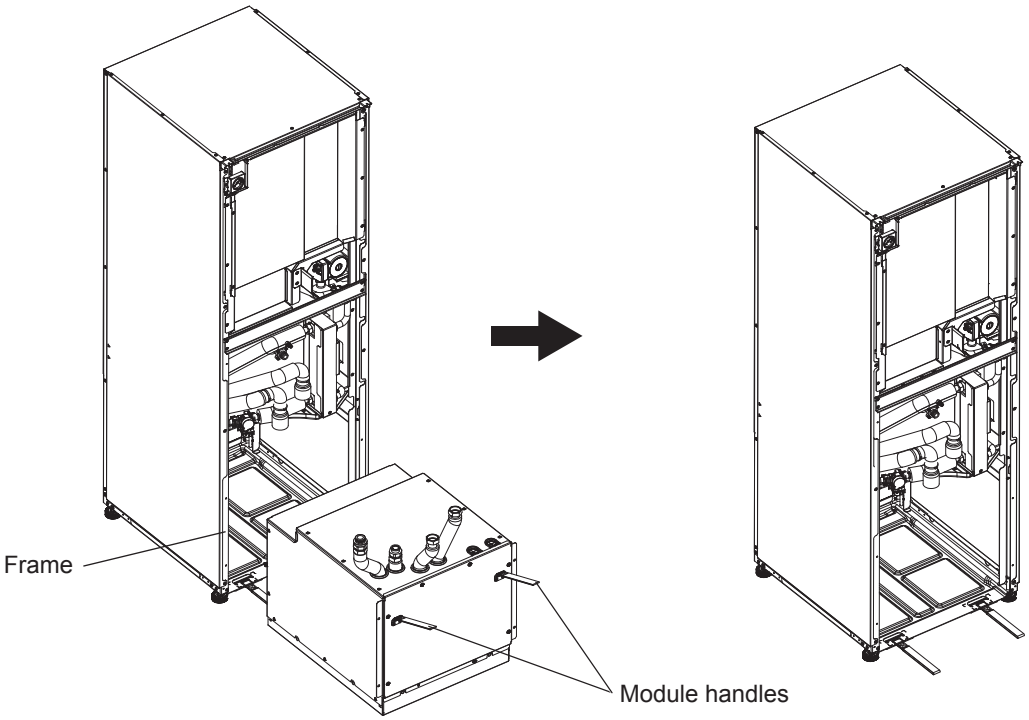
3. CYLINDER - MODULE

<WIRE>
Remove the 7 connectors from the MODULE BOX.
Remove the wires from the top of the MODULE BOX and the wire clamps on the Primary/Sanitary P-HEX.
・UNIT SIDE
Put them together under the CONT BOX
・MODULE SIDE
Put them together on the MODULE BOX

<PIPE>
Remove the following four points.
① Plate heat exchanger (Water/Brine - Refrigerant) IN
② Plate heat exchanger (Water/Brine - Refrigerant) OUT
③ 3 WAY VALVE - Primary flow (from MODULE)
④ Primary Water Pump-Water in (Return)

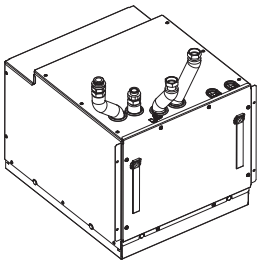


4. Pull the MODULE BOX out by using the MODULE HANDLES



5. After pulling MODULE BOX out

Fit the cap or plastic bag etc. (local supply) on flexible pipes. Please bundle the wires during transportation and secure them with band etc. on the module.



* The module is then re-installed in reverse order.
When returning the Module unit assy to the unit, be careful not to get your hands caught between the unit and the Module unit assy. Hold the module unit assy with nylon bands (Module handles), NOT the corners of it (HAZARD).

4.2 Water/Ambient Loop Quality and System Preparation

<Water>

■ General

- The water in both primary and sanitary circuit should be clean and with pH value of 6.5-8.0
- The followings are the maximum values;
  Calcium: 100 mg/L, Ca hardness: 250 mg/L
  Chloride: 100 mg/L, Copper: 0.3 mg/L
- Other constituents should be to European Directive 98/83 EC standards.
- In known hard water areas, to prevent/minimise scaling, it is beneficial to restrict the routine stored water temperature (DHW max. temp.) to 55°C.

■ Anti-Freeze

Anti-freeze solutions should use propylene glycol with a toxicity rating of Class 1 as listed in Clinical Toxicology of Commercial Products, 5th Edition.

Note:

1. **Ethylene glycol is toxic and should NOT be used in the primary water circuit in case of any cross-contamination of the sanitary circuit.**
2. **For 2-zone valve ON/OFF control, propylene glycol should be used.**

■ Installation (primary water circuit)

- Before installation heat pump unit, thoroughly cleanse pipework of building debris, solder etc using a suitable chemical cleansing agent.
- Flush the system to remove chemical cleanser.
- The responsible installer should decide if anti-freeze solution is necessary for each site's conditions. Corrosion inhibitor however should ALWAYS be used.

When using chemical cleansers and inhibitors always follow manufacturer's instructions and ensure the product is appropriate for the materials used in the water circuit.

<Ambient loop>

■ General

- The water in both primary and sanitary circuit should be clean and with pH value of 6.5-8.0
- The followings are the maximum values;
  Calcium: 100 mg/L, Ca hardness: 250 mg/L
  Chloride: 100 mg/L, Copper: 0.3 mg/L
- Other constituents should be to European Directive 98/83 EC standards.
- **Installer MUST** fill water or the following antifreeze solution mix when filling the ambient loop.
- The water in Ambient loop should be clean and with pH value of 6.5-8.0.
  38 WT% propylene glycol
  29 WT% bioethanol
  25 WT% ethylene glycol
  Note: DO NOT use Inorganic brine.
- Fit the local supply particle filter on the incoming pipe.
- Use the heat pump unit ONLY in a closed system for ambient loop. Using the system in an open system will lead to excessive corrosion.

■ Installation (Ambient loop)

- Before installation of heat pump unit, thoroughly cleanse pipework of building debris, solder etc using a suitable chemical cleansing agent.
- Flush the system to remove chemical cleanser.

When using chemical cleansers and inhibitors always follow manufacturer's instructions and ensure the product is appropriate for the materials used in the circuit.

■ Amount of brine required in the ambient loop

- As a measure of the brine filling amount, please make approximation of 1 L/m of collector hose length.

■ How to access Internal Components and Control and Electrical Box

<A> Opening the front panel

1. Remove the two lower screws and two upper screws.
2. Slide front panel upwards to slightly and open carefully.
3. Disconnect the relay connector connecting main remote controller cable and the control board cable.

<B> Accessing the back of the control and electrical box

The control and electrical box has 8 holding screws and is hinged on the right hand side.

1. Remove the 4 screws fixing the metal plate (with a warning label) in front of the electrical box, then lift the plate to remove.
2. Remove the holding screws on the control and electrical box.
3. The control and electrical box can then be swung forward on the right hand hinges.

Note:

After servicing, re-secure all cables using straps provided. Reconnect main remote controller cable to its relay connector. Replace front panel and resecure screws.

4.3 Water Pipe Work

■ Hot Water Pipework

The heat pump unit is UNVENTED. When installing unvented hot water systems building regulations part G3 (England and Wales), P3 (Scotland) and P5 (Northern Ireland) should be adhered to. If outside of the UK please adhere to your own country's regulations for unvented hot water systems.

Connect the flow for the DHW to pipe A (Figure 3.1).
The function of the following safety components of the heat pump unit should be checked on installation for any abnormalities;
- Pressure relief valve (Primary circuit and Tank)
- Expansion vessel pre-charge (gas charge pressure)

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The instruction on the following pages regarding safe discharge of hot water from Safety devices should be followed carefully.
- The pipework will become very hot, so should be insulated to prevent burns.
- When connecting pipework, ensure that no foreign objects such as debris etc. enter the pipe work.

■ Cold Water Pipework

Cold water to the suitable standard (see section 4.2) should be introduced to the system by connecting pipe B (Figure 3.1) using appropriate fittings.

■ Negative pressure prevention

To prevent negative pressure effecting DHW tank, installer should install appropriate pipework or use appropriate devices.

■ Pipework Connections

Connections to the heat pump unit should be made using the 22 mm or 28 mm compression as appropriate.
When connecting DHW pipes using compression fittings, insert copper liner for DHW pipe (accessory parts) into the pipes and tighten them from 0.75 to 1.25 turns.
Do not over-tighten compression fittings as this will lead to deformation of the olive ring and potential leaks.
Note:
<u>Before</u> brazing pipes in the field, protect pipes on the cylinder unit using wet towels etc as "heat shield".

■ Insulation of Pipework

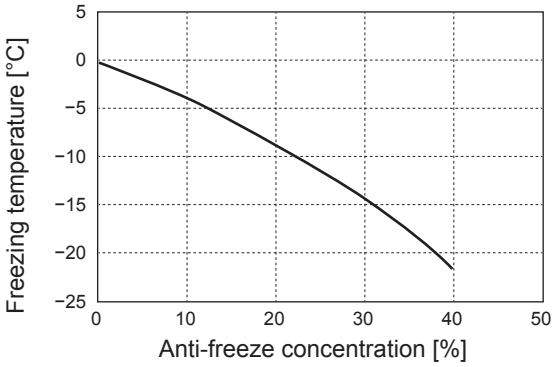
- All exposed water pipework should be insulated to prevent unnecessary heat loss and condensation. To prevent condensate entering the heat pump unit, the pipework and connections at the top of the heat pump unit should be carefully insulated.
- Cold and hot water pipework should not be run close together where possible, to avoid unwanted heat transfer.
- Pipework should be insulated with suitable pipe insulation material with a thermal conductivity of ≤ 0.04 W/m.K.

■ Filling the System (Primary Circuit)

1. Check and charge expansion vessel.
2. Check all connections including factory fitted ones are tight.
3. Insulate pipework.
4. Thoroughly clean and flush, system of all debris. (see section 4.2 for instruction.)
5. Fill heat pump unit with sanitary water. Fill primary heating circuit with water and suitable anti-freeze and inhibitor as necessary. Always use a filling loop with double check valve when filling the primary circuit to avoid back flow contamination of water supply.

When connecting metal pipes of different materials insulate the joints to prevent a corrosive reaction taking place which will damage the pipework.

6. Check for leakages. If leakage is found, retighten the nut onto the connections.
7. Pressurise system to 1 bar.
8. Release all trapped air using air vents during and following heating period.
9. Top up with water as necessary. (If pressure is below 1 bar)



<Figure 4.3.1>

■ Sizing Expansion Vessels

Expansion vessel volume must fit the local system water volume.
To size an expansion vessel for the heating circuit the following formula and graph can be used. When the necessary expansion vessel volume exceeds the volume of an built-in expansion vessel, install an additional expansion vessel so that the sum of the volumes of the expansion vessels exceeds the necessary expansion vessel volume.
For installation of the heat pump unit, the installer MUST provide and install a suitable primary-side expansion vessel as the model **DOES NOT** come fitted with a primary-side expansion vessel.

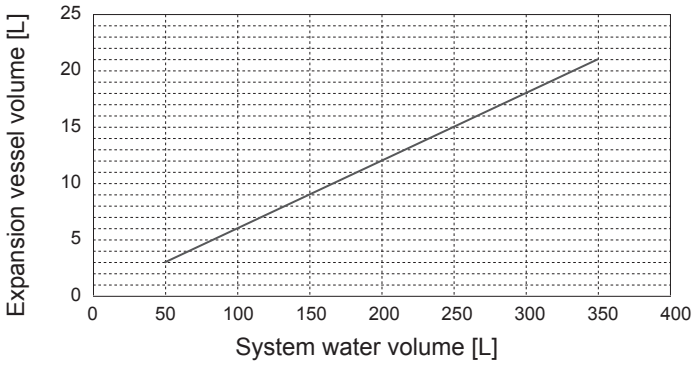
$$V = \frac{\varepsilon \times G}{1 - \frac{P_1 + 0.098}{P_2 + 0.098}}$$

Where;
V : Necessary expansion vessel volume [L]
ε : Water expansion coefficient
G : Total volume of water in the system [L]
P_1 : Expansion vessel setting pressure [MPa]
P_2 : Max. pressure during operation [MPa]

Graph to the right is for the following values

ε : at 70 °C = 0.0229
P_1 : 0.1 MPa
P_2 : 0.3 MPa
*A 30% safety margin has been added.

Expansion vessel sizing



<Figure 4.3.2>

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■ Water Circulation Pump Characteristics

1. Primary circuit
Pump speed can be selected by main remote controller setting (see <Figure 4.3.3>).
Adjust the pump speed setting so that the flow rate in the primary circuit is appropriate for the Table 4.3.1. It may be necessary to add an additional pump to the system depending on the length and lift of the primary circuit.

<Second pump >
If a second pump is required for the installation please read the following carefully.
If a second pump is used in the system it can be positioned in 2 ways.
The position of the pump influences which terminal of the FTC the signal cable should be wired to. If the additional pump(s) have current greater than 1A please use appropriate relay. Pump signal cable can either be wired to TBO.1 1-2 or CNP1 but NOT both.

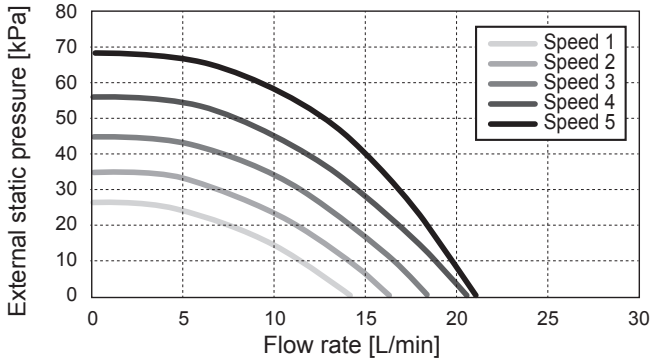
Option 1 (Space heating only)
If the second pump is being used for the heating circuit only then the signal cable should be wired to TBO.1 terminals 3 and 4 (OUT2). In this position the pump can be run at a different speed to the heat pump unit's in-built pump.

Water flow rate range [L/min]	7.1-27.7

<Table 4.3.1>

* If the water flow rate is less than 7.1 L/min, the flow rate error will be activated.
If the water flow rate exceeds 27.7 L/min, the flow speed will be greater than 1.5 m/s, which could erode the pipes.

Water circulation pump characteristics



<Figure 4.3.3>

2. Sanitary circuit
Default setting: Speed 2
DHW circulation pump MUST be set to speed 2.

■ Immersion heater

Do NOT energise the immersion heater until the DHW tank is full of water. Also do NOT energise any immersion heater if any sterilisation chemicals remain in the DHW tank as this will cause premature failure of the heater.

4.4 Ambient Loop Pipe Work

■ Pipework Connections

Connections to the heat pump unit should be made using the 22 mm compression as appropriate.
When connecting Ambient Loop pipes using compression fittings, insert copper liner for Ambient Loop pipe (accessory parts) into the pipes and tighten them from 0.75 to 1.25 turns. Do not over-tighten compression fittings as this will lead to deformation of the olive ring and potential leaks.
Note:
To weld the pipes in the field, cool the pipes on the heat pump unit using wet towel etc.

■ Side Connections

It is possible to angle the ambient loop connections, for connection to the side instead of top connection.
To angle out the connection:

1. Remove left side panel.
2. Cut the pipes to the desired length and angle the pipes in the desired direction.
3. Make a hole on the panel.
4. Fit the panel
5. Connect the pipes
6. Please fill in the gap between panel and ambient loop pipes with insulation

Notes:

- **For side connection, the pipe diameter is 22.2 mm.**
- **Triangle marks on left side panel shows center of ambient loop pipes.**
- **Noise from heat pump can be significant.**

■ How to install PICV (Pressure Independent Control Valve)

PICV should be installed on the Ambient loop pipe in order to balance water or brine in Ambient loop.

■ Insulation of Pipework

- All exposed ambient loop pipework should be insulated to prevent unnecessary heat loss and condensation. To prevent condensate entering the heat pump unit, the pipework and connections at the top of the heat pump unit should be carefully insulated.
- Ambient loop inlet and outlet pipework should not be run close together where possible, to avoid unwanted heat transfer.
- Pipework between Local System2 and heat pump unit should be insulated with suitable pipe insulation material with a thermal conductivity of ≤ 0.04 W/m.K.

■ Filling the System (Ambient loop)

1. Check and charge expansion vessel.
   If expansion vessel is used, close the valve under the expansion vessel.
2. Check all connections including factory fitted ones are tight.
3. If you use filling pump, Connect the filling pump and return line on the ambient loop system's filler connector.
4. Insulate all exposed ambient loop pipework.
5. Thoroughly clean and flush, system of all debris. (see section 4.2 for instruction.)
6. Close the valve in the filler connector, open the valves on the filler connector.
7. Fill heat pump unit's ambient loop with suitable sanitary water or antifreeze solution mix.

When connecting metal pipes of different materials insulate the joints to prevent a corrosive reaction taking place which will damage the pipework.

8. Check for leakages. If leakage is found, retighten the nut onto the connections.
9. Pressurise system to atmospheric pressure. Top up with water as necessary.
10. Close the valves on the filler connector, Open the three way valve in the filler connector.
11. If expansion vessel is used, open the valve under the expansion vessel.

Ambient loop flow rate range [L/min]	7.2 - 24.0

If the water or brine flow rate is less than 7.2 L/min, the flow rate error will be activated.

■ Sizing Expansion Vessels

Expansion vessel volume must fit the local system water or brine volume. Refer to the 4.3 water pipe work for details

4.5 Safety Device Discharge Arrangements (G3)

The following instructions are a requirement of UK Building Regulations and must be adhered to. For other countries please refer to local legislation. If you are in any doubt please seek advice from local building planning office.

1. Position the inlet control group so that discharge from both safety valves can be joined together via a 15 mm end feed Tee.
2. Connect the tundish and route the discharge pipe as shown in Figure 4.5.1.
3. The tundish should be fitted vertically and as close to the safety device as possible and within 500 mm of the device.
4. The tundish should be visible to occupants and positioned away from electrical devices.
5. The discharge pipe (D2) from the tundish should terminate in a safe place where there is no risk to persons in the vicinity of the discharge, be of metal construction and:

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A) Be at least one pipe size larger than the nominal outlet size of the safety device unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9 m long i.e. discharge pipes between 9 m and 18 m equivalent resistance length should be at least two sizes larger than the nominal outlet size of the safety device, between 18 and 27 m at least 3 sizes larger, and so on. Bends must be taken into account in calculating the flow resistance. Refer to Figure 4.5.1, Table 4.5.1 and the worked example. An alternative approach for sizing discharge pipes would be to follow BS 6700: 1987 specification for design installation, testing and maintenance of services supplying water for domestic use within buildings and their cartilages.

B) Have a vertical section of pipe at least 300 mm long, below the tundish before any elbows or bends in the pipework.

C) Be installed with a continuous fall.

D) Have discharges visible at both the tundish and the final point of discharge but where this is not possible or is practically difficult there should be clear visibility at one or other of these locations. Examples of acceptable discharge arrangements are:

i. Ideally below a fixed grating and above the water seal in a trapped gully.

ii. Downward discharges at low level; i.e. up to 100 mm above external surfaces such as car parks, hard standings, grassed areas etc. are acceptable providing that where children may play or otherwise come into contact with discharges a wire cage or similar guard is positioned to prevent contact, whilst maintaining visibility.

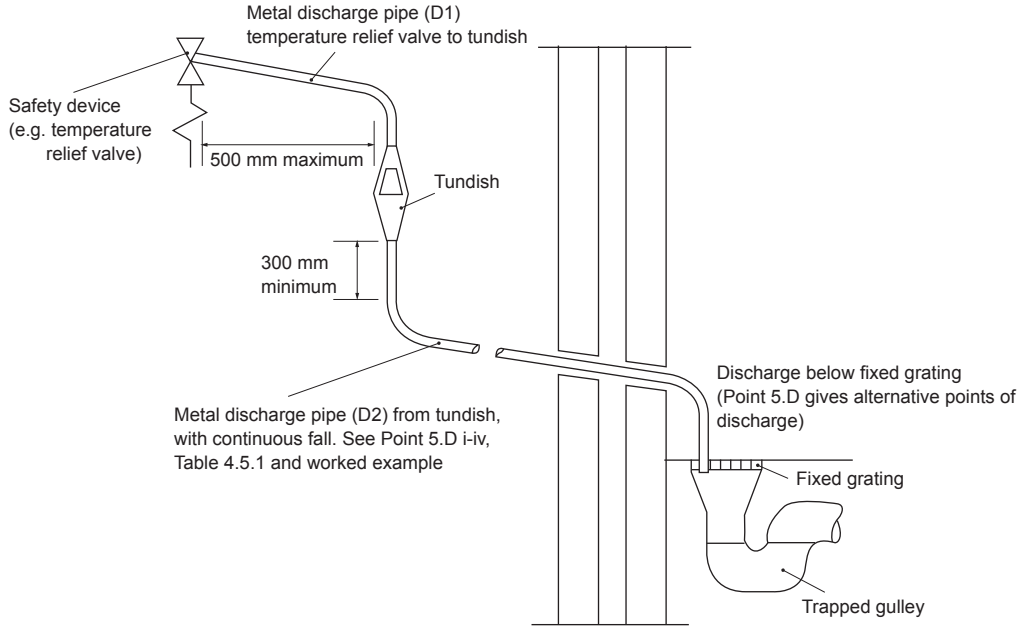
iii. Discharges at high level; e.g. into a metal hopper and metal down pipe with the end of the discharge pipe clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water and 3 m from any plastic guttering system that would collect such discharges (tundish visible).

iv. Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that any installation discharging can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe (D2) to be connected. If unvented hot water storage systems are installed where discharges from safety devices may not be apparent i.e. in dwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and nonmetallic rainwater goods may be damaged by such discharges.

Worked example: The example below is for a G½ temperature relief valve with a discharge pipe (D2) having 4 No. elbows and length of 7 m from the tundish to the point of discharge.

From Table 4.5.1: Maximum resistance allowed for a straight length of 22 mm copper discharge pipe (D2) from a G½ temperature relief valve is: 9.0 m subtract the resistance for 4 No. 22 mm elbows at 0.8 m each = 3.2 m. Therefore the maximum permitted length equates to: 5.8 m. 5.8 m is less than the actual length of 7 m, therefore calculate the next largest size. Maximum resistance allowed for a straight length of 28 mm pipe (D2) from a G½ temperature relief valve equates to: 18 m
Subtract the resistance for 4 No. 28 mm elbows at 1.0 m each = 4 m. Therefore the maximum permitted length equates to: 14 m. As the actual length is 7 m, a 28 mm (D2) copper pipe will be satisfactory.



<Figure 4.5.1>

Valve outlet size	Minimum size of discharge pipe D1	Minimum size of discharge pipe D2 from tundish	Maximum resistance allowed, expressed as a length of straight pipe (no elbows or bends)	Resistance created by each elbow or bend
G 1/2	15 mm	22 mm	Up to 9 m	0.8 m
		28 mm	Up to 18 m	1.0 m
		35 mm	Up to 27 m	1.4 m
G 3/4	22 mm	28 mm	Up to 9 m	1.0 m
		35 mm	Up to 18 m	1.4 m
		42 mm	Up to 27 m	1.7 m
G1	28 mm	35 mm	Up to 9 m	1.4 m
		42 mm	Up to 18 m	1.7 m
		54 mm	Up to 27 m	2.3 m

<Table 4.5.1>

4.6 Electrical Connection

All electrical work should be carried out by a suitably qualified technician. Failure to comply with this could lead to electrocution, fire, and death. It will also invalidate product warranty. All wiring should be according to national wiring regulations.

Breaker abbreviation	Meaning
ECB2	Earth leakage circuit breaker for immersion heater
TB1	Terminal block 1
TB2	Terminal block 2

Connections should be made to the terminals indicated in the figures.

Immersion heater should be connected independently from one another to dedicated power supplies.

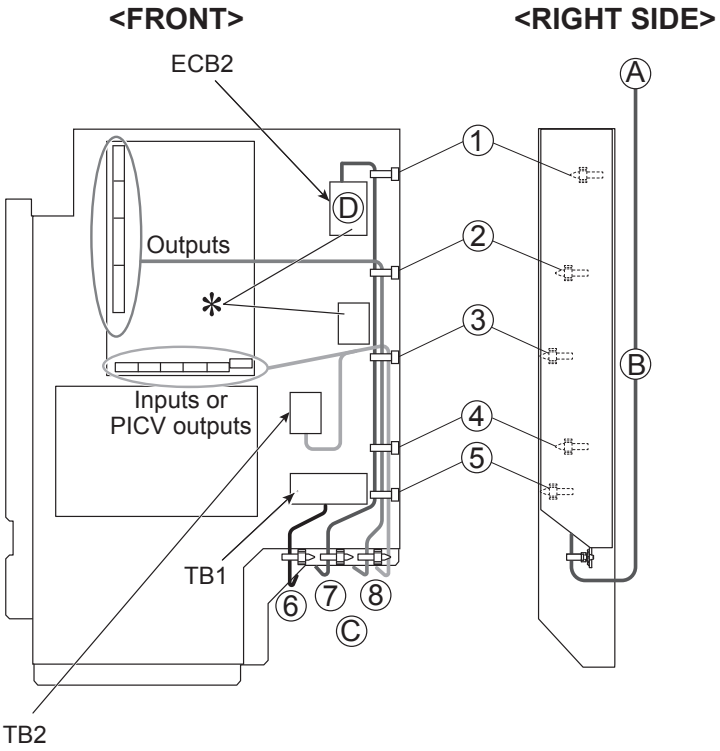
Ⓐ Locally supplied wiring should be inserted through the inlets situated on the top of the heat pump unit. (Refer to <Table 3.3>.)
Ⓑ Wiring should be fed down the back right hand side of the control and electrical box.
Ⓒ The wires should be inserted individually through the cable inlets as below.
Ⓓ Connect the power cable for the immersion heater to ECB2.

- Avoid contact between wiring and parts (✻).
- Make sure that ECB2 is ON.
- When connecting PICV, connect the terminal and PICV

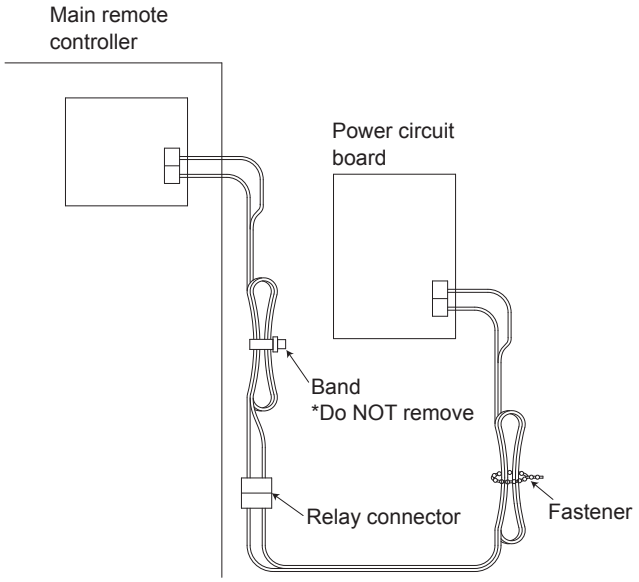
Ⓔ The wires should be fixed with the cable straps as below
- Immersion heater cables should use the cable strap ①, ⑦.
- Output cables should use the cable strap ②, ④, ⑧.
- Input cables, PICV power cables, and PICV output cables should use the cable strap ③, ⑤.
- Power cables should use the cable strap ⑥.

Ⓕ On completion of wiring ensure main remote controller cable is connected to the relay connector.

* Before connecting the main remote controller cable, remove the fastener bundling the cable between the power circuit board and the relay connector.
Caution: Do NOT remove the band bundling the cable between the main remote controller and the relay connector, or the heat pump unit may malfunction due to electrical noise of the power circuit board. (See Figure 4.6.2.)



<Figure 4.6.1>



<Figure 4.6.2>

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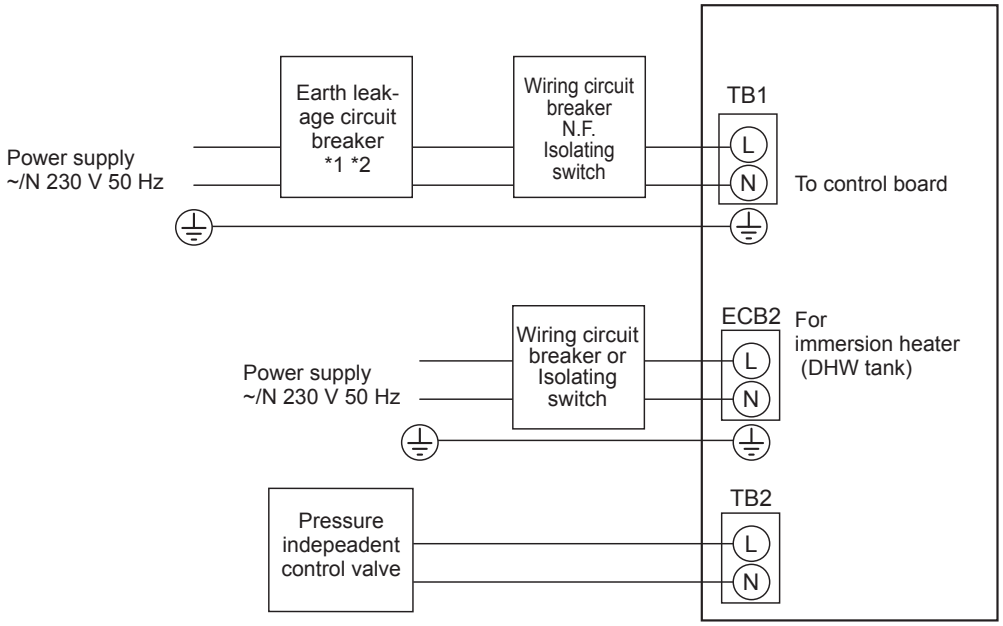
Affix label A that is included with the manuals near each wiring diagram for heat pump units.



<Figure 4.6.3>
Electrical connections 1 phase

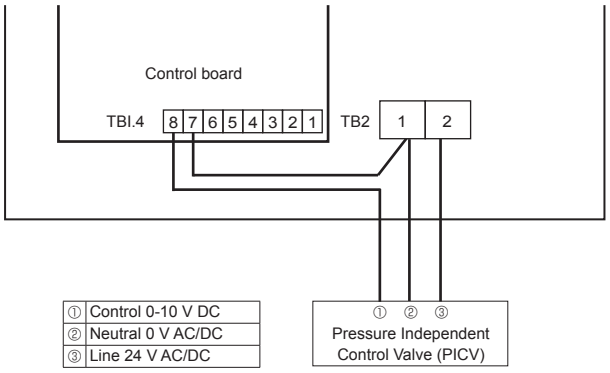
Description	Power supply	Capacity	Breaker	Wiring *4
Immersion heater (DHW tank)	~/N 230 V 50 Hz	3 kW	16 A *2	2.5 mm²

Water to water unit power supply			~/N 230 V 50 Hz
Water to water unit circuit breaker capacity		*2	16 A
Wiring No. × size (mm²)	Water to water unit power supply, earth	*4	3 × Min. 1.5
Circuit rating	Water to water unit L, N	*3	230 V AC

Description	Power supply	Capacity	Wiring specification
Pressure independent control value (PICV) *5	~/N 24 V 50 Hz	500 mA	Use sheathed vinyl coated cord or cable. Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.13 mm² to 0.52 mm² Solid wire: ø0.4 mm to ø0.8 mm

*1.If the installed earth leakage circuit breaker does not have an over-current protection function, install a breaker with that function along the same power line.
*2.A breaker with at least 3.0 mm contact separation in each pole shall be provided. Use earth leakage breaker (NV).
The breaker shall be provided to ensure disconnection of all active phase conductors of the supply.
*3.The values given in the table above are not always measured against the ground value.
*4.Use wires in conformity with design 60245 IEC 57.
*5.External wiring length to PICV is less than 2 m.

Note: 1. Wiring size must comply with the applicable local and national codes.
2. Install an earth longer than other cables.
3. Please keep enough output capacity of power supply for each heater. Insufficient power supply capacity might cause chattering.
4. Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).



<Figure 4.6.4>

Breaker abbreviation	Meaning
TB2	Terminal block 2

Connections should be made to the terminals indicated in Figure 4.6.4.

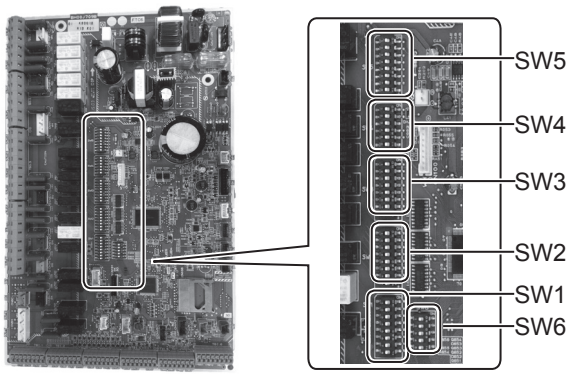
If connecting the PICV, attend to the following points.
- External wiring length to PICV is less than 2 m.
- Tighten the TBI 4.7 pin wiring and the PICV (0 V AC/DC) wiring together to TB2.

5.1 FTC

5.1.1 DIP Switch Function

Located on the FTC printed circuit board are 6 sets of small white switches known as DIP switches. The DIP switch number is printed on the circuit board next to the relevant switches. The word ON is printed on the circuit board and on the DIP switch block itself. To move the switch you will need to use a pin or the corner of a thin metal ruler or similar.

DIP switch settings are listed below in Table 5.1.1.
Only an authorised installer can change DIP switch setting under one's own responsibility according to the installation condition. Make sure to turn off heat pump unit power supplies before changing the switch settings.



<Figure 5.1.1>

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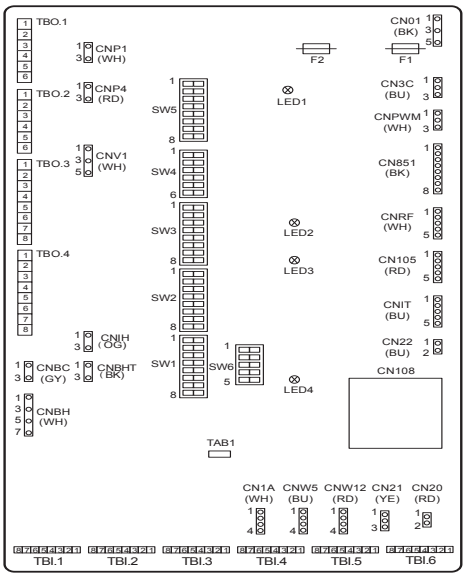
DIP switch		Function	OFF	ON	Default settings
SW1	SW1-1	Boiler	WITHOUT Boiler	WITH Boiler	OFF
	SW1-2	Heat pump maximum outlet water temperature	55ºC	60ºC	ON
	SW1-3	DHW tank	WITHOUT DHW tank	WITH DHW tank	ON
	SW1-4	Immersion heater	WITHOUT Immersion heater	WITH Immersion heater	ON
	SW1-5	Booster heater	WITHOUT Booster heater	WITH Booster heater	OFF
	SW1-6	Booster heater function	For heating only	For heating and DHW	OFF
	SW1-7	—	—	—	OFF
	SW1-8	Wireless remote controller	WITHOUT Wireless remote controller	WITH Wireless remote controller	OFF
SW2	SW2-1	Room thermostat1 input (IN1) logic change	Zone1 operation stop at thermostat short	Zone1 operation stop at thermostat open	OFF
	SW2-2	Flow switch1 input (IN2) logic change	Failure detection at short	Failure detection at open	OFF
	SW2-3	Booster heater capacity restriction	Inactive	Active	OFF
	SW2-4	—	—	—	OFF
	SW2-5	Automatic switch to backup heat source operation (When compressor stops by error)	Inactive	Active *1	OFF
	SW2-6	Mixing tank	WITHOUT Mixing tank	WITH Mixing tank	OFF
	SW2-7	2-zone temperature control	Inactive	Active *4	OFF
	SW2-8	—	—	—	ON
SW3	SW3-1	Room thermostat 2 input (IN6) logic change	Zone2 operation stop at thermostat short	Zone2 operation stop at thermostat open	OFF
	SW3-2	Flow switch 2,3 input (IN3,7) logic change	Failure detection at short	Failure detection at open	OFF
	SW3-3	—	—	—	ON
	SW3-4	Electric energy meter	WITHOUT Electric energy meter	WITH Electric energy meter	OFF
	SW3-5	—	—	—	OFF
	SW3-6	2-zone valve ON/OFF control	Inactive	Active	OFF
	SW3-7	—	—	—	ON
	SW3-8	Heat meter	WITHOUT Heat meter	WITH Heat meter	OFF
SW4	SW4-1	—	—	—	OFF
	SW4-2	—	—	—	OFF
	SW4-3	—	—	—	OFF
	SW4-4	Water circuit only operation (during installation work) *2	Inactive	Active	OFF
	SW4-5	Emergency mode (Heater only operation)	Normal	Emergency mode (Heater only operation)	OFF *3
	SW4-6	Emergency mode (Boiler operation)	Normal	Emergency mode (Boiler operation)	OFF *3
SW5	SW5-1	—	—	—	OFF
	SW5-2	Advanced auto adaptation	Inactive	Active	ON
	SW5-3	Capacity code	—	—	ON
	SW5-4		—	—	OFF
	SW5-5		—	—	OFF
	SW5-6		—	—	ON
	SW5-7		—	—	OFF
	SW5-8	—	—	—	OFF
SW6	SW6-1	—	—	—	OFF
	SW6-2	—	—	—	OFF
	SW6-3	Pressure sensor	Inactive	Active	ON
	SW6-4	Analog output signal (0-10V)	Inactive	Active	OFF
	SW6-5	Model select	Air to Water	Water to Water	ON

<Table 5.1.1>

Note: ***1. External output (OUT11) will be available. For safety reasons, this function is not available for certain errors. (In that case, system operation must be stopped and only the water circulation pump keeps running.)**
***2. Space heating and DHW can be operated only in water circuit, like an electric boiler. (Refer to "5.1.5 Water circuit only operation".)**
***3. If emergency mode is no longer required, return the switch to OFF position.**
***4. Active only when SW3-6 is set to OFF.**

5.1.2 Connecting inputs/outputs



<Figure 5.1.2>

Wiring specification and local supply parts

Item	Name	Model and specifications
Signal input function	Signal input wire	Use sheathed vinyl coated cord or cable. Max. 30 m Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.13 mm² to 0.52 mm² Solid wire: ø0.4 mm to ø0.8 mm
	Switch	Non-voltage “a” contact signals Remote switch: minimum applicable load 12V DC, 1mA

Note:
Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).

■ Signal inputs

Name	Terminal block	Connector	Item	OFF (Open)	ON (Short)
IN1	TBI.1 7-8	—	Room thermostat 1 input *1	Refer to SW2-1 in <5.1.1 DIP Switch Functions>.	
IN2	TBI.1 5-6	—	Flow switch 1 input	Refer to SW2-2 in <5.1.1 DIP Switch Functions>.	
IN3	TBI.1 3-4	—	Flow switch 2 input (Zone1)	Refer to SW3-2 in <5.1.1 DIP Switch Functions>.	
IN4	TBI.1 1-2	—	Demand control input	Normal	Heat source OFF/ Boiler operation *3
IN5	TBI.2 7-8	—	Outdoor thermostat input *2	Standard operation	Heater operation/ Boiler operation *3
IN6	TBI.2 5-6	—	Room thermostat 2 input *1	Refer to SW3-1 in <5.1.1 DIP Switch Functions>.	
IN7	TBI.2 3-4	—	Flow switch 3 input (Zone2)	Refer to SW3-2 in <5.1.1 DIP Switch Functions>.	
IN8	TBI.3 7-8	—	Electric energy meter 1	*4	
IN9	TBI.3 5-6	—	Electric energy meter 2		
IN10	TBI.2 1-2	—	Heat meter		
IN11	TBI.3 3-4	—	Smart grid ready input	*5	
IN12	TBI.3 1-2	—			
INA1	TBI.4 1-3	CN1A	Flow sensor	—	—

*1. Set the ON/OFF cycle time of the room thermostat for 10 minutes or more; otherwise the compressor may be damaged.
*2. If using outdoor thermostat for controlling operation of heaters, the lifetime of the heaters and related parts may be reduced.
*3. To turn on the boiler operation, use the main remote controller to select “Boiler” in “External input setting“ screen in the service menu.
*4. Connectable electric energy meter and heat meter

- Pulse type: Voltage free contact for 12VDC detection by FTC (TBI.2 1pin ,TBI.3 5 and 7 pins have a positive voltage.)
- Pulse duration: Minimum ON time: 40ms
  Minimum OFF time: 100ms
- Possible unit of pulse: 0.1 pulse/kWh 1 pulse/kWh 10 pulse/kWh
  100 pulse/kWh 1000 pulse/kWh

Those values can be set by the main remote controller. (Refer to the menu tree in "Main remote controller".)
*5. As for the SG ready, refer to "5.1.6 Smart grid ready".

■ Thermistor inputs

Name	Terminal block	Connector	Item	Optional part model
TH1	—	CN20	Thermistor (Room temp.) (Option)	PAC-SE41TS-E
TH2	—	CN21	Thermistor (Ref. liquid temp.)	—
THW1	—	CNW12 1-2	Thermistor (Flow water temp.)	—
THW2	—	CNW12 3-4	Thermistor (Return water temp.)	—
THW5A	—	CNW5 1-2	Thermistor (DHW tank upper water temp.)	—
THW5B	—	CNW5 3-4	Thermistor (DHW tank lower water temp.)	—
THW6	TBI.5 7-8	—	Thermistor (Zone1 flow water temp.) (Option) *1	PAC-TH011-E
THW7	TBI.5 5-6	—	Thermistor (Zone1 return water temp.) (Option) *1	
THW8	TBI.5 3-4	—	Thermistor (Zone2 flow water temp.) (Option) *1	PAC-TH011-E
THW9	TBI.5 1-2	—	Thermistor (Zone2 return water temp.) (Option) *1	
THW10	TBI.6 5-6	—	Thermistor (Mixing tank water temp.)	PAC-TH012HT-E
THWB1	TBI.6 7-8	—	Thermistor (Boiler flow water temp.) (Option) *1	

Ensure to wire thermistor wirings away from the power line and/or OUT1 to 15 wirings.

***1. The maximum length of the thermistor wiring is 30 m. When the wires are wired to adjacent terminals, use ring terminals and insulate the wires.**

The length of the optional thermistors are 5 m. If you need to splice and extend the wirings, following points must be carried out.

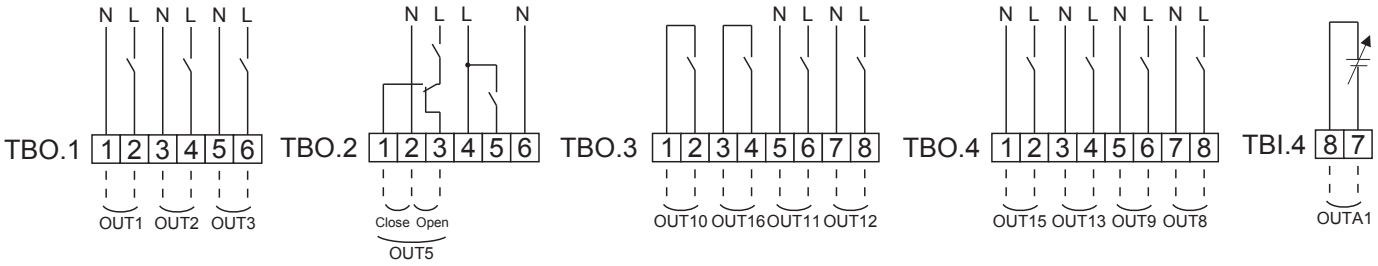
1) Connect the wirings by soldering.

2) Insulate each connecting point against dust and water. Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).

■ Outputs

Name	Terminal block	Connector	Item	OFF	ON	Signal/Max current	Max. total current
OUT1	TBO.1 1-2	CNP1	Water circulation pump 1 output (Space heating & DHW)	OFF	ON	230V AC 0.6A Max.	3.0A
OUT2	TBO.1 3-4	—	Water circulation pump 2 output (Space heating for Zone1)	OFF	ON	230V AC 1.0A Max.	
OUT3	TBO.1 5-6	—	Water circulation pump 3 output (Space heating for Zone2) *1 2-way valve 2b output *2	OFF	ON	230V AC 1.0A Max.	
OUT14	—	CNP4	Water circulation pump 4 output (DHW)	OFF	ON	230V AC 0.4A Max.	
OUT4	—	CN851	3-way valve output	Heating	DHW	—	1.3A
OUT5	TBO.2 1-2 TBO.2 2-3	—	Mixing valve output *1	Stop	Close Open	230V AC 0.1A Max.	
OUT6	—	—	—	—	—	—	
OUT7	—	—	—	—	—	—	
OUT8	TBO.4 7-8	—	—	—	—	—	
OUT9	TBO.4 5-6	CNIH	Immersion heater output	—	—	230V AC 0.1A Max. (Relay)	
OUT11	TBO.3 5-6	—	Error output	Normal	Error	230V AC 0.5A Max.	
OUT12	TBO.3 7-8	—	—	—	—	—	
OUT13	TBO.4 3-4	—	2-way valve 2a output *2	OFF	ON	230V AC 0.1A Max.	
OUT15	TBO.4 1-2	—	Comp ON signal	OFF	ON	230V AC 0.5A Max.	
OUT10	TBO.3 1-2	—	Boiler output	OFF	ON	non-voltage contact ·220-240V AC (30V DC) 0.5A or less ·10mA 5V DC or more	—
OUT16	TBO.3 3-4	—	Heating thermo ON signal	OFF	ON		
OUTA1	TBI.4 7-8	—	Analog output (PICV Output)	OFF	ON	0-10V DC 5mA max.	—

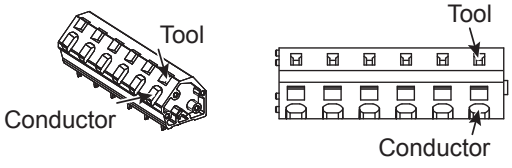
Do not connect to the terminals that are indicated as "—" in the "Terminal block" field.
***1 For 2-zone temperature control.**
***2 For 2-zone valve ON/OFF control.**



Wiring specification and local supply parts

Item	Name	Model and specifications
External output function	Outputs wire	Use sheathed vinyl coated cord or cable. Max. 30 m Wire type: CV, CVS or equivalent Wire size: Stranded wire: 0.25 mm² to 1.5 mm² Solid wire: ø0.57 mm to ø1.2 mm

How to use TBO.1 to 4



Connect them using either way as shown above.

<Figure 5.2.2>

Note:
1. Do not connect multiple water circulation pumps directly to each output (OUT1, OUT2, and OUT3). In such a case, connect them via (a) relay(s).
2. Do not connect water circulation pumps to both TBO.1 1-2 and CNP1 at the same time.
3. Connect an appropriate surge absorber to OUT10 (TBO.3 1-2) depending on the load at site.
4. Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).
5. Use the same thing as the Signal input wire for OUTA1 wiring.

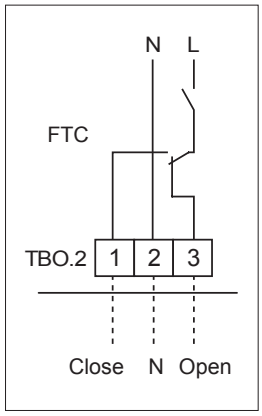
5.1.3 Wiring for 2-zone temperature control

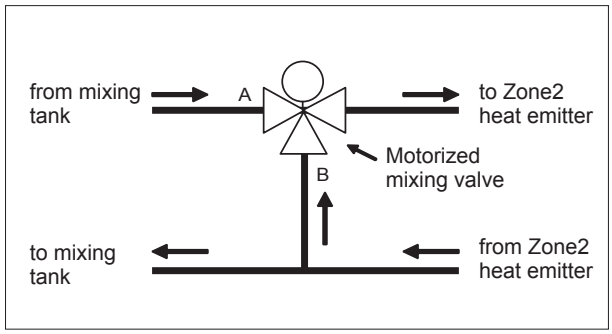
Connect the pipe work and locally supplied parts according to the relevant circuit diagram shown “Local system” in Section 3, of this manual.

<Mixing valve>
Connect the signal line to open Port A (hot water inlet port) to TBO. 2-3 (Open), the signal line to open Port B (cold water inlet port) to TBO. 2-1 (Close) , and the neutral terminal wire to TBO. 2-2 (N).

<Thermistor>
• Do not install the thermistors on the mixing tank.
• Install the Zone2 flow temp. thermistor (THW8) near the mixing valve.
• The maximum length of the thermistor wiring is 30 m.
• The length of the optional thermistors are 5 m. If you need to splice and extend the wirings, following points must be carried out.
1) Connect the wirings by soldering.
2) Insulate each connecting point against dust and water.

Note:
Do not install the thermistors on the mixing tank. This could affect correct monitoring of flow and return temperatures through each zone.
Install the Zone2 flow temp. thermistor (THW8) near the mixing valve.

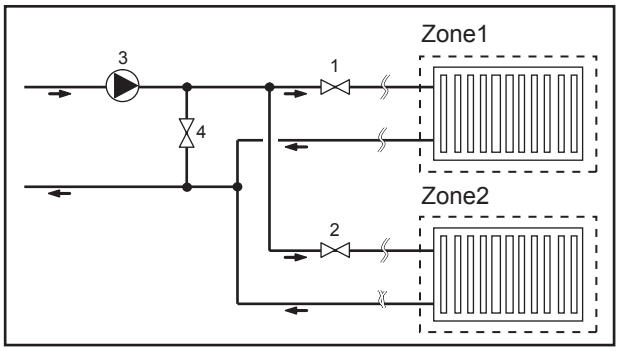




5.1.4 2-zone valve ON/OFF control

Opening /closing 2-way valve provides a simple 2-Zone control.
Flow temperature is common for Zone1 and 2.

1. Pipe work



1. Zone1 2-way valve 2a (local supply)
2. Zone2 2-way valve 2b (local supply)
3. Water circulation pump 2 (local supply) *1
4. By-pass valve (local supply) *2

***1 Install according to system in the field.**
***2 For safety protection, it is recommended to install a auto-operational (eg. mechanical spring ie. not manual valve) by-pass valve.**

Note:
Freeze stat function is deactivated whilst this control is ON. Use anti-freeze solution to avoid freezing, if necessary.

2. DIP switch
Turn DIP switch 3-6 ON.
3. 2-way valve 2a (for Zone1) / 2-way valve 2b (for Zone2)
Electrically wire 2-way valve 2a and 2b to the appropriate external output terminals. (Refer to "External outputs" in 5.1.2)
4. Room thermostat connection

Heating operation mode	Zone1	Zone2
Room temp. control (Auto adaptation) *3	● Wireless remote controller (option) ● Room temperature thermistor (option) ● Main remote controller (remote position)	● Wireless remote controller (option)
Compensation curve or flow temp. control	● Wireless remote controller (option) *4 ● Room temperature thermostat (local supply)	● Wireless remote controller (option) *4 ● Room temperature thermostat (local supply)

***3 Ensure to install the room thermostat for Zone1 in main room since the Room temp. control for Zone1 is prioritized.**
***4 The wireless remote controller can be used as a thermostat.**

5.1.5 Water circuit only operation (Indoor unit only operation) (during installation work)

During installation work, once the primary and sanitary circuits are fully charged with water it may be flexible to engaged the electric heater to provide DHW (For UK only). *

1. To start operation

- Check if the power supply is OFF, and turn DIP switch 4-4 and 4-5 (on FTC) ON.
- Turn ON the power supply.

2. To end operation*1

- Turn OFF the power supply.
- Turn DIP switch 4-4 and 4-5 (on FTC) OFF.

*1 When the water circuit only operation is ended, ensure to check over the settings after ambient loop is connected and fully charged.

Note:

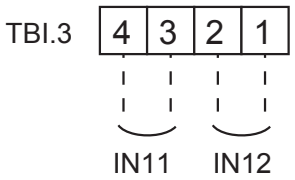
Prolonged running of this operation may affect the life of the electric heater.

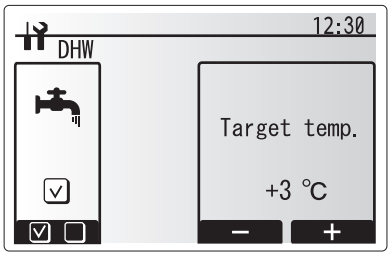
*If booster heater equipped, the function is activated.

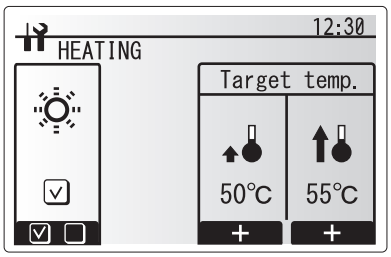
5.1.6 Smart grid ready

In DHW or heating operation, the commands in the table below can be used.

IN11	IN12	Meaning
OFF (open)	OFF (open)	Normal operation
ON (short)	OFF (open)	Switch-on recommendation
OFF (open)	ON (short)	Switch-off command
ON (short)	ON (short)	Switch-on command







5.1.7 Main remote Controller Options

The heat pump unit comes factory fitted with a main remote controller. This incorporates a thermistor for temperature monitoring and a graphical user interface to enable set-up, view current status and input scheduling functions. The main remote controller is also used for servicing purposes. This facility is accessed via password protected service menus.

To provide the best efficiency Mitsubishi Electric recommends using automatic adaptation function based on room temperature. To use this function a room thermistor needs to be present in a main living area. This can be done in a number of ways the most convenient are detailed below.

Refer to heating section of this manual for instructions on how to set compensation curve, Flow temp. or Room temp. (Auto adaptation).

For instructions on how to set the thermistor input for the FTC please refer to Initial settings section.

The factory setting for space heating mode is pre-set to Room temp. mode (auto adaptation). If there is no room sensor present in the system, this setting must be changed to either Compensation curve mode or Flow temp. mode.

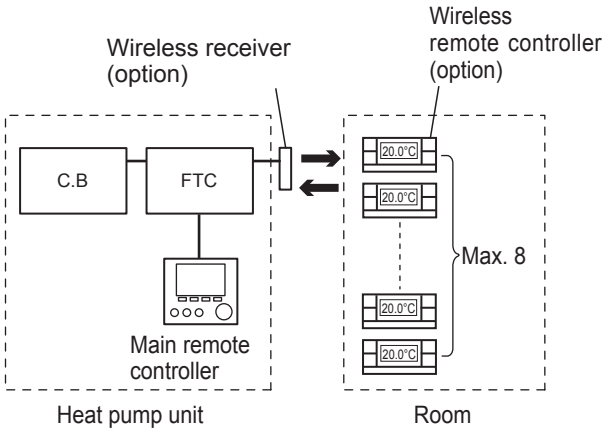
■ 1-zone temperature control

Control option A

This option features the main remote controller and the Mitsubishi Electric wireless remote controller. The wireless remote controller is used to monitor room temperature and can be used to make changes to the space heating settings, boost DHW and switch to holiday mode without having to directly use the main remote controller.

If more than one wireless remote controller is used, the most recently requested temperature setting will commonly be applied to all rooms by the central control system regardless of which wireless remote controller was used. No hierarchy exists across these remote controllers.

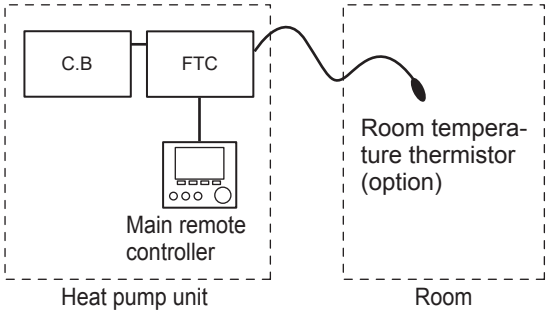
Wire the wireless receiver to FTC referring to the wireless remote controller instruction manual. **Turn DIP SW1-8 to ON.** Before operation configure the wireless remote controller to transmit and receive data referring to the wireless remote controller installation manual.



Control option B

This option features the main remote controller and the Mitsubishi Electric thermistor wired to FTC. The thermistor is used to monitor room temperature but can not make any changes in control operation. Any changes to DHW must be made using the main remote controller mounted on the heat pump unit.

Wire the thermistor to the TH1 connector on FTC.
The number of room temperature thermistors that can be connected to FTC is always one.



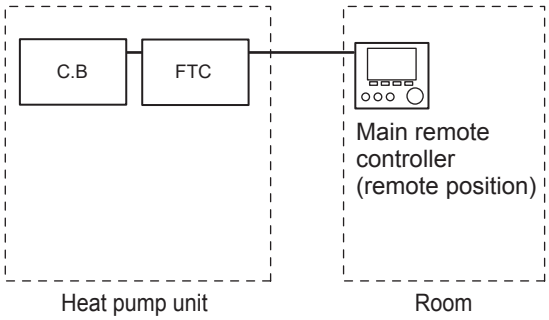
Control option C

This option features the main remote controller being removed from the heat pump unit and situated in a different room. A thermistor built in the main remote controller can be used for monitoring the room temperature for Auto Adaptation function whilst keeping all its features of the main remote controller available.

The main remote controller and FTC are connected by a 2-core, 0.3 mm², non-polar cable (local supply) with a maximum length of 500 m.

To use the sensor in the main remote controller the main remote controller should come off from the heat pump unit. Otherwise it will detect the temperature of the heat pump unit instead of room temperature. This will affect the output of the space heating.

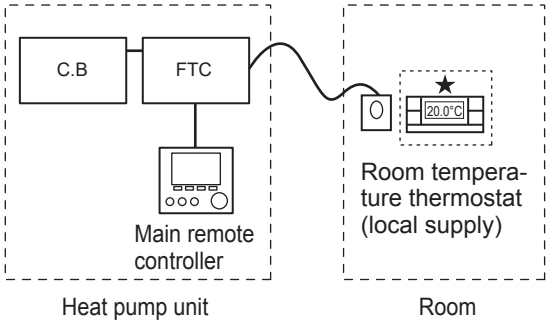
Note: Wiring for main remote controller cable shall be (5 cm or more) apart from power source wiring so that it is not influenced by electrical noise from power source wiring. (Do NOT insert main remote controller cable and power source wiring in the same conduit.)



Control option D

This option features the main remote controller and a locally supplied thermostat wired to FTC. The thermostat is used to set the maximum temperature for heating room. Any changes to DHW must be made using main remote controller mounted on the heat pump unit.
The thermostat is wired to IN1 in TBI.1 on FTC. The number of thermostats that can be connected to FTC is always one.

★ **The wireless remote controller can be also used as a thermostat.**



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■ 2-zone temperature control

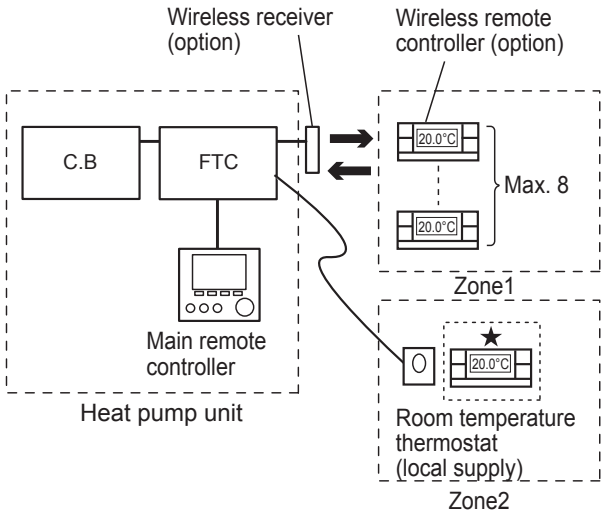
Control option A

This option features the main remote controller, the Mitsubishi Electric wireless remote controller and a locally supplied thermostat.
The wireless remote controller is used to monitor the Zone1 room temperature and the thermostat is used to monitor the Zone2 room temperature.
The thermostat can be also allocated to Zone1 and the wireless remote controller to Zone2.

The wireless remote controller can be also used to make changes to the space heating settings, boost DHW and switch to holiday mode without having to use the main remote controller.

If more than one wireless remote controller is used, the last temperature setting adjustment/demand will be applied to ALL rooms in same zone.

Wire the wireless receiver to FTC referring to the wireless remote controller instruction manual. Turn DIP SW1-8 to ON. Before operation configure the wireless remote controller to transmit and receive data referring to the wireless remote controller installation manual.
The thermostat is used to set the maximum temperature for heating Zone2 room.
The thermostat is wired to IN6 on FTC. (If the thermostat is allocated to Zone1, it is wired to IN1 on TBI.1.) (Refer to 5.1.2.)

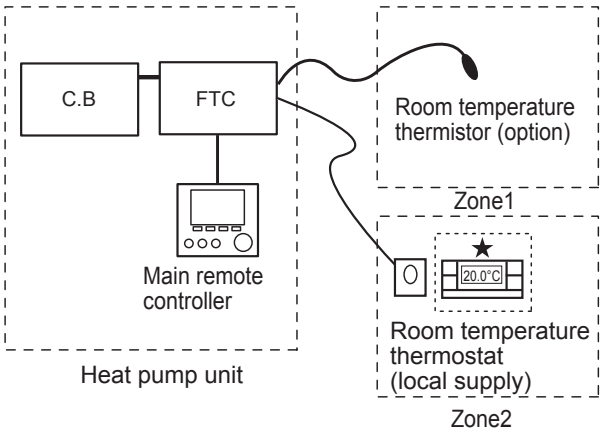


Zone1: Room temp. control (Auto adaptation)
Zone2: Compensation curve or flow temp. control

Control option B

This option features the main remote controller, the Mitsubishi Electric thermistor and a locally supplied thermostat that are wired to FTC.
The thermistor is used to monitor the Zone1 room temperature and the thermostat is used to control the Zone2 room temperature.

The thermostat can be also allocated to Zone1 and the thermistor to Zone2.
The thermistor can not make any changes in control operation. Any changes to DHW must be made using the main remote controller mounted on the heat pump unit.
Wire the thermistor to the TH1 connector on FTC.
The number of room temperature thermistors that can be connected to FTC is always one.
The thermostat is used to set the maximum temperature for heating Zone2 room.
The thermostat is wired to IN6 on FTC. (If the thermostat is allocated to Zone1, wire it to IN1 on TBI.1.) (Refer to 5.1.2.)



Zone1: Room temp. control (Auto adaptation)
Zone2: Compensation curve or flow temp. control

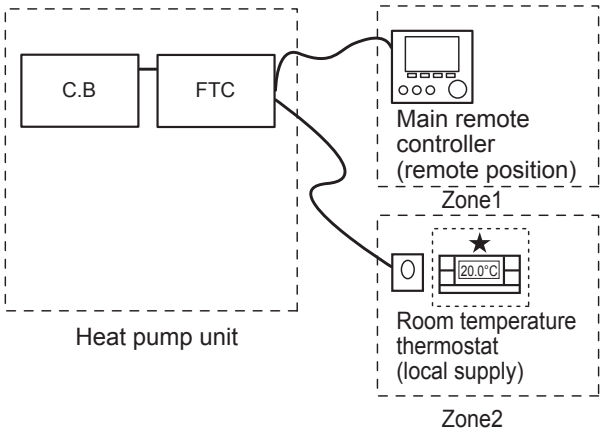
Control option C

This option features the main remote controller (with in-built thermistor) that is removed from the heat pump unit to monitor the Zone1 room temperature and a locally supplied thermostat to monitor the Zone2 room temperature.
The thermostat can be also allocated to Zone1 and the thermistor to Zone2.

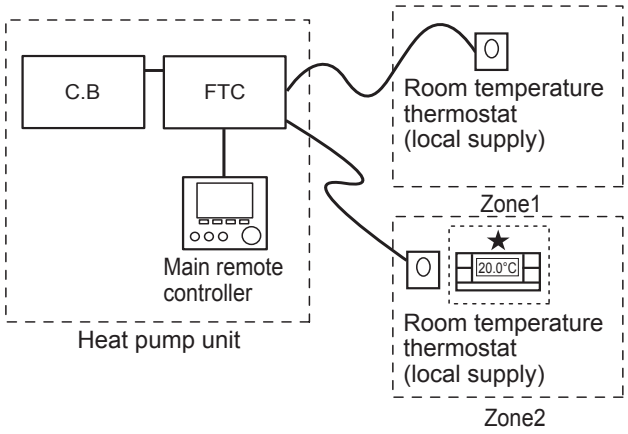
A thermistor built into the main remote controller can be used for monitoring the room temperature for Auto Adaptation function whilst keeping all its features of the main remote controller available.
The main remote controller and FTC are connected by a 2-core, 0.3 mm², non-polar cable (local supply) with a maximum length of 500 m.
To use the sensor in the main remote controller the main remote controller should be detached from the heat pump unit. Otherwise it will detect the temperature of the heat pump unit instead of room temperature. This will affect the output of the space heating.

The thermostat is used to set the maximum temperature for heating Zone2 room.
The thermostat is wired to IN6 on FTC. (If the thermostat is allocated to Zone1, wire it to external input IN1 on TBI.1.) (Refer to 5.1.2.)

Note:
Wiring for main remote controller cable shall be (5 cm or more) apart from power source wiring so that it is not influenced by electrical noise from power source wiring. (Do NOT insert main remote controller cable and power source wiring in the same conduit.)



Zone1: Room temp. control (Auto adaptation)
Zone2: Compensation curve or flow temp. control

Control option D	
This option features the locally supplied thermostats wired to FTC. The thermostats are individually allocated to Zone1 and Zone2. The thermostats are used to set each maximum temperature for heating Zone1 and Zone2 rooms. Any changes to DHW must be made using the main remote controller mounted on the heat pump unit. The thermostat for Zone1 is wired to IN1 in TBI.1 on FTC. The thermostat for Zone2 is wired to IN6 in TBI.1 on FTC.	 Zone1, Zone2: Compensation curve or flow temp. control

Note: For the options above, the sensor types can be exchanged between Zone1 and Zone2.
(e.g. Wireless remote controller in Zone1 and Room temp. thermostat in Zone2 can be changed to Room temp. thermostat and wireless remote controller, respectively).

★ **The wireless remote controller can be also used as a thermostat.**

en

5.1.8 Using SD memory card

The heat pump unit is equipped with an SD memory card interface in FTC.
Using an SD memory card can simplify main remote controller settings and can store operating logs. *1

<Handling precautions>

(1) Use an SD memory card that complies with the SD standards. Check that the SD memory card has a logo on it of those shown to the right.
(2) SD memory cards to the SD standards include SD, SDHC, miniSD, micro SD, and microSDHC memory cards. The capacities are available up to 32 GB. Choose that with a maximum allowable temperature of 55ºC.
(3) When the SD memory card is a miniSD, miniSDHC, microSD, or micro SDHC memory card, use an SD memory card converter adapter.
(4) Before writing to the SD memory card, release the write-protect switch.

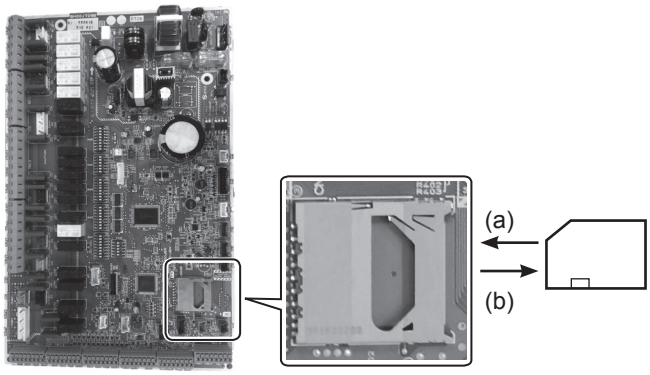
(5) Before inserting or ejecting an SD memory card, make sure to power off the system. If an SD memory card is inserted or ejected with the system powered on, the stored data could be corrupted or the SD memory card be damaged.
*An SD memory card is live for a short duration after the system is powered off. Before insertion or ejection wait until the LED lamps on the FTC control board are all off.
(6) The read and write operations have been verified using the following SD memory cards, however, these operations are not always guaranteed as the specifications of these SD memory cards could change.

Manufacturer	Model	Tested in
Verbatim	#44015	Mar. 2012
SanDisk	SDSDB-002G-B35	Oct. 2011
Panasonic	RP-SDP04GE1K	Oct. 2011
Arvato	2GB PS8032 TSB 24nm MLC	Jun. 2012
Arvato	2GB PS8035 TSB A19nm MLC	Jul. 2014
SanDisk	SDSDUN-008G-G46	Oct. 2016
Verbatim	#43961	Oct. 2016
Verbatim	#44018	Oct. 2016
VANTASTEK	VSDHC08	Sep. 2017
RiTEK	RiDATA 8GB SDHC	Aug. 2021

Before using a new SD memory card (including the card that comes with the unit), always check that the SD memory card can be safely read and written to by the FTC controller.
<How to check read and write operations>
a) Check for correct wiring of power supply to the system. For more details, refer to section 4.6.
(Do not power on the system at this point.)
b) Insert an SD memory card.
c) Power on the system.
d) The LED4 lamp lights if the read and write operations are successfully completed. If the LED4 lamp continues blinking or does not light, the SD memory card cannot be read or written to by the FTC controller.

(7) Make sure to follow the instruction and the requirement of the SD memory card's manufacturer.
(8) Format the SD memory card if determined unreadable in step (6). This could make it readable.
Download an SD card formatter from the following site.
SD Association homepage: https://www.sdcard.org/home/
(9) FTC supports FAT file system but not NTFS file system.
(10) Mitsubishi Electric is not liable for any damages, in whole or in part, including failure of writing to an SD memory card, and corruption and loss of the saved data, or the like. Back up saved data as necessary.
(11) Do not touch any electronic parts on the FTC control board when inserting or ejecting an SD memory card, or else the control board could fail.

(a) For insertion, push on the SD memory card until it clicks into place.
(b) For ejection, push on the SD memory card until it clicks.
Note: To avoid cutting fingers, do not touch sharp edges of the SD memory card connector (CN108) on the FTC control board.

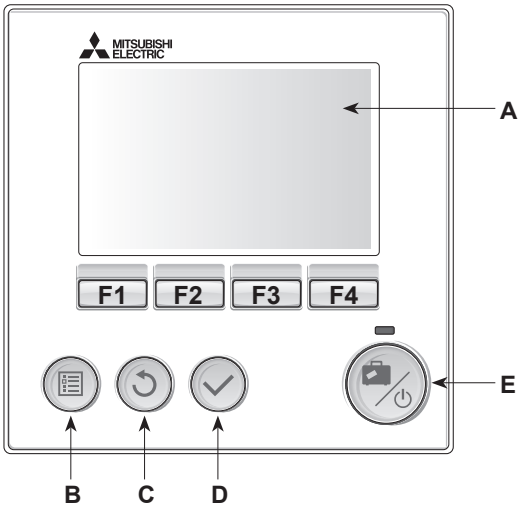


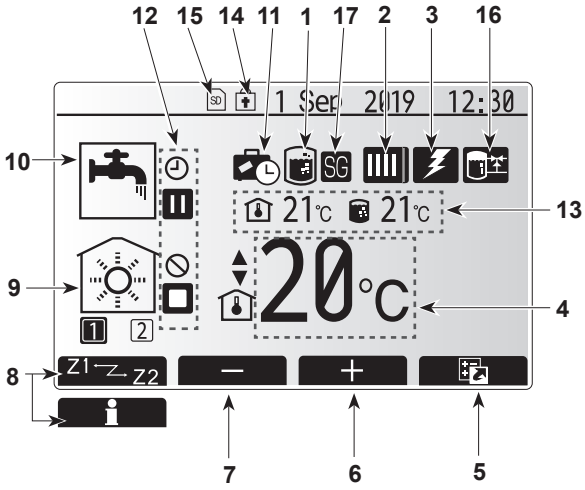
Logos
Capacities
2 GB to 32 GB *2
SD speed classes
All

• The SD Logo is a trademark of SD-3C, LLC.
The miniSD logo is a trademark of SD-3C, LLC.
The microSD logo is a trademark of SD-3C, LLC.

*1 To edit main remote controller settings or to check operating data, an ecodan service tool (for use with PC) is required.
*2 A 2-GB SD memory card stores up to 30 days of operation logs.

5.1.9 Main remote controller





Main screen

<Main remote controller parts>

Letter	Name	Function
A	Screen	Screen in which all information is displayed.
B	Menu	Access to system settings for initial set up and modifications.
C	Back	Return to previous menu.
D	Confirm	Used to select or save. (Enter key)
E	Power/ Holiday	If system is switched off pressing once will turn system on. Pressing again when system is switched on will enable Holiday Mode. Holding the button down for 3 seconds will turn the system off. (***1**)
F1-4	Function keys	Used to scroll through menu and adjust settings. Function is determined by the menu screen visible on screen A.

***1**
When the system is switched off or the power supply is disconnected, the heat pump unit protection functions (e.g. freeze stat. function) will NOT operate. Please beware that without these safety functions enabled the heat pump unit may potentially become exposed to damage.

<Main screen icons>

	Icon	Description	
1	Legionella prevention	When this icon is displayed 'Legionella prevention mode' is active.	
2	Heat pump		'Heat pump' is running.
			Emergency heating
			'Quiet mode' is activated.
3	Electric heater	When this icon is displayed the 'Electric heaters' (immersion heater) are in use.	
4	Target temperature		Target flow temperature
			Target room temperature
			Compensation curve
5	OPTION	Pressing the function button below this icon will display the option screen.	
6	+	Increase desired temperature.	
7	-	Decrease desired temperature.	
8	Z1 Z2	Pressing the function button below this icon switches between Zone1 and Zone2.	
	Information	Pressing the function button below this icon displays the information screen.	
9	Space heating mode		Heating mode Zone1 or Zone2
10	DHW mode	Normal or Eco mode	
11	Holiday mode	When this icon is displayed 'Holiday mode' activated.	
12		Timer	
		Prohibited	
		Server control	
		Stand-by	
		Stop	
		Operating	
13	Current temperature		Current room temperature
			Current water temperature of DHW tank
14		The Menu button is locked or the switching of the operation modes between DHW and Heating operations are disabled in the Option screen. (***2**)	
15		SD memory card is inserted. Normal operation.	
		SD memory card is inserted. Abnormal operation.	
16	Buffer tank control	When this icon is displayed, 'Buffer tank control' is active.	
17	Smart grid ready	When this icon is displayed, 'Smart grid ready' is active.	

***2 To lock or unlock the Menu, press the BACK and CONFIRM keys simultaneously for 3 seconds.**

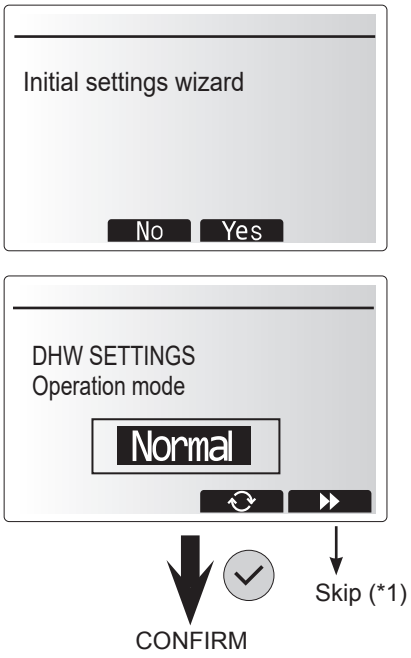
■ [Initial settings wizard]

When the main remote controller is switched on for the first time, the screen automatically goes to Language setting screen, Date/Time setting screen and Main settings menu screen in order. Enter the desired number using the function keys and press CONFIRM.

Note:
<[HEATER CAPACITY RESTRICTION]>*
This setting restricts the capacity of booster heater (if fitted). It is NOT possible to change the setting after starting up.
If you do not have any special requirements (such as building regulations) in your country, skip this setting (select "No").
* If booster heater equipped, the function is activated.

- [Hot water (DHW/Legionella)]
- [Heating]
- [Operation mode (ON/Prohibited/Timer)]
- [Pump speed]
- [Heat pump flow rate range]
- [Mixing valve control]
- [HEATER CAPACITY RESTRICTION]

*1 The screen goes to the next setting screen. Changes have not been saved.



■ Main Settings Menu

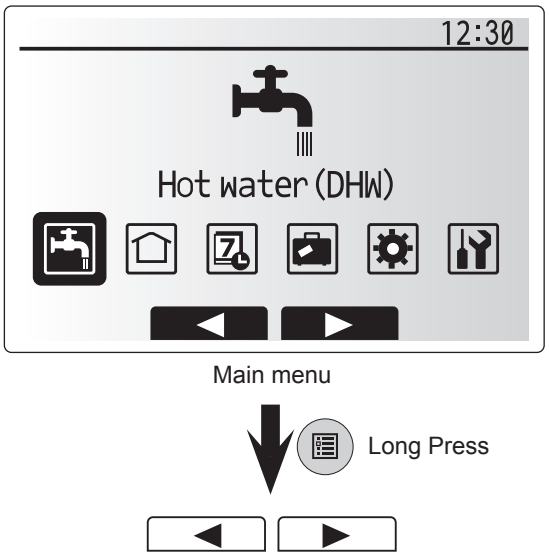
The main settings menu can be accessed by pressing the MENU button. To reduce the risk of untrained end users altering the settings accidentally there are two access levels to the main settings; and the service section menu is password protected.

User Level – Short press
If the MENU button is pressed once for a short time the main settings will be displayed but without the edit function. This will enable the user to view current settings but **NOT** change the parameters.

Installer Level – Long press
If the MENU button is pressed down for 3 seconds the main settings will be displayed with all functionality available.
The color of ◄► buttons is inverted, as per right figure.

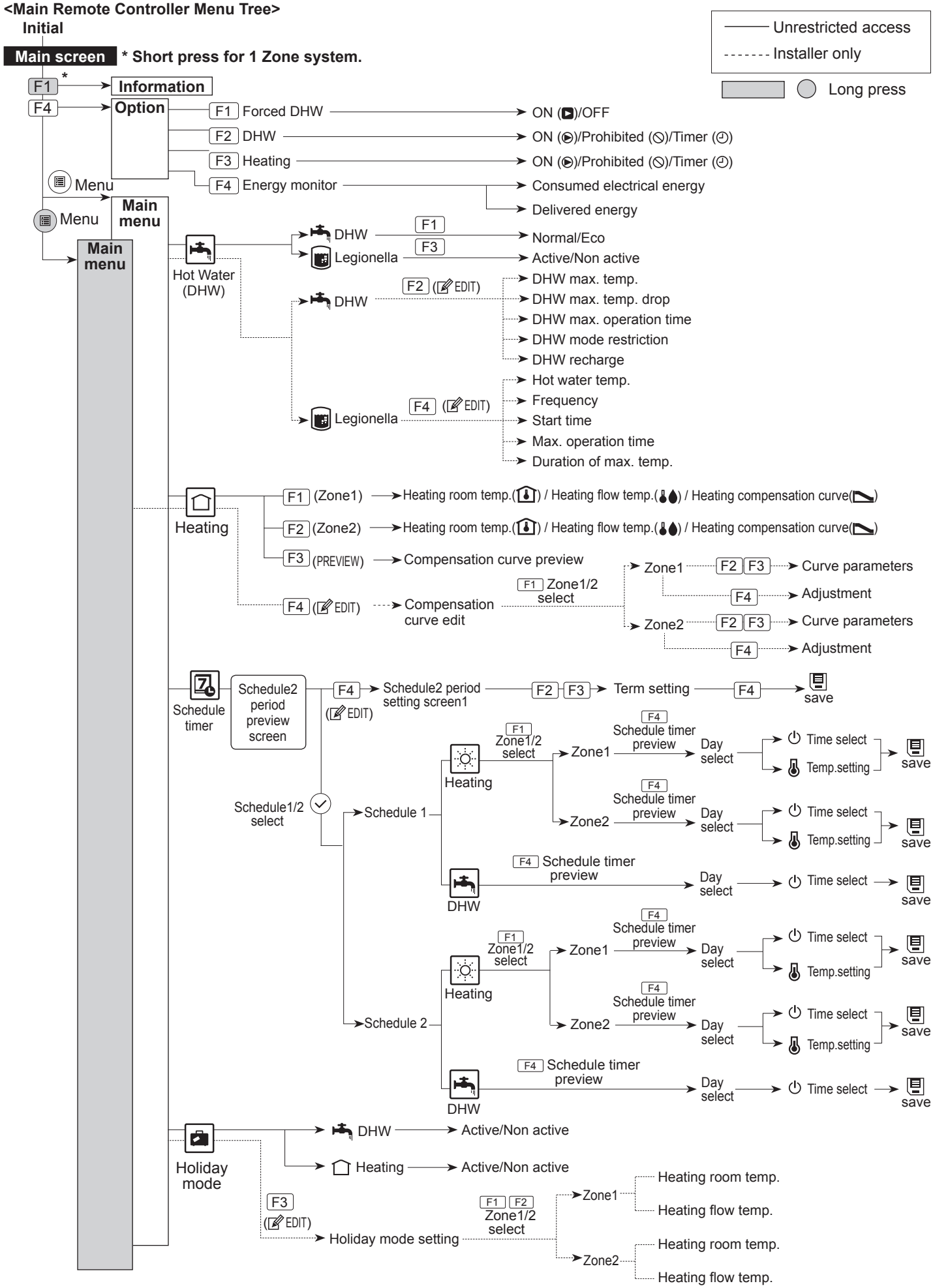
The following items can be viewed and/or edited (dependent on access level).

- [Domestic Hot water (DHW)]
- [Heating]
- [Schedule timer]
- [Holiday mode]
- [Initial settings]
- [Service (Password protected)]



5 System Set Up

<Main Remote Controller Menu Tree>



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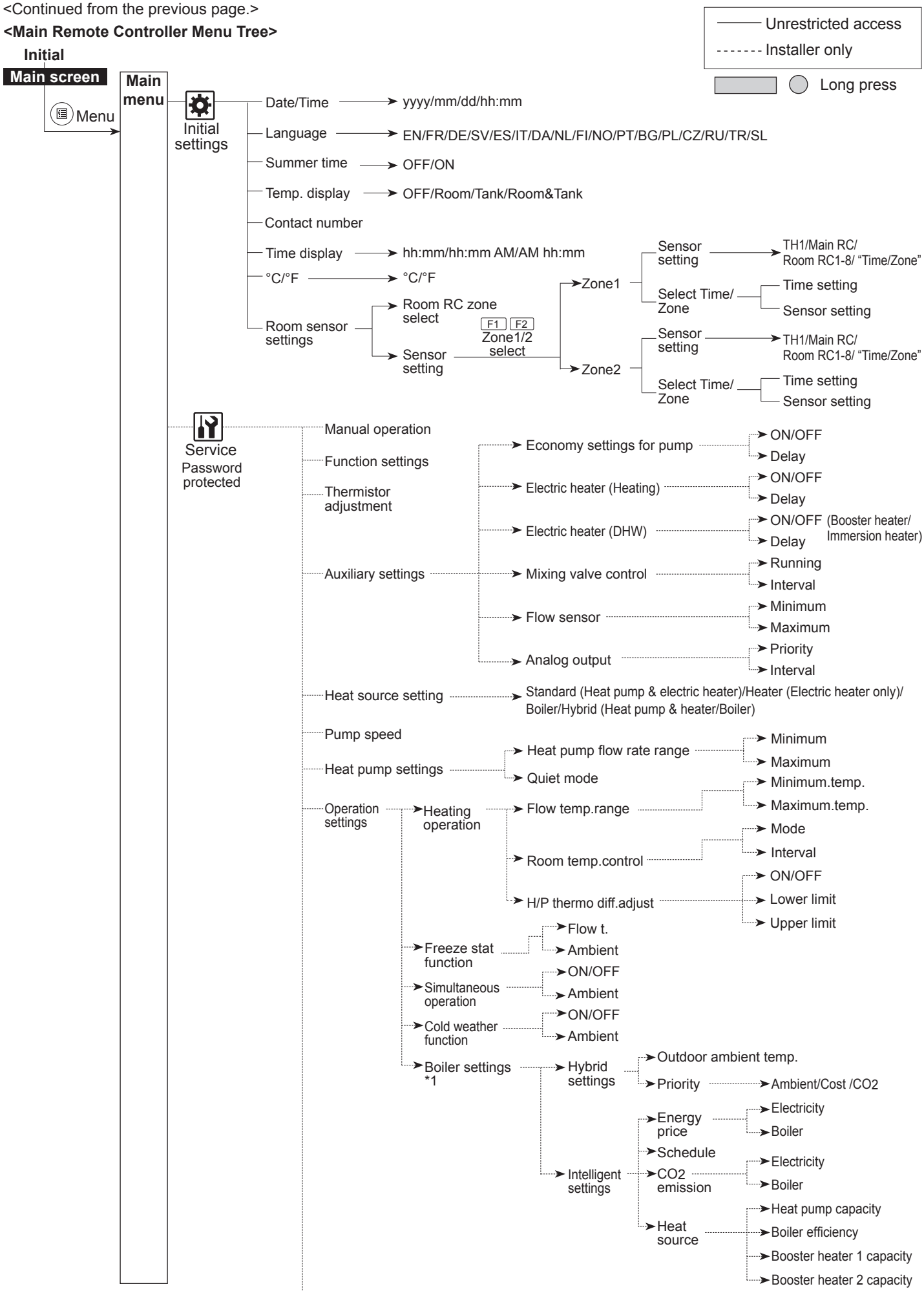
<Main Remote Controller Menu Tree>



*1 For more details, refer to the installation manual of PAC-TH012HT-E.

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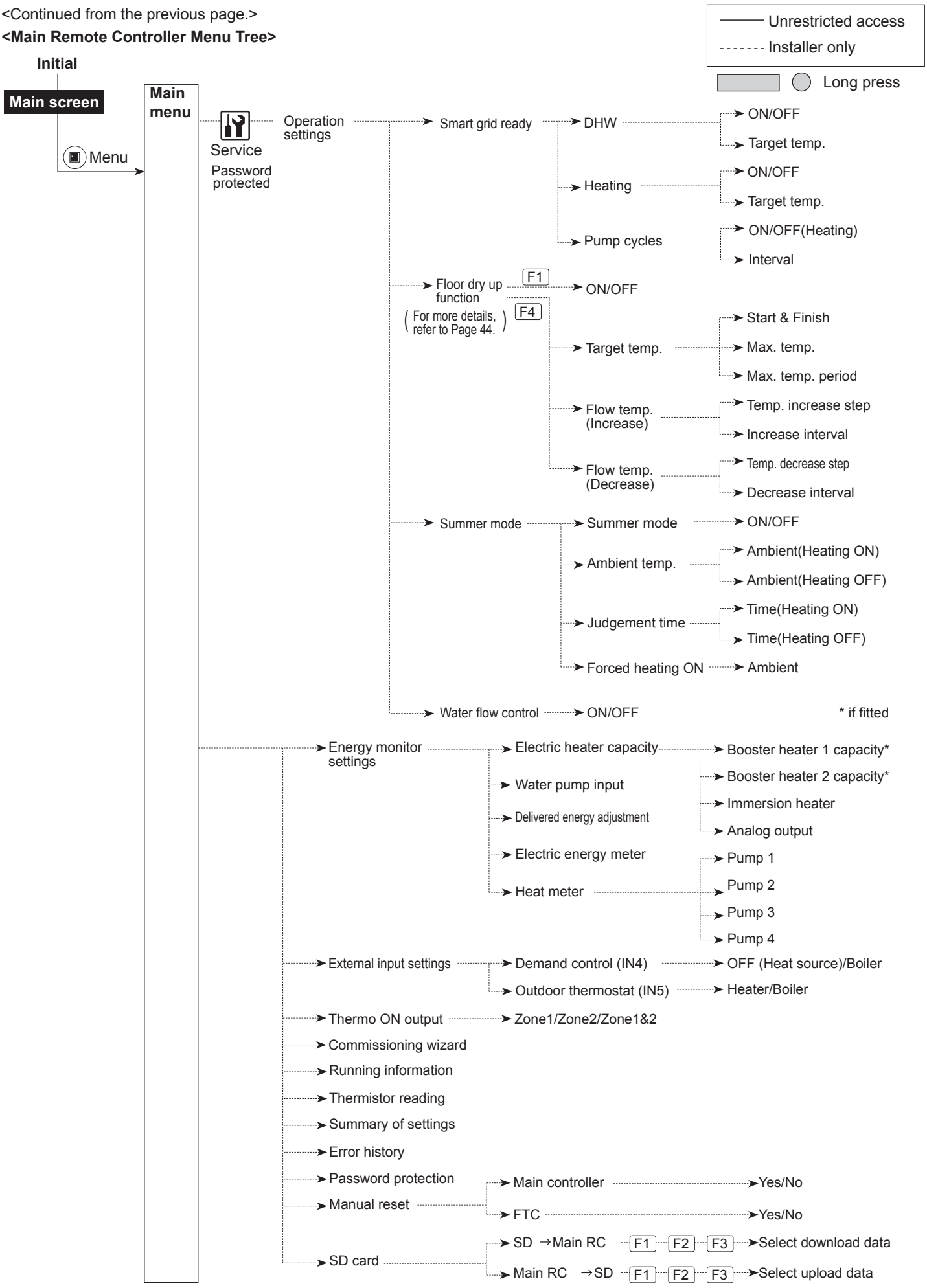
<Main Remote Controller Menu Tree>



en

[Service Menu]

The service menu provides functions for use by installer or service engineer. It is NOT intended the home owner alters settings within this menu. It is for this reason password protection is required to prevent unauthorised access to the service settings.

The factory default password is "0000".
Follow the procedure described in General Operation for the set up operation.

The service menu is navigated using the F1 and F2 buttons to scroll through the functions. The menu is split across two screens and is comprised of the following functions;

1. [Manual operation]
2. [Function settings]
3. [Thermistor adjustment]
4. [Auxiliary settings]
5. [Heat source setting]
6. [Pump speed]
7. [Heat pump settings]
8. [Operation settings]
9. [Energy monitor settings]
10. [External input settings]
11. [Thermo ON output]
12. [Commissioning wizard]
13. [Running information]
14. [Thermistor reading]
15. [Summary of settings]
16. [Error history]
17. [Password protection]
18. [Manual reset]
19. [SD card]

In this Installation Manual, instructions will be given only for the following functions;

1. [Manual operation]
2. [Auxiliary settings]
3. [Heat source setting]
4. [Operation settings]
5. [Energy monitor settings]
6. [External input settings]
7. [Password protection]
8. [Manual reset]

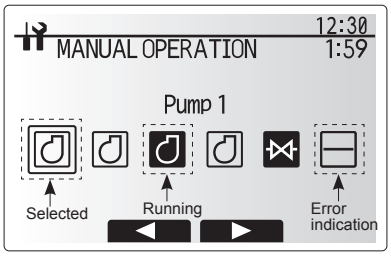
Information on the other functions can be found by consulting the service manual.

Many functions can not be set whilst the heat pump unit is running. The installer should turn off the unit before trying to set these functions. If the installer attempts to change the settings whilst the unit is running the main remote controller will display a reminder message prompting the installer to stop operation before continuing. By selecting “Yes” the unit will cease operation.

<[Manual operation]>

During the filling of the system the water circulation pump and 3-way valve can be manually overridden using manual operation mode.
When manual operation is selected a small timer icon appears in the screen. The function selected will only remain in manual operation for a maximum of 2 hours. This is to prevent accidental permanent override of the FTC.

►Example
Pressing F3 button will switch manual operation mode ON for the main 3-way valve. When filling of the DHW tank is complete the installer should access this menu again and press F3 to deactivate manual operation of the part.
Alternatively after 2 hours manual operation mode will no longer be active and FTC will resume control of the part.



Manual operation menu screen

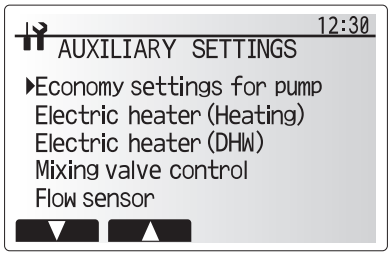
Manual operation and heat source setting can not be selected if the system is running. A screen will be displayed asking the installer to stop the system before these modes can be activated.
The system automatically stops 2 hours after last operation.

<[Auxiliary settings]>

This function is used to set the parameters for any auxiliary parts used in the system

Menu subtitle		Function/ Description
Economy settings for pump		Water pump stops automatically a specified period of time from when operation is finished.
	Delay	Time before pump switches off*1
Electric heater (Heating)*4		To select "WITH booster heater (ON)" or "WITHOUT booster heater (OFF)" in Heating mode.
	Delay	The minimum time required for the booster heater to turn ON after Heating mode has started.
Electric heater (DHW)		To select "WITH (ON)" or "WITHOUT (OFF)" booster heater or immersion heater individually in DHW mode.
	Delay	The minimum time required for the booster heater or immersion heater to turn ON from after DHW mode has started. (This setting is applied for both booster and immersion heater.)
Mixing valve control *2	Running	Period from valve fully open (at a hot water mixing ratio of 100%) to valve fully closed (at a cold water mixing ratio of 100%)
	Interval	Interval (min) to control the mixing valve.
Flow sensor *3	Minimum	The minimum flow rate to be detected at flow sensor.
	Maximum	The maximum flow rate to be detected at flow sensor.

*1. Decreasing "time before pump switched off" may increase the duration of stand-by in heating mode.
*2. Set the running time according to the specifications of the actuator of each mixing valve.
It is recommended to set the interval to 2 minutes that is a default value. With the interval set longer, it could take longer to warm up a room.
*3. Do not change the setting since it is set according to the specification of flow sensor attached to the heat pump unit.
*4. If booster heater equipped, the function is activated.



Auxiliary settings menu screen

<[Heat source setting]>

The default heat source setting is heat pump and all electric heaters present in the system to be operational. This is referred to as standard operation on the menu.

<[Operation settings]>

[Heating operation]

This function allows operational setting of flow temperature range from the heat pump unit and also the time interval at which the FTC collects and processes data for the auto adaptation mode.

Menu subtitle		Function	Range	Unit	Default
Flow temp. range	Minimum temp.	To minimize the loss by frequent ON and OFF in mild outdoor ambient temperature seasons.	20 to 45	ºC	30
	Maximum temp.	To set max. possible flow temperature according to the type of heat emitters.	35 to 60	ºC	50
Room temp. control	Mode	Setting for Room temp. control At Fast mode, target outlet water temperature is set higher than the one set at normal mode. This reduces the time to reach the target room temperature when the room temperature is relatively low.*	Normal/ Fast	—	Normal
	Interval	Selectable according to the heat emitter type and the materials of floor (i.e. radiators, floor heating-thick, -thin concrete, wood, etc.)	10 to 60	min	10
Heat pump thermo diff. adjust	On/Off	To minimize the loss by frequent ON and OFF in mild outdoor ambient temperature seasons.	On/Off	—	On
	Lower limit	Prohibits heat pump operation until the flow temperature drops below the target flow temperature plus lower limit value.	−9 to −1	ºC	−5
	Upper limit	Allows heat pump operation until the flow temperature rises above the target flow temperature plus upper limit value.	+3 to +5	ºC	+5

Note:

1. The minimum flow temperature that prohibits heat pump operation is 20ºC.
2. The maximum flow temperature that allows heat pump operation equals to the maximum temperature set in the Flow temp. range menu.

* Fast mode is not efficient and will increase running cost when compared to normal mode.

[Freeze stat function]

Menu subtitle		Function/ Description
Freeze stat function *1		An operational function to prevent the water circuit from freezing when outdoor ambient temperature drops.
	Flow t.	The target outlet water temperature at water circuit when operating in Freeze stat function. *2
	Outdoor ambient temp.	Minimum outdoor ambient temperature which freeze stat function will begin to operate, (3 - 20ºC) or choose**. If asterisk (**) is chosen freeze stat function is deactivated. (i.e. primary water freeze risk)"

*1 When the system is turned off, freeze stat function is not enabled.
*2 Flow t. is fixed to 20ºC and unchangeable.

[Simultaneous Operation]

For periods of very low outside temperature this mode can be used. Simultaneous operation allows both DHW and space heating to run together by using the heat pump and/or booster heater (if present) to provide space heating whilst only the immersion heater provides heating for DHW. This operation is only available if BOTH a DHW tank AND immersion heater are present on the system.*

- Range of outdoor ambient temperature at which simultaneous operation starts is −30°C to 10°C (default −15°C).
- System shall automatically return to routine operation. This will happen when the outdoor ambient temperature rises above the selected temperature for this specific mode of operation.

[Cold weather function]

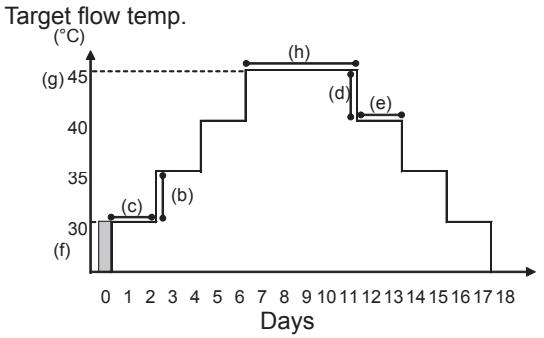
For extremely low outdoor ambient temperature conditions when the heat pump's capacity is restricted the provision of DHW is supported by the immersion heater,where fitted.
The support of both space heating and DHW can only be provided if the heat pump unit is also fitted with an electrical booster heater.

- Range of outdoor ambient temperature at which cold weather function starts is −30°C to −10°C (default −15°C).
- System shall automatically return to routine operation. This will happen when the outdoor temperature rises above the selected temp. for this specific mode of operation.

Note:
Electrical booster is only applicable to some modules.

[Floor dry up function]
The Floor dry up function automatically changes the target hot water temperature in stages to gradually dry concrete when this particular type of underfloor heating system is installed.

Upon completion of the operation the system stops all the operations except the Freeze stat. operation.
For Floor dry up function, the target flow temp. of Zone1 is the same as that of Zone2.



Disconnect wiring to external inputs of room thermostat, demand control, and outdoor thermostat, or the target flow temperature may not be maintained.

Functions		Symbol	Description	Option/ Range	Unit	Default
Floor dry up function		a	Set the function to ON and power on the system using the main remote controller, and the dry up heating operation will start.	On/Off	—	Off
Flow temp. (increase)	Flow temp. increase step	b	Sets the increase step of the target flow temperature.	+1 to +10	ºC	+5
	Increase interval	c	Sets the period for which the same target flow temperature is maintained.	1 to 7	day	2
Flow temp. (decrease)	Flow temp. decrease step	d	Sets the decrease step of the target flow temperature.	−1 to −10	ºC	−5
	Decrease interval	e	Sets the period for which the same target flow temperature is maintained.	1 to 7	day	2
Target temperature	Start & Finish	f	Sets the target flow temperature at the start and the finish of the operation.	20 to 60	ºC	30
	Max. target temp.	g	Sets the maximum target flow temperature.	20 to 60	ºC	45
	Max. temp. period	h	Sets the period for which the maximum target flow temperature is maintained.	1 to 20	day	5

en

<[Energy monitor settings]>
In this menu, all parameters required to record the consumed electrical energy and the delivered heat energy which is displayed on the main remote controller can be set. The parameters are an electric heater capacity, supply power of water pump and heat meter pulse.

Follow the procedure described in General Operation for the set up operation.

For Pump 1, *** can be also set besides this setting.
In the case *** is selected, the system acknowledges "factory fitted pump" is selected.
Refer to the section [Energy Monitor] in "3. Technical Information"

<[External input settings]>
Demand control (IN4)

The selection of “OFF”, whilst a signal is being sent to IN4, forcefully stops all the heat source operations and the selection of “Boiler” stops operations of heat pump and electric heater and performs boiler operation.

Outdoor thermostat (IN5)

The selection of “Heater”, whilst a signal is being sent to IN5, performs electric-heater-only operation and the selection of “Boiler” performs boiler operation.

<[Password protection]>
Password protection is available to prevent unauthorised access to the service menu by untrained persons.

Resetting the password
If you forget the password you entered, or have to service a unit somebody else installed, you can reset the password to the factory default of **0000**.

1. From the main settings menu scroll down the functions until Service Menu is highlighted.
2. Press CONFIRM.
3. You will be prompted to enter a password.
4. Hold down buttons F3 and F4 together for 3 seconds
5. You will be asked if you wish to continue and reset the password to default setting.
6. To reset press button F3.
7. The password is now reset to **0000**.

Password input screen

Password verify screen

<[Manual reset]>
Should you wish to restore the factory settings at any time you should use the manual reset function. Please note this will reset ALL functions to the factory default settings.

5.2 C.B.

5.2.1 DIP Switch Function

Located on the C.B. printed circuit board are 7 sets of small white switches known as DIP switches. The DIP switch number is printed on the circuit board next to the relevant switches. The word ON is printed on the circuit board and on the DIP switch block itself. To move the switch you will need to use a pin or the corner of a thin metal ruler or similar.

DIP switch settings are listed below in Table 5.2.1.
Only an authorised installer can change DIP switch setting under one's own responsibility according to the installation condition.
Make sure to turn off heat pump unit power supplies before changing the switch settings.

DIP switch		Function	OFF	ON	Effective timing	Default settings
SW1	SW1-1	—	—	—	—	OFF
	SW1-2	Abnormal history clear	Normal	Clear	Always	OFF
SW4	SW4-1	—	—	—	—	OFF
	SW4-2	—	—	—	—	OFF
SW5	SW5-1	—	—	—	—	OFF
	SW5-2	Power failure automatic recovery*1	No auto recovery	Auto recovery	When power supply ON	ON
	SW5-3	—	—	—	—	OFF
	SW5-4	—	—	—	—	OFF
	SW5-5	—	—	—	—	OFF
	SW5-6	—	—	—	—	OFF
SW6	SW6-1	—	—	—	—	OFF
	SW6-2	—	—	—	—	OFF
	SW6-3	—	—	—	—	OFF
	SW6-4	Model select	Heat pump setting		—	OFF
	SW6-5					ON
	SW6-6					OFF
	SW6-7					ON
	SW6-8					OFF
SW7 *2	SW7-1	—	—	—	—	OFF
	SW7-2	—	—	—	—	OFF
	SW7-3	—	—	—	—	OFF
	SW7-4	—	—	—	—	OFF
	SW7-5	—	—	—	—	OFF
	SW7-6	—	—	—	—	OFF
SW8	SW8-1	—	—		—	OFF
	SW8-2	—	—	—	—	OFF
	SW8-3	—	—	—	—	OFF
SW9	SW9-1	—	—		Always	OFF
	SW9-2					OFF
	SW9-3					OFF
	SW9-4					OFF

<Table 5.2.1>

Note:

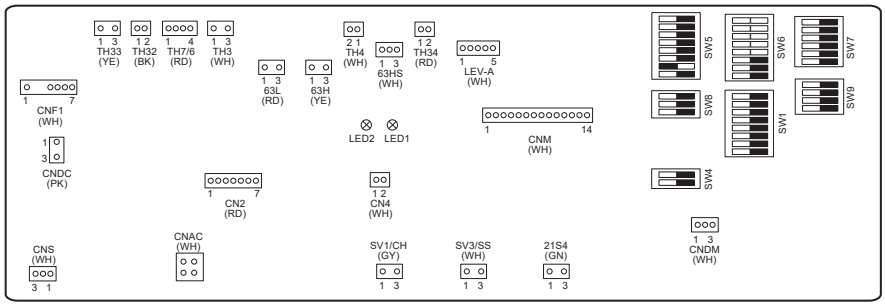
***1 "Power failure automatic recovery" can be set by either remote controller or this DIP SW. If one of them is set to ON, "Auto recovery" activates.**

***2 Please do not use SW7-3, 4 usually. Trouble might be caused by the usage condition.**

5.2.2 Connecting inputs/outputs

■ Inputs/Outputs

Name	Connector	Item
MC	TB-U/V/W	Motor for compressor (Mediate Power board)
63H	63H	High Pressure switch
63HS	63HS	High Pressure Sensor
FS	63L	Flow switch (Ambient loop)
TH3	TH3	Thermistor (Ref. liquid temp.)
TH4	TH4	Thermistor (Discharge temp.)
TH7	TH7/6	Thermistor (Outdoor temp.)
TH8	CN6	Thermistor (Heat sink temp.)
TH32	TH32	Thermistor (Ambient loop inlet temp.)
TH33	TH33	Thermistor (Comp. surface temp.)
TH34	TH34	Thermistor (Ambient loop outlet temp.)
LEV-A	LEV-A	Linear Expansion Valve
CNM	CNM	Connection for option



6 Commissioning

■ Pre-commissioning exercises- sanitary/DHW circuit

Initial fill procedure:
Ensure all pipe joints and fittings are tight and secure.
Open the most distant DHW tap/outlet.
Slowly/gradually open the mains water supply to begin filling unit and DHW pipework.
Allow most distant tap to run free and release/purge residual air from installation.
Close tap/outlet to retain fully charged system.

Note: When an immersion heater is fitted, do NOT energise the heater until the DHW tank is full of water. Also do NOT energise any immersion heater if any sterilisation chemicals remain in the DHW tank as this will cause premature failure of the heater.

Initial flush procedure:
Energise system to heat-up heat pump unit contents to a temperature of approx. 30 - 40°C.
Flush/drain the water contents to remove any residue/impurities resulting from the installation works. Use the heat pump unit drain cock to safely discharge the warmed water to drain via a suitable hose.
On completion, close drain cock, re-fill system and resume system commissioning.

■ Error Codes (FTC)

Code	Error	Action
L3	Circulation water temperature overheat protection	Flow rate may be reduced. Check for; • Water leakage • Strainer blockage • Water circulation pump function (Error code may display during filling of primary circuit, complete filling and reset error code.)
L4	DHW tank water temperature overheat protection	Check the immersion heater and it's contactor.
L5	FTC temperature thermistor (THW1, THW2, THW5A, THW5B, THW6, THW7, THW8, THW9) failure	Check resistance across the thermistor.
L6	Circulation water freeze protection	See Action for L3.
L8	Heating operation error	Check and re-attach any thermistors that have become dislodged.
L9	Low primary circuit flow rate detected by flow sensor or flow switch (flow switches 1, 2, 3)	See Action for L3. If the flow sensor or flow switch itself does not work, replace it. **Caution: The pump valves may be hot, please take care.**
LA	Pressure sensor failure	1. Connector/terminal wire has become detached or loose wiring. 2. Pressure sensor fault 3. FTC board failure 1. Check pressure sensor cable for damage or loose connections. 2. Electrically test to determine fault. 3. Replace board.
LC	Boiler circulation water temperature overheat protection	Check if the setting temperature of the Boiler for heating exceeds the restriction. (See the manual of the thermistors "PAC-TH012HT-E") Flow rate of the heating circuit from the boiler may be reduced. Check for • water leakage, • strainer blockage • water circulation pump function.
LD	Boiler temperature thermistor (THWB1) failure	Check resistance across the thermistor.
LE	Boiler operation error	See Action for L8. Check the status of the boiler.
LF	Flow sensor failure	Check flow sensor cable for damage or loose connections.
LH	Boiler circulation water freeze protection	Flow rate of the heating circuit from the boiler may be reduced. Check for • water leakage • strainer blockage • water circulation pump function.
LJ	DHW operation error (type of external plate HEX)	• Check for disconnection of DHW tank water temp. thermistor (THW5B). • Flow rate of the sanitary circuit may be reduced. • Check for water circulation pump function.
LL	Setting errors of DIP switches on FTC control board	For boiler operation, check that DIP SW1-1 is set to ON (With Boiler) and DIP SW2-6 is set to ON (With Mixing Tank). For 2-zone temperature control, check DIP SW2-7 is set to ON (2-zone) and DIP SW2-6 is set to ON (With Mixing Tank).
LP	Out of water flow rate range	Check the installation Table 4.3.1 Check remote controller settings (Service menu / heat pump flow rate range) See Action for L3.
J0	Communication failure between FTC and wireless receiver	Check connection cable for damage or loose connections.
P1	Thermistor (Room temp.) (TH1) failure	Check resistance across the thermistor.
P2	Thermistor (Ref. liquid temp.) (TH2) failure	Check resistance across the thermistor.
P6	Anti-freeze protection of plate heat exchanger	See Action for L3. Check for correct amount of refrigerant.
J1 - J8	Communication failure between wireless receiver and wireless remote controller	Check wireless remote controller's battery is not flat. Check the pairing between wireless receiver to wireless remote controller. Test the wireless communication. (See the manual of wireless system)
E0 - E5	Communication failure between main remote controller and FTC	Check connection cable for damage or loose connections.
E6 - EF	Communication failure between FTC and C.B.	Check connection cable for damage or loose connections. Refer to service handbook.
E9	C.B. receives no signal from FTC.	Check connection cable for damage or loose connections. Refer to service handbook.
U*, F*	Refrigerant or ambient loop failure	Refer to Error Codes (C.B.) or service handbook.

Note: To cancel error codes please switch system off (Press button F4(RESET) on main remote controller, for 3 seconds).

■ Error Codes (C.B.)

Code	Error	Cause	Action
None	—	① No voltage is supplied to terminal block (TB1) of heat pump unit. a) Power supply breaker is turned off. b) Contact failure or disconnection of power supply terminal c) Open phase (L or N phase)	① Check following items. a) Power supply breaker b) Connection of power supply terminal block (TB1) c) Connection of power supply terminal block (TB1)
		② Electric power is not charged to power supply terminal of power circuit board. a) Contact failure of power supply terminal b) Open phase on the power circuit board	② Check following items. a) Connection of power supply terminal block (TB1) b) Connection of terminal on power circuit board Check connection of the connector LI or NI.
		③ Electric power is not supplied to C.B. a) Disconnection of connector (CNDC)	③ Check connection of the connector (CNDC) on the C.B.
		④ Disconnection of reactor (DCL)	④ Check connection of reactor. (DCL)
		⑤ Defective power circuit board	⑤ Replace power circuit board.
		⑥ Defective C.B.	⑥ Replace C.B. (When items above are checked but the units cannot be repaired).
		⑦ Disconnection of wire between UNIT SIDE and MODULE SIDE.	⑦ Refer to 'How to remove the module'. Check connection of the wire between UNIT SIDE and MODULE SIDE.
F5 (5201)	**63H connector open** Abnormal if 63H connector circuit is open for 3 minutes continuously after power supply. 63H: High pressure switch	① Disconnection or contact failure of 63H connector on C.B.	① Check connection of 63H connector on C.B.
		② Disconnection or contact failure of 63H	② Check the 63H side of connecting wire.
		③ 63H is working due to defective parts.	③ Check continuity by tester. Replace the parts if the parts are defective.
		④ Defective C.B.	④ Replace C.B.
U1 (1302)	**High pressure (High pressure switch 63H operated)** Abnormal if high pressure switch 63H operated (4.15 MPa) during compressor operation. 63H: High pressure switch	① Clogged or broken pipe	① Check piping and repair defect.
		② Short cycle of refrigerant or ambient loop	②-③ Check heat pump unit and repair defect.
		③ Dirt of ambient loop heat exchanger	
		④ Decreased ambient loop flow rate	④ Check the ambient loop flow rate.
		⑤ Disconnection or contact failure of connector (63H) on C.B.	⑤-⑦ Turn the power off and check F5 is displayed when the power is turned again.
		⑥ Disconnection or contact failure of 63H connection	
		⑦ Defective C.B.	
		⑧ Defective action of linear expansion valve	⑧ Check linear expansion valve.

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Code	Error	Cause	Action
U2 (1102)	**High discharge temperature** (1) Abnormal if TH4 exceeds 125°C or 110°C continuously for 5 minutes. (2) Abnormal if discharge superheat (Heating: TH4−T63HS) exceeds 70°C continuously for 10 minutes. TH4: Thermistor <Discharge> **High comp. surface temperature** Abnormal if TH33 exceeds 125°C. In the case of high comp. surface temperature error, compressor does not restart unless the thermistor (TH33) becomes less than 95°C. TH33: Thermistor <Comp. surface>	① Overheated compressor operation caused by shortage of refrigerant ② Defective thermistor ③ Defective C.B. ④ Defective action of linear expansion valve ⑤ Clogging with foreign objects in refrigerant circuit Note: Clogging occur in the parts which become below freezing point when water enters in refrigerant circuit. ⑥ In the case of the unit does not restart: Detection temp. of thermistor (TH33) ≧ 95°C	① Check intake superheat. Check leakage of refrigerant. Charge additional refrigerant. ②③ Turn the power off and check if U3 is displayed when the power is turned on again. When U3 is displayed, refer to 'Judgment and action' for U3. ④ Check linear expansion valve. ⑤ After recovering refrigerant, remove water from entire refrigerant circuit under vacuum more than 1 hour.
U3 (5104)	**Open/short circuit of heat pump unit temperature thermistor (TH4, TH33)** Abnormal if open (3°C or less) or short (217°C or more) is detected during compressor operation. (Detection is inoperative for 10 minutes of compressor starting process and for 10 minutes after and during defrosting.) TH4: Thermistor <Discharge> TH33: Thermistor <Comp. surface>	① Disconnection or contact failure of connectors (TH4, TH33) on the C.B. ② Defective thermistor ③ Defective C.B.	① Check connection of connector (TH4, TH33) on the C.B. Check breaking of the lead wire for TH4, TH33. ② Check resistance value of TH4, TH33 or temperature by microprocessor. ③ Replace C.B.
U4 (TH3: 5105) (TH7: 5106) (TH8: 5110) (TH32: 5132) (TH34: 5134)	**Open/short of heat pump unit thermistors (TH3, TH32, TH34, TH7 and TH8)** Abnormal if open or short is detected during compressor operation. Open detection of TH3, TH32 and TH34 is inoperative for 10 seconds to 10 minutes after compressor starting. Note: Check which unit has abnormality in its thermistor by switching the mode of SW2. (PAC-SK52ST)	① Disconnection or contact failure of connectors C.B.: TH3, TH32, TH34, TH7 Power board: CN6 ② Defective thermistor ③ Defective C.B.	① Check connection of connector (TH3, TH32, TH34 TH7) on the C.B. Check connection of connector (CN6) on the power board. Check breaking of the lead wire for TH3, TH32, TH34, TH7, TH8. ② Check resistance value of TH3, TH32, TH34,TH7,TH8 or check temperature by microprocessor. ③ Replace C.B. Note: Emergency operation is available in case of abnormalities of TH3 and TH7.
U5 (4230)	**Temperature of heat sink** Abnormal if TH8 detects temperature indicated 95°C. TH8: Thermistor <Heat sink>	① Rise of ambient temperature ② Defective thermistor ③ Defective input circuit of power circuit board	① Check if there is something which causes temperature rise around unit. (Upper limit of ambient temperature is 35°C.) Turn off power, and on again to check if U5 is displayed within 30 minutes. If U4 is displayed instead of U5, follow the action to be taken for U4. ② Check resistance value of TH8 or temperature by microprocessor. ③ Replace power circuit board.
U6 (4250)	**Power module** Check abnormality by driving power module in case overcurrent is detected. (UF or UP error condition)	① Decrease of power supply voltage ② Looseness, disconnection or converse of compressor wiring connection ③ Defective compressor ④ Defective power circuit board	① Check facility of power supply. ② Correct the wiring (U•V•W phase) to compressor. ③ Check compressor ④ Replace power circuit board

Code	Error	Cause	Action
U7 (1520)	**Too low superheat due to low discharge temperature** Abnormal if discharge superheat is continuously detected less than or equal to −15°C for 3 minutes even though linear expansion valve has minimum open pulse after compressor starts operating for 10 minutes.	① Disconnection or loose connection of discharge temperature thermistor (TH4) ② Defective holder of discharge temperature thermistor ③ Disconnection or loose connection of linear expansion valve's coil ④ Disconnection or loose connection of linear expansion valve's connector ⑤ Defective linear expansion valve	①② Check the installation conditions of discharge temperature thermistor (TH4). ③ Check the coil of linear expansion valve. ④ Check the connection or contact of LEV-A on C.B. ⑤ Check linear expansion valve.
U9 (4220)	**Abnormal voltage error** See service handbook.	See service handbook.	See service handbook.
UE (1302)	**Abnormal pressure of 63HS** Abnormal if 63HS detects 0.1 MPa or less. Detection is inoperative for 3 minutes after compressor starting and 3 minutes after and during defrosting. 63HS: High pressure sensor	① Disconnection or contact failure of connector (63HS) on the C.B. ② Defective pressure sensor ③ Defective C.B.	① Check connection of connector (63HS) on the C.B. Check breaking of the lead wire for 63HS. ② Check pressure by microprocessor. (Pressure sensor/ 63HS) ③ Replace C.B.
UL (1300)	**Low pressure** Abnormal if TH33-TH4 exceeds 20°C and TH33 exceeds 80°C during compressor operation.	① Defective linear expansion valve. ② Defective C.B.	① Check linear expansion valve. ② Replace C.B.
UF (4100)	**Compressor overcurrent interruption (When compressor locked)** Abnormal if overcurrent of DC bus or compressor is detected within 30 seconds after compressor starts operating.	① Decrease of power supply voltage ② Looseness, disconnection or converse of compressor wiring connection ③ Defective compressor ④ Defective power circuit board	① Check facility of power supply. ② Correct the wiring (U•V•W phase) to compressor. ③ Check compressor. ④ Replace power circuit board.
UH (5300)	**Current sensor error or input current error** • Abnormal if current sensor detects –1.0A to 1.0A during compressor operation. (This error is ignored in case of test run mode.) • Abnormal if 40A of input current is detected or 37A or more of input current is detected for 10 seconds continuously.	① Disconnection of compressor wiring ② Defective circuit of current sensor on power circuit board ③ Decrease of power supply voltage ④ Leakage or shortage of refrigerant	① Correct the wiring (U•V•W phase) to compressor. ② Replace power circuit board. ③ Check the facility of power supply. ④ Check leakage of refrigerant.
UA (2511)	**Low ambient loop flow rate (flow switch operated)** Abnormal if flow switch is operated (under 5.5L/min) during compressor operation.	① Valve or PICV of ambient loop circuit is closed during operation. ② Disconnection or loose connection of connector (63L) on C.B. ③ Disconnection or loose connection of 63L ④ Defective C.B. ⑤ Leakage or shortage of water or brine (Ambient loop) ⑥ Misconnection of Water/Brine pipe.	① Check valve or PICV. Active SW6-4 on FTC, if TBI.4 7-8 is connected. ②-④ Turn the power off and on again to check if F3 is displayed on restarting. If F3 is displayed, follow the F3 processingdirection. ⑤ Correct to proper amount of water or brine. ⑥ Check Water/Brine pipe connection.
UP (4210)	**Compressor overcurrent interruption** Abnormal if overcurrent DC bus or compressor is detected after compressor starts operating for 30 seconds.	See service handbook.	See service handbook.

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7 Service and Maintenance

■ Annual Maintenance

It is essential that the heat pump is serviced at least once a year by a qualified individual. Any required parts should be purchased from Mitsubishi Electric. NEVER bypass safety devices or operate the unit without them being fully operational. For more details, refer to service handbook.

Note:
Within the first couple of months of installation, remove and clean the heat pump unit's strainer plus any additional filter items that are fitted external to the heat pump unit. This is especially important when installing on an old/existing pipe work system.

In addition to annual servicing it is necessary to replace or inspect some parts after a certain period of system operation. Please see tables below for detailed instructions. Replacement and inspection of parts should always be done only by a competent person with relevant training and qualifications.

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Parts which require regular replacement

Parts	Replace every	Possible failures
Pressure relief valve (PRV) Manometer	6 years	Water leakage

Parts which require regular inspection

Parts	Check every	Possible failures
Pressure relief valve (3 bar)	1 year (turning the knob manually)	PRV would be fixed and expansion vessel would burst
Immersion heater	2 years	Earth leakage causing circuit breaker to activate (Heater is always OFF)
Water circulation pump (Primary circuit)	20,000 hrs (3 years)	Water circulation pump failure

Parts which must NOT be reused when servicing

* O-ring
* Gasket

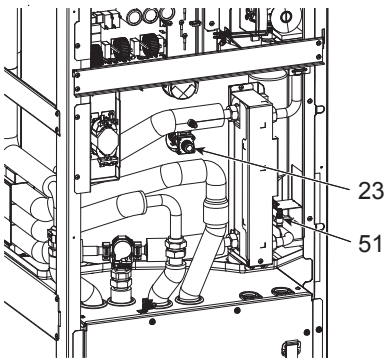
Note:

- **Always replace the gasket for pump with a new one at each regular maintenance (every 20,000 hours of use or every 3 years).**

<Draining the heat pump unit and its primary heating circuit (local)>
WARNING: DRAINED WATER MAY BE VERY HOT

1. Firstly to eliminate any air in heat pump unit pipe works, engage the DHW pump circulator for 1-2 mins and expel any trapped air via nearest hot water tap so as unit becomes fully primed/water charged.
2. Before attempting to drain the heat pump unit isolate from the electrical supply to prevent the immersion heater burning out.
3. Isolate cold water feed to DHW tank.
4. Open a hot water tap to allow draining without creating a vacuum.
5. Attach a hose to the DHW tank drain cocks (No. 23 and 51 on Figures 3.1 and 7.1 below). The hose should be able to withstand heat as the draining water could be very hot. The hose should drain to a place lower than the DHW tank bottom to encourage siphoning. Begin draining by opening drain cock.
6. When the DHW tank is drained close drain cock and the hot water tap.
7. For primary circuit, attach hose to water circuit drain cocks (No. 7 on Figure 3.1 and Figure. 3.2). The hose should be able to withstand heat as the draining water could be very hot. The hose should drain to a place lower than the drain cock to encourage siphoning. Open the pump valves and the strainer valves.
8. Water remains in the strainer still after the heat pump unit was drained.

Drain the strainer by removing the strainer cover.



<Figure 7.1>

■ Engineers Forms

Should settings be changed from default, please enter and record new setting in 'Field Setting' column. This will ease resetting in the future should the system use change or the circuit board need to be replaced.

Commissioning/Field settings record sheet

Main remote controller screen				Parameters	Default setting	Field setting	Notes
Main			Zone1 heating room temp.	10°C to 30°C	20°C		
			Zone2 heating room temp. *8	10°C to 30°C	20°C		
			Zone1 heating flow temp.	20°C to 60°C	45°C		
			Zone2 heating flow temp. *1	20°C to 60°C	35°C		
			Zone1 heating compensation curve	−9°C to +9°C	0°C		
			Zone2 heating compensation curve *1	−9°C to +9°C	0°C		
			Holiday mode	Active/Non active/Set time	—		
Option			Forced DHW operation	On/Off	—		
			DHW	On/Off/Timer	On		
			Heating	On/Off/Timer	On		
			Energy monitor	Consumed electrical energy/Delivered energy	—		
Setting	DHW		Operation mode	Normal/Eco	Eco		
			DHW max. temp.	40°C to 60°C	50°C		
			DHW ma. temp. drop	5°C to 30°C	10°C		
			DHW max. operation time	30 to 120 min	60 min		
			DHW mode restriction	30 to 120 min	30 min		
			DHW recharge	Standard/Large	Standard		
	Legionella prevention		Active	Yes/No	Yes		
			Hot water temp.	60°C to 70°C	65°C		
			Frequency	1 to 30 days	15 days		
			Start time	00:00 to 23:00	03:00		
			Max. operation time	1 to 5 hours	3 hours		
			Duration of maximum temp.	1 to 120 min	30 min		
	Heating		Zone1 operation mode	Heating room temp./ Heating flow temp./ Heating compensation curve	Room temp.		
			Zone2 operation mode *1	Heating room temp./ Heating flow temp./ Heating compensation curve	Compensation curve		
	Compensation curve	Hi flow temp. set point	Zone1 outdoor ambient temp.	−30°C to +33°C	−15°C		
			Zone1 flow temp.	20°C to 60°C	50°C		
			Zone2 outdoor ambient temp. *1	−30°C to +33°C	−15°C		
			Zone2 flow temp. *1	20°C to 60°C	40°C		
		Lo flow temp. set point	Zone1 outdoor ambient temp.	−28°C to +35°C	35°C		
			Zone1 flow temp.	20°C to 60°C	25°C		
			Zone2 outdoor ambient temp. *1	−28°C to +35°C	35°C		
			Zone2 flow temp.*1	20°C to 60°C	25°C		
		Adjust	Zone1 outdoor ambient temp.	−29°C to +34°C	—		
			Zone1 flow temp.	20°C to 60°C	—		
			Zone2 outdoor ambient temp. *1	−29°C to +34°C	—		
			Zone2 flow temp. *1	20°C to 60°C	—		
	Holiday		DHW	Active/Non active	Non active		
			Heating	Active/Non active	Active		
			Zone1 heating room temp.	10°C to 30°C	15°C		
			Zone2 heating room temp. *8	10°C to 30°C	15°C		
			Zone1 heating flow temp.	20°C to 60°C	35°C		
			Zone2 heating flow temp. *1	20°C to 60°C	25°C		
	Initial settings		Language	EN/FR/DE/SV/ES/IT/DA/NL/FI/NO/PT/BG/PL/CZ/RU/TR/SL	EN		
			°C/°F	°C/°F	°C		
			Summer time	On/Off	Off		
			Temp. display	Room/DHW tank/Room&DHW tank / Off	Off		
			Time display	hh:mm/hh:mm AM/AM hh:mm	hh:mm		
			Room sensor settings for Zone1	TH1/Main RC/Room RC1-8/"Time/Zone"	TH1		
			Room sensor settings for Zone2 *1	TH1/Main RC/Room RC1-8/"Time/Zone"	TH1		
			Room RC zone select *1	Zone1/Zone2	Zone1		

(Continued to next page.)

■ Engineers Forms

Commissioning/Field settings record sheet (continued from the previous page)

Main remote controller screen					Parameters			Default setting	Field setting	Notes
Setting	Service menu	Thermistor adjustment	THW1		−10°C to +10°C			0°C		
			THW2		−10°C to +10°C			0°C		
			THW5A		−10°C to +10°C			0°C		
			THW5B		−10°C to +10°C			0°C		
			THW6		−10°C to +10°C			0°C		
			THW7		−10°C to +10°C			0°C		
			THW8		−10°C to +10°C			0°C		
			THW9		−10°C to +10°C			0°C		
			THW10		−10°C to +10°C			0°C		
			THWB1		−10°C to +10°C			0°C		
		Auxiliary settings	Economy settings for pump.		On/Off *2			On		
					Delay (3 to 60 min)			10 min		
			Electric heater (Heating) *12		Space heating: On (used)/Off (not used)			On		
					Electric heater delay timer (5 to 180 min)			30 min		
			Electric heater (DHW)		Booster heater	DHW: On (used)/Off (not used)		On		
					Immersion heater	DHW: On (used)/Off (not used) *12		On		
					Electric heater delay timer (15 to 30 min)			15 min		
			Mixing valve control		Running (10 to 240 sec)			120 sec		
					Interval (1 to 30 min)			2 min		
			Flow sensor *10		Minimum (0 to 100L/min)			5 L/min		
					Maximum (0 to 100L/min)			100 L/min		
			Analog output		Interval (1 to 30 min)			5 min		
					Priority (Normal/High)			Normal		
		Pump speed	DHW		Pump speed (1 to 5)			5		
			Heating		Pump speed (1 to 5)			5		
		Heat source setting			Standard/Heater/Boiler/Hybrid *3			Standard		
		Heat pump settings	Heat pump flow rate range		Minimum (0 to 100L/min)			5 L/min		
					Maximum (0 to 100L/min)			100 L/min		
			Quiet mode		Day (Mon to Sun)			—		
					Time			0:00 to 23:45		
					Quiet level (Normal/Level1/Level2)			Normal		
		Operation settings	Heating operation *4	Flow temp. range *6	Minimum.temp. (20 to 45°C)			30°C		
					Maximum.temp. (35 to 60°C)			50°C		
				Room temp. control *9	Mode (Normal/Fast)			Normal		
					Interval (10 to 60 min)			10 min		
				Heat pump thermo diff. adjust	On/Off *2			On		
					Lower limit (−9 to −1°C)			-5°C		
					Upper limit (+3 to +5°C)			5°C		
			Freeze stat function *7		Outdoor ambient temp. (3 to 20°C) / **			5°C		
			Simultaneous operation (DHW/Heating)		On/Off *2			Off		
					Outdoor ambient temp. (−30 to +10°C)			−15°C		
			Cold weather function		On/Off *2			Off		
					Outdoor ambient temp. (−30 to −10°C)			−15°C		
			Boiler operation		Hybrid settings	Outdoor ambient temp. (−30 to +10°C)		−15°C		
						Priority mode (Ambient/Cost/CO_2)		Ambient		
					Intelligent settings	Energy price *5	Electricity (0.001 to 999 */kWh)	0.5 */kWh		
							Boiler (0.001 to 999 */kWh)	0.5 */kWh		
						CO_2 emission	Electricity (0.001 to 999 kg -CO2/kWh)	0.5 kg -CO2/kWh		
							Boiler (0.001 to 999 kg -CO2/kWh)	0.5 kg -CO2/kWh		
						Heat source	Heat pump capacity (1 to 40 kW)	11.2 kW		
							Boiler efficiency (25 to 150%)	80%		
							Booster heater 1 capacity (0 to 30 kW)	2 kW		
							Booster heater 2 capacity (0 to 30 kW)	4 kW		

(Continued to next page.)

■ Engineers Forms

Commissioning/Field settings record sheet (continued from the previous page)

Main remote controller screen							Parameters	Default setting	Field setting	Notes
Setting	Service menu	Operation settings	Smart grid ready	DHW	On/Off			Off		
					Target temp (+1 to +20℃) / -- (Non active)			--		
				Heating	On/Off			Off		
					Target temp.		Switch-on recommendation (20 to 60°C)	50°C		
							Switch-on command (20 to 60°C)	55°C		
				Pump cycles	Heating (On/Off)			On		
					Interval (10 to 120 min)			10 min		
			Floor dry up function		On/Off *2			Off		
					Target temp.		Start&Finish (20 to 60°C)	30°C		
							Max. temp. (20 to 60°C)	45°C		
							Max. temp. period (1 to 20 days)	5 days		
					Flow temp. (Increase)		Temp. increase step (+1 to +10°C)	+5°C		
							Increase interval (1 to 7 days)	2 days		
					Flow temp. (Decrease)		Temp. decrease step (−1 to −10°C)	−5°C		
							Decrease interval (1 to 7 days)	2 days		
			Summer mode		On/Off			Off		
					Outdoor ambient temp.		Heating ON (4 to 19°C)	10°C		
							Heating OFF (5 to 20°C)	15°C		
					Judgement time		Heating ON (1 to 48 hours)	6 hours		
							Heating OFF (1 to 48 hours)	6 hours		
					Forced heating ON (−30 to 10°C)			5 °C		
			Water flow control		On/Off			Off		
		Energy monitor settings		Electric heater capacity	Booster heater 1 capacity		0 to 30kW *12	2kW		
					Booster heater 2 capacity		0 to 30kW *12	4kW		
					Immersion heater capacity		0 to 30kW	0kW		
					Analog output		0 to 30kW	0kW		
				Delivered energy adjustment			−50 to +50%	0%		
				Water pump input	Pump 1		0 to 200W or ***(factory fitted pump)	***		
					Pump 2		0 to 200W	0W		
					Pump 3		0 to 200W	0W		
					Pump 4		0 to 200W	72W		
				Electric energy meter			0.1/1/10/100/1000 pulse/kWh	1 pulse/kWh		
				Heat meter			0.1/1/10/100/1000 pulse/kWh	1 pulse/kWh		
		External input settings		Demand control (IN4)			Heat source OFF/Boiler operation	Boiler operation		
				Outdoor thermostat (IN5)			Heater operation/Boiler operation	Boiler operation		
		Thermo ON output					Zone1/Zone2/Zone1&2	Zone1&2		

*1 The settings related to Zone2 can be switched only when 2 zone temperature control is enabled (when DIP SW2-6 and SW 2-7 (FTC) are ON).
*2 On: the function is active; Off: the function is inactive.
*3 When DIP SW1-1 (FTC) is set to OFF “WITHOUT Boiler” or SW2-6 (FTC) is set to OFF “WITHOUT Mixing tank”, neither Boiler nor Hybrid can be selected.
*4 Valid only when operating in Room temp. control mode.
5 “” of “*/kWh” represents currency unit (e.g. € or £ or the like)
*6 Valid only when operating in Heating room temperature.
*7 If asterisk (**) is chosen freeze stat function is deactivated. (i.e. primary water freeze risk)
*8 The settings related to Zone2 can be switched only when 2-zone temperature control or 2-Zone valve ON/OFF control is active.
*9 When DIP SW5-2 (FTC) is set to OFF, the function is active.
*10 Do not change the setting since it is set according to the specification of flow sensor attached to the heat pump unit.
*11 The default setting is 1 pulse/kWh depend on the connected indoor unit.
*12 If booster heater equipped, the function is activated.

8 Supplementary information

■ Back-up operation of boiler

Heating operation is backed up by boiler.
For more details, refer to the installation manual of PAC-TH012HT-E.

<Installation & System set up>

1. Set DIP-SW 1-1 (FTC) to ON "With boiler" and SW2-6 (FTC) to ON “With Mixing tank”.
2. Install the thermistors THWB1[*1] on the boiler circuit.
3. Connect the output wire (OUT10: Boiler operation) to the input (room thermostat input) on the boiler. [*2]
4. Install one of the following room temperature thermostats. [*3]

- Wireless remote controller (option)
- Room temp. thermostat (local supply)
- Main remote controller (remote position)

*1 The boiler temperature thermistor is an optional part.
*2 OUT10 has no voltage across it.
*3 Boiler heating is controlled on/off by the Room temp. thermostat.

<Main remote controller settings>

1. Go to Service menu > Heat source setting and choose “Boiler” or “Hybrid”. [*4]
2. Go to Service menu > Operation settings > Boiler settings to make detailed settings for “Hybrid” above .

*4 The “Hybrid” automatically switches heat sources between Heat pump (and Electric heater) and boiler.

■ Product fiche of temperature control

(a) Supplier's name: MITSUBISHI ELECTRIC CORPORATION
(b) Supplier's model identifier: PAR-WT50R-E and PAR-WR51R-E
(c) The class of the temperature control: VI
(d) The contribution of the temperature control to seasonal space heating energy efficiency: 4%

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EG-DEKLARATION OM ÖVERENSSTÄMMELSE
EU-VAATIMUSTENMUKAISUUSVAKUUTUS
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MITSUBISHI ELECTRIC AIR CONDITIONING SYSTEMS EUROPE LTD.
NETTLEHILL ROAD, HOUSTOUN INDUSTRIAL ESTATE, LIVINGSTON, EH54 5EQ, SCOTLAND, UNITED KINGDOM

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2014/30/EU: Electromagnetic Compatibility
2009/125/EC: Energy-related Products Directive and Regulation (EU) No 813/2013
2011/65/EU, (EU) 2015/863 and (EU) 2017/2102: RoHS Directive

Issued	**1. Apr. 2022**	**Atsushi EDAYOSHI**
UNITED KINGDOM		**Manager, Quality Assurance Department**

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The Electrical Equipment (Safety) Regulations 2016
The Supply of Machinery (Safety) Regulations 2008
The Electromagnetic Compatibility Regulations 2016
The Ecodesign for Energy-Related Products and Energy Information (Amendment) (EU Exit) Regulations 2019
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Issued	**1. Apr. 2022**	**Atsushi EDAYOSHI**
UNITED KINGDOM		**Manager, Quality Assurance Department**

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

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

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RK79D203K01 Printed in the UNITED KINGDOM