



FLOW TEMP. CONTROLLER [MASTER] (Cased)

PAC-IF061B-E

PAC-IF062B-E

FLOW TEMP. CONTROLLER [SLAVE] (Cased)

PAC-SIF051B-E

INSTALLATION MANUAL

FOR INSTALLER

For safe and correct use, read this manual thoroughly before installing the FTC unit.

OPERATION MANUAL

FOR USER

For safe and correct use, please read this operation manual thoroughly before operating the FTC unit.

English

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“FTC (Master)” is the abbreviation of “Flow Temperature Controller [Master]”, which is described as “FTC (Master)” in this manual.

“FTC (Slave)” is the abbreviation of “Flow Temperature Controller [Slave]”, which is described as “FTC (Slave)” in this manual.

In this manual, “FTC” that is not followed by “(Master)” or “(Slave)” means “FTC (Master and Slave)”.

Mitsubishi Electric is not responsible for the failure of locally supplied parts.

1. Safety precautions **FOR INSTALLER**

- ▶ Before installing the FTC unit, make sure you read all the “Safety precautions”.
- ▶ Please report to your supply authority or obtain their consent before connecting this equipment to the power supply system.

⚠ Warning:

Precautions that must be observed to prevent injuries or death.

⚠ Caution:

Precautions that must be observed to prevent damage to the unit.

⚠ Warning:

- The unit must not be installed by the user. Ask an installer or an authorized technician to install the unit. If the unit is installed improperly, electric shock, or fire may be caused.
- For installation work, follow the instructions in the Installation Manual and use tools and pipe components specifically made for use with refrigerant specified in the outdoor unit installation manual.
- The unit must be installed according to the instructions in order to minimize the risk of damage by earthquakes, typhoons, or strong winds. Improperly installed units may fall down and cause damage or injuries.
- The unit must be securely installed on a structure that can sustain its weight. If the unit is mounted on an unstable structure, it may fall down and cause damage or injuries.
- All electric work must be performed by a qualified technician according to local regulations and the instructions given in this manual. The unit must be powered by dedicated power lines and the correct voltage and circuit breakers must be used. Power lines with insufficient capacity or incorrect electrical work may result in electric shock or fire.

After installation, perform the test run to ensure normal operation. Then explain to your customer the “Safety Precautions” *1, use, and maintenance of the unit based on the information in this manual. This manual must be given to the user. This manual must always be kept by the actual users.

*1 “Safety Precautions” for user is indicated on page 33.

⚡ : This indicates a part which must be grounded.

⚠ Warning:

Carefully read the labels attached to the unit.

- Only the specified cables can be used for wiring. Connections must be made securely without tension on the terminals. If cables are connected or installed improperly, it may result in overheating or fire.
- Terminal block cover panel of the unit must be firmly fixed. If the cover panel is mounted improperly, dust and moisture may enter the unit, and it may cause electric shock or fire.
- Make sure to use accessories authorized by Mitsubishi Electric and ask an installer or an authorized technician to install them. If accessories are improperly installed, it may cause electric shock, or fire.
- Do not remodel the unit. Consult an installer for repairs. If alterations or repairs are not performed correctly, it may cause electric shock or fire.
- The user should never attempt to repair the unit or transfer it to another location. If the unit is installed improperly, it may cause electric shock or fire. If the FTC unit needs to be repaired or moved, ask an installer or an authorized technician.
- During installing a heat pump system, keep water from splashing on the FTC unit.
- When installing sensors and parts, do not expose the terminals.

1.1 Before installation (Environment)

⚠ Caution:

- Do not install the FTC unit in outdoor location as it is designed for indoor installation only. Otherwise electric shock or breakdown may be caused by water, wind or dust.
- Do not use the unit in an unusual environment. If the FTC unit is installed or exposed to steam, volatile oil (including machine oil), or sulfuric gas, or exposed to briny air, the internal parts can be damaged.
- Do not install the unit where combustible gases may leak, be produced, flow, or accumulate. If combustible gas accumulates around the unit, it may cause fire or explosion.

- When installing the unit in a hospital or in a building where communications equipment are installed, you may need to take measures to prevent noise and electronic interference. Inverters, home appliances, high-frequency medical equipment, and radio communications equipment can cause the FTC unit to malfunction or to breakdown. At the same time, the noise and electric interference from the FTC unit may disturb the proper operation of nearby medical equipment, and communications equipment.

1.2 Before installation or relocation

⚠ Caution:

- Be very careful when moving the units. Do not hold the packaging bands. Wear protective gloves to unpack and to move the units, in order to avoid injury to your hands.

- Be sure to safely dispose of the packaging materials. Packaging materials, such as nails and other metal or wooden parts may cause injuries.
- Do not wash the FTC unit. You may receive an electric shock.

1.3 Before electric work

⚠ Caution:

- Be sure to install a circuit breaker. If it is not installed, there may be a risk to get an electric shock.
- For the power lines, use standard cables of sufficient capacity. Otherwise, it may cause a short circuit, overheating, or fire.
- When installing the power lines, do not apply tension to the cables. The cables may be cut or overheated resulting in a fire.

- Make 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, there may be a risk to get an electric shock.
- Make sure to 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.

1. Safety precautions

1.4 Before starting the test run

⚠ Caution:

- Turn on the main power switch of the outdoor unit more than 12 hours before starting operation. Starting operation immediately after turning on the power switch can severely damage the internal parts. Keep the main power switch turned on during the operation period.
- In heating mode, to avoid the heat emitters being damaged by excessively hot water, set the target flow temperature to a minimum of 2°C below the maximum allowable temperature of all the heat emitters. For Zone2, set the target flow temperature to a minimum of 5°C below the maximum allowable flow temperature of all the heat emitters in Zone2 circuit.

- Before starting operation, check that all protective parts are correctly installed. Make sure not to get injured by touching high voltage parts.
- Do not touch any switch with wet hands. There may be a risk to get an electric shock.
- After stopping operation, make sure to wait at least 5 minutes before turning off the main power. Otherwise, it may cause breakdown.

1.5 Electric booster and immersion heaters

⚠ Warning:

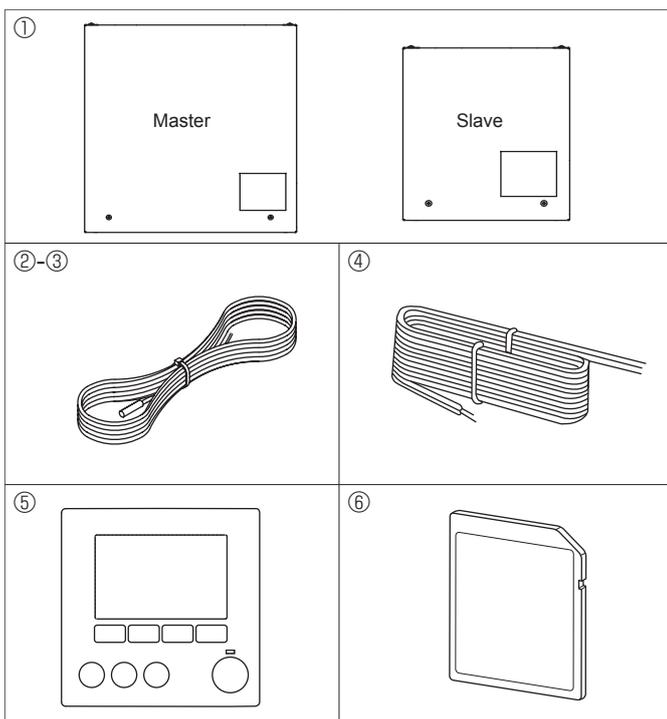
- FTC has signal outputs for heaters however it can not isolate power to them in the event of overheating. All electrical heaters used on the water circuit must have

- a) A thermostat to prevent overheating.
- b) A non-self resetting thermal mechanism to prevent overheating.

Abbreviations and glossary

Abbreviations/Word	Description
Ambient temperature	The outdoor temperature
Freeze stat. function	Heating to prevent water pipes freezing
ASHP/HP	Air source heat pump
COP	Coefficient of performance the efficiency of the heat pump
Cylinder unit	Indoor unvented DHW tank and component plumbing parts
Hydrobox	Indoor unit housing the component plumbing parts (NO DHW tank)
DeltaT	Difference in temperature between two system locations.
DHW mode	Domestic hot water heating mode for showers, sinks, etc
Flow temperature	Temperature at which water is delivered to the primary circuit
FTC (Master)	Flow temperature controller, the circuit board in charge of controlling the system, master board for multiple outdoor units control
FTC (Slave)	Slave board for multiple outdoor units control
Compensation curve mode	Space heating incorporating outdoor temperature compensation
Heating mode	Space heating through radiators or under floor heating
Cooling mode	Space cooling through radiators or under floor cooling
Legionella	Bacteria potentially found in plumbing, showers and water tanks that may cause Legionnaires disease
LP mode	Legionella prevention mode – a function on systems with tanks to prevent the growth of legionella bacterium
Packaged model	Plate heat exchanger (Refrigerant - Water) in the outdoor heat pump unit
Split model	Plate heat exchanger (Refrigerant - Water) in the indoor unit
TRV	Thermostatic radiator valve – a valve on the entrance or exit of the radiator panel controlling the heat output

2. Installing the FTC unit



<Fig. 2.1.1>

2.1. Check the parts (Fig. 2.1.1)

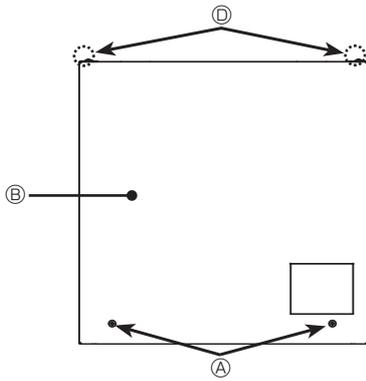
The FTC unit should be supplied with the following parts.

	Part name	Wiring diagram symbol	Q'ty
①	FTC (master) unit: PAC-IF061/062B-E FTC (slave) unit: PAC-SIF051B-E		1
②	Liquid refrigerant temp. thermistor (Lead wire: 5m/Red, Connector: 3p/Yellow)	TH2	1 *1
③	Flow water temp. and Return water temp. thermistor (Lead wire: 5m/Gray(Flow water temp.), 5m/Black(Return water temp.), Connector: 4p/Red)	THW1/2	1
④	Main controller cable (10 m)		1
⑤	Main controller		1 *2
⑥	SD memory card		1

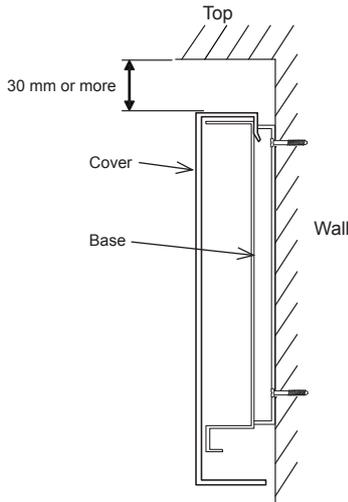
*1 Not included with PAC-IF062B-E.

*2 Not included with PAC-SIF051B-E.

2. Installing the FTC unit



<Fig. 2.3.1>



<Fig. 2.3.2>
Service space

2.2. Choosing the FTC unit installation location

- Do not install the FTC units outdoors as it is designed for indoor installation only. (The FTC circuit board and casing are not waterproof.)
- Avoid locations where the unit is exposed to direct sunlight or other sources of heat.
- Select a location where easy wiring access to the power source is available.
- Avoid locations where combustible gases may leak, be produced, flow, or accumulate.
- Select a level location that can bear the weight and vibration of the unit.
- Avoid locations where the unit is exposed to oil, steam, or sulfuric gas.
- Do not install in location that is hot or humid for long periods of time.

2.3. Installing the FTC unit (Fig. 2.3.1, 2.3.2, 2.3.3, 2.3.4)

1. Remove 2 screws (A Screw) from FTC unit and remove the cover. (See Fig. 2.3.4)
2. Install the 4 screws (locally supplied) in the 4 holes (C Hole).
* To prevent the unit from falling off the wall, select the appropriate screws (locally supplied) and secure the base horizontally to the appropriate wall location. (See Fig. 2.3.2)

- (A) Screw (B) Cover
(C) Hole for installation (D) Screw

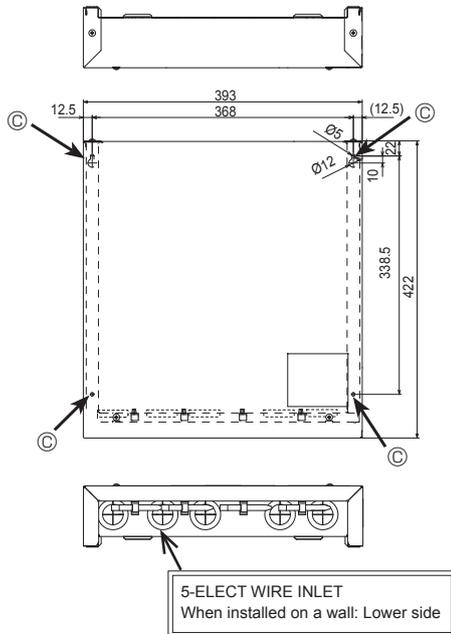
Note: Do not remove the screws (D) as the screws are the component parts of the cover and are not used for the installation of cover.

Weight	PAC-IF061B-E	4.0 kg + ACCESSORIES 0.9 kg
	PAC-IF062B-E	4.4 kg + ACCESSORIES 0.7 kg
	PAC-SIF051B-E	1.9 kg + ACCESSORIES 0.3 kg
Allowable ambient temperature	0 to 35°C	
Allowable ambient humidity	80% RH or less	

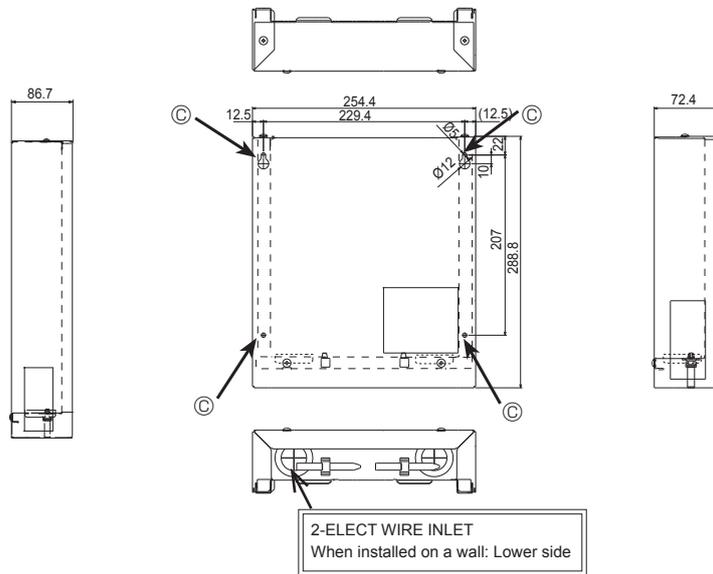
Optional extras

- Wireless Remote Controller PAR-WT50R-E
- Wireless Receiver PAR-WR51R-E
- Remote sensor PAC-SE41TS-E

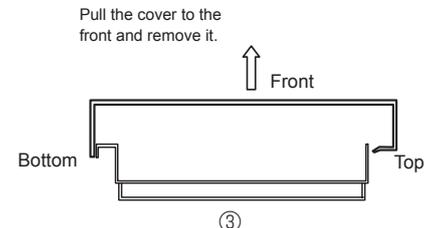
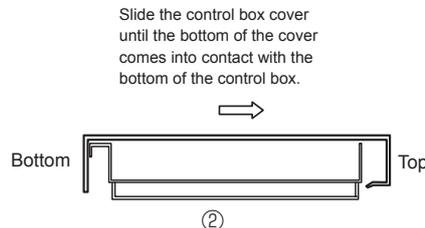
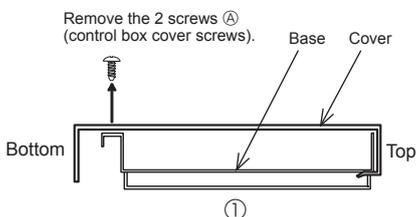
<FTC (Master) unit>



<FTC (Slave) unit>



<Fig. 2.3.3>

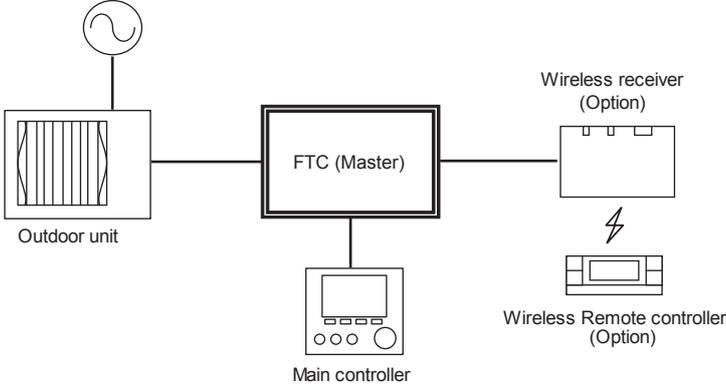
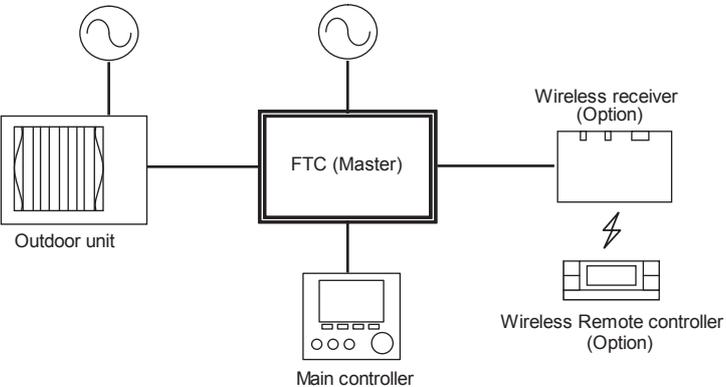


<Fig. 2.3.4>

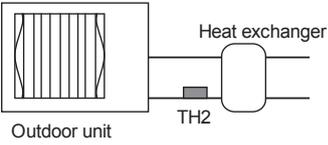
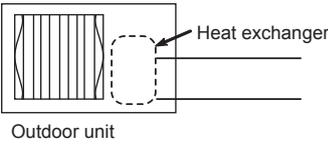
3. System

The FTC (Master) is designed for use with a number of heat pump systems. Please refer to the following table to find the relevant installation information for your system. For multiple outdoor units control with FTC (Slave), see section 9.

3.1 First step (Electrical work)

Power supplies	System diagram	Reference section
FTC (Master) powered via outdoor unit		4.1 4.2
FTC (Master) powered by independent source		4.1 4.2

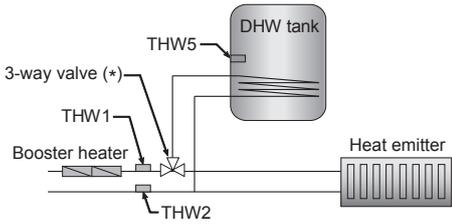
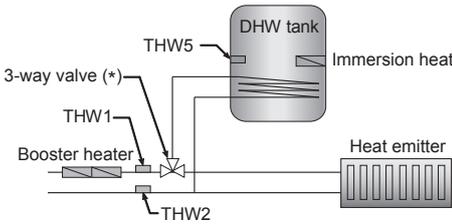
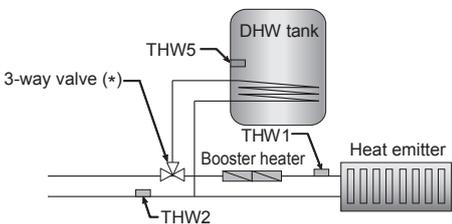
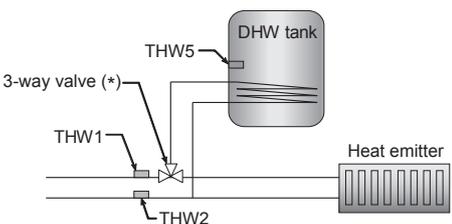
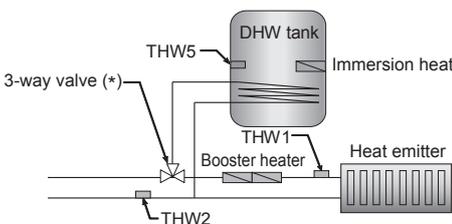
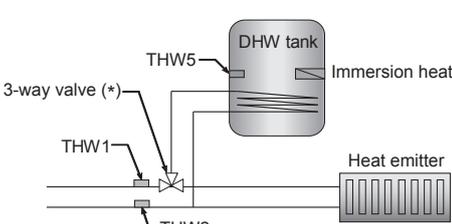
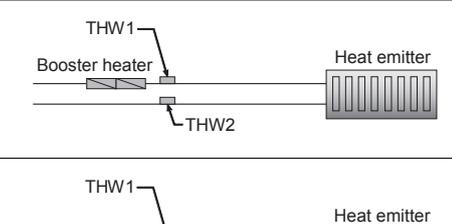
3.2 Second step (Outdoor unit type)

Outdoor unit type	System diagram	Thermistor	Reference section
Split		TH2: Liquid refrigerant temp.	4.4 5.2
Packaged		—	4.4 5.2

* PAC-IF062B-E is not available for Split-type system.

3. System

3.3 Third step (Functions setting)

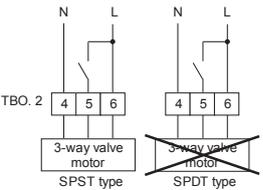
DHW tank	Immersion heater	Booster heater	BH function	System diagram	Thermistor	Reference section	Remarks
Present	Absent	Present	For heating and DHW		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	
Present	Present	Present	For heating and DHW		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	
Present	Absent	Present	For heating only		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	1. 'Legionella Prevention Mode' cannot be selected in this system.
Present	Absent	Absent	—		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	1. 'Legionella Prevention Mode' cannot be selected in this system. 2. Please make sure water circuit not to get frozen during defrost.
Present	Present	Present	For heating only		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	
Present	Present	Absent	—		THW1: Flow water temp. THW2: Return water temp. THW5: Tank water temp.	4.4 4.5 5.3	
Absent	Absent	Present	—		THW1: Flow water temp. THW2: Return water temp.	4.4 4.5 5.3	
Absent	Absent	Absent	—		THW1: Flow water temp. THW2: Return water temp.	4.4 4.5 5.3	1. Please make sure water circuit not to get frozen during defrost.

* The use of two 2-way valves can perform same function as a 3-way valve.

3. System

3.4 Fourth step (Functions setting)

* Make sure to check the followings for your safety when designing a system. These are the minimum requirement for the safe use of FTC unit.

Parts name	Requirement																																			
Flow switch	It is required to protect system from the effects of insufficient flow.																																			
Flow sensor	It is required to detect an error in flow rate. (The operation is validated with GRUNDFOS VFS5-100.) It is required for Energy monitor function.																																			
Strainer /Magnetic filter (water circuit)	Provide it as required to protect parts from damages caused by iron particles/water/contamination (e.g. the position before pump and return part from emitters).																																			
Pressure relief valve (Primary circuit side) (Sanitary water side)	It is required to protect system from reaching high pressure. Select the operating pressure depending on water pressure in the circuit in normal use. ※ Follow the national regulations.																																			
3-way valve	<p>Current: 0.1A Max (If over 0.1A you must use a relay) Power supply: 230V AC Connect earth cable, if there is one. Type: SPST ※ SPDT type can NOT be used.</p> 																																			
2-way valve	<p>Current: 0.1A Max (If over 0.1A you must use a relay) Power supply: 230V AC Connect earth cable, if there is one. Type: Normally closed Select the 2-way valve that slowly opens and shuts off to prevent water hammer. A by-pass valve or circuit should be installed between pump and 2-way valve for safety (to release pressure when the both 2-way valves are closed). Select a 2-way valve equipped with manual override, which is necessary for topping up or draining of water.</p>																																			
Water circulation pump	<p>Current: 1.0A Max, Power supply: 230V AC When connecting a pump with an electric current of $\geq 1A$ or multiple pumps, please note the following.</p> <ol style="list-style-type: none"> Use (a) relay(s). When power is supplied from outdoor unit, TOTAL current (including the other parts) requirement MUST be $\leq 3A$ (otherwise, the fuse on the outdoor unit PCB will blow.) When independent power supplies (i.e. from the FTC unit itself) , total current for the pump(s) is $\leq 4A$. (otherwise, the fuse on the FTC PCB will blow.) <p>Connect earth cable, if there is one. Adjust the pump speed setting so that the flow rate in the primary circuit is appropriate for the outdoor unit installed see the table and figures below.</p> <table border="1" data-bbox="316 1243 917 1657"> <thead> <tr> <th colspan="2">Outdoor heat pump unit</th> <th>Water flow rate range [L/min]</th> </tr> </thead> <tbody> <tr> <td rowspan="5">Packaged model</td> <td>PUHZ-W50</td> <td>6.5-14.3</td> </tr> <tr> <td>PUHZ-W85</td> <td>10.0-25.8</td> </tr> <tr> <td>PUHZ-W112</td> <td>14.4-32.1</td> </tr> <tr> <td>PUHZ-HW112</td> <td>14.4-32.1</td> </tr> <tr> <td>PUHZ-HW140</td> <td>17.9-40.1</td> </tr> <tr> <td rowspan="11">Split model</td> <td>SUHZ-SW45</td> <td>7.1-12.9</td> </tr> <tr> <td>PUHZ-SW40</td> <td>7.1-11.8</td> </tr> <tr> <td>PUHZ-SW50</td> <td>7.1-17.2</td> </tr> <tr> <td>PUHZ-SW75</td> <td>10.2-22.9</td> </tr> <tr> <td>PUHZ-SW100</td> <td>14.4-32.1</td> </tr> <tr> <td>PUHZ-SW120</td> <td>20.1-45.9</td> </tr> <tr> <td>PUHZ-SHW80</td> <td>10.2-22.9</td> </tr> <tr> <td>PUHZ-SHW112</td> <td>14.4-32.1</td> </tr> <tr> <td>PUHZ-SHW140</td> <td>17.9-40.1</td> </tr> <tr> <td>PUHZ-SHW230</td> <td>28.7-68.9</td> </tr> </tbody> </table> <p>* The water velocity in pipes should be kept within certain limits of material to avoid erosion corrosion and excessive noise generation. (e.g. Copper pipe: 1.5m/s)</p>	Outdoor heat pump unit		Water flow rate range [L/min]	Packaged model	PUHZ-W50	6.5-14.3	PUHZ-W85	10.0-25.8	PUHZ-W112	14.4-32.1	PUHZ-HW112	14.4-32.1	PUHZ-HW140	17.9-40.1	Split model	SUHZ-SW45	7.1-12.9	PUHZ-SW40	7.1-11.8	PUHZ-SW50	7.1-17.2	PUHZ-SW75	10.2-22.9	PUHZ-SW100	14.4-32.1	PUHZ-SW120	20.1-45.9	PUHZ-SHW80	10.2-22.9	PUHZ-SHW112	14.4-32.1	PUHZ-SHW140	17.9-40.1	PUHZ-SHW230	28.7-68.9
Outdoor heat pump unit		Water flow rate range [L/min]																																		
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	PUHZ-SHW230	28.7-68.9																																		

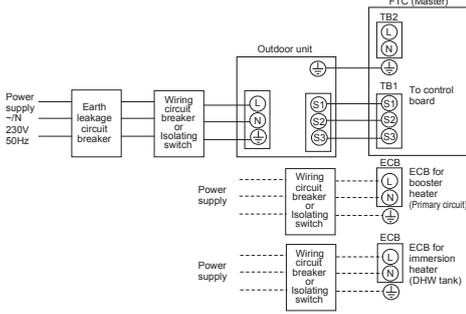
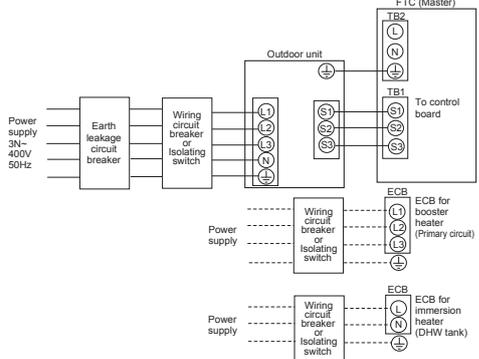
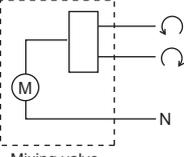
Continue to the next page.

3. System

From the previous page.

Parts name	Requirement
Water circulation pump	<p>(1) Packaged-type units</p> <p>■ Heating</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="316 293 874 571"> <p>PUHZ-W50</p> </div> <div data-bbox="922 293 1481 571"> <p>PUHZ-W85</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="316 593 874 893"> <p>PUHZ-W112 PUHZ-HW112/140</p> </div> </div> <p>(2) Split-type units</p> <p>■ Heating</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="316 974 874 1274"> <p>PUHZ-SW40/50 *1 SUHZ-SW45 *1</p> </div> <div data-bbox="922 974 1481 1274"> <p>PUHZ-SW75 *2 PUHZ-SHW80 *2</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="316 1296 874 1597"> <p>PUHZ-SW100/120 *3 PUHZ-SHW112/140 *3</p> </div> <div data-bbox="922 1296 1481 1597"> <p>PUHZ-SHW230 *4</p> </div> </div> <p>*1 When the connected plate heat exchanger is ACH 30-30 made by ALFA LAVAL. *2 When the connected plate heat exchanger is ACH 70-30 made by ALFA LAVAL. *3 When the connected plate heat exchanger is ACH 70-40 made by ALFA LAVAL. *4 When two ACH 70-40 plate heat exchangers made by ALFA LAVAL are parallel-connected.</p>

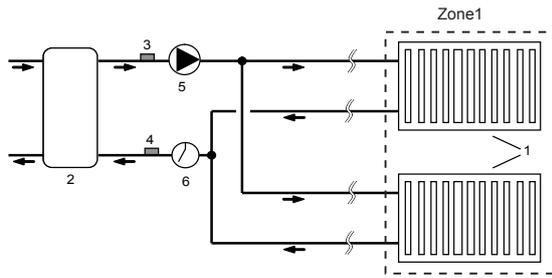
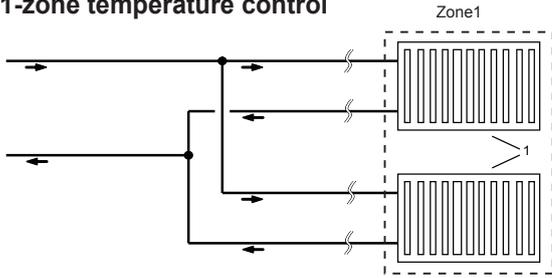
3. System

Parts name	Requirement																																					
Booster heater	General <p>* Consider necessity and capacity of booster heater to meet the following points.</p> <p>(1) Heating capacity and flow water temperature should always be sufficient.</p> <p>(2) System can increase the temperature of the stored water in tank to inhibit legionella bacterium growth.</p> <p>(Note) System without neither booster heater or immersion heater, 'Legionella Prevention Mode' is NOT available.</p> <p>(3) Water circuit should not be frozen during defrost operation.</p>																																					
	Control Power for Contactor <p>Current: 0.5A Max , Power supply: 230V AC</p> <p>* Use a relay.</p>																																					
	Separate power for Heater <p>Install an earth leakage circuit breaker (ECB) for heater, separate from control power (See Fig.1 and Fig.2).</p> <p>* When using two booster heaters, booster heater 1 capacity must be less than that of booster heater 2.</p> <p>When using a single booster heater, connect to BH1 (TBO.5 5-6 (OUT6)) , and turn the Dip SW2-3 to ON. (Booster heater capacity restriction)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><Fig. 1 (1 phase)></p> </div> <div style="text-align: center;">  <p><Fig. 2 (3 phase)></p> </div> </div> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: left;">Heater capacity/Breaker/wiring (recommended)</th> </tr> <tr> <th colspan="5" style="text-align: left;"><1 Phase></th> </tr> <tr> <th>Description</th> <th>Power supply</th> <th>Total capacity (BH1 + BH2)</th> <th>Breaker</th> <th>Wiring</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Booster heater (Primary circuit)</td> <td rowspan="2">~N 230V 50Hz</td> <td>2 kW (2 kW + 0 kW)</td> <td>16 A</td> <td>2.5 mm²</td> </tr> <tr> <td>6 kW (2 kW + 4 kW)</td> <td>32 A</td> <td>6.0 mm²</td> </tr> </tbody> </table> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: left;"><3 Phase></th> </tr> <tr> <th>Description</th> <th>Power supply</th> <th>Total capacity (BH1 + BH2)</th> <th>Breaker</th> <th>Wiring</th> </tr> </thead> <tbody> <tr> <td>Booster heater (Primary circuit)</td> <td>3~ 400V 50Hz</td> <td>9 kW (3 kW + 6 kW)</td> <td>16 A</td> <td>2.5 mm²</td> </tr> </tbody> </table> <p>* When installing a booster heater with the capacity of bigger than shown above, select an appropriate size breaker and cable (diameter) based on the maximum possible electric current.</p>	Heater capacity/Breaker/wiring (recommended)					<1 Phase>					Description	Power supply	Total capacity (BH1 + BH2)	Breaker	Wiring	Booster heater (Primary circuit)	~N 230V 50Hz	2 kW (2 kW + 0 kW)	16 A	2.5 mm ²	6 kW (2 kW + 4 kW)	32 A	6.0 mm ²	<3 Phase>					Description	Power supply	Total capacity (BH1 + BH2)	Breaker	Wiring	Booster heater (Primary circuit)	3~ 400V 50Hz	9 kW (3 kW + 6 kW)	16 A
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Booster heater (Primary circuit)	3~ 400V 50Hz	9 kW (3 kW + 6 kW)	16 A	2.5 mm ²																																		
Safety device	<p>(1) Use an overheat protection thermostat (manual reset type) (to detect unusual temperature increase/heating up without water). Protection device operating temperature must be above 80 °C. Protection device should not operate quickly, but water circuit must not boil even when heater(s) overshoot.</p> <p>(Reference value) Thermostat operation temperature used in our Cylinder unit and Hydrobox : 90 °C ± 4 °C</p> <p>(2) Connect a pressure relief valve on the primary circuit side.</p>																																					
Immersion heater	General <p>* Consider necessity and capacity of immersion heater to meet the following points.</p> <p>(1) Heating capacity and flow water temperature should always be sufficient.</p> <p>(2) System can increase the temperature of the stored water in tank to inhibit legionella bacterium growth.</p> <p>(Note) System without neither booster heater or immersion heater can not select 'Legionella Prevention Mode'.</p>																																					
	Control Power for Contactor <p>Current: 0.5A Max , Power supply: 230V AC</p> <p>* Use a relay.</p>																																					
	Separate power for heater <p>Install an earth leakage circuit breaker (ECB) for heater, separate from control power (See Fig.1 and Fig.2).</p> <p>*ECB is built-in in PAC-IF062B-E.</p> <p>Heater capacity/Breaker/wiring (recommended)</p> <p><1 Phase></p> <table border="1" style="width: 100%; margin-top: 5px;"> <thead> <tr> <th>Description</th> <th>Power supply</th> <th>Capacity</th> <th>Breaker</th> <th>Wiring</th> </tr> </thead> <tbody> <tr> <td>Immersion heater (DHW tank)</td> <td>~N 230V 50Hz</td> <td>3 kW</td> <td>16 A</td> <td>2.5 mm²</td> </tr> </tbody> </table> <p>* When installing an immersion heater with the capacity of bigger than shown above, select an appropriate size breaker and cable (diameter) based on the maximum possible electric current.</p>	Description	Power supply	Capacity	Breaker	Wiring	Immersion heater (DHW tank)	~N 230V 50Hz	3 kW	16 A	2.5 mm ²																											
Description	Power supply	Capacity	Breaker	Wiring																																		
Immersion heater (DHW tank)	~N 230V 50Hz	3 kW	16 A	2.5 mm ²																																		
Safety device <p>(1) Install the thermistor THW5 (optional parts PAC-TH011TK-E(5 m) or PAC-TH011TKL-E(30 m)) on the DHW tank. (Micro-computer detecting temperature for protection: 80 °C)</p> <p>(2) Use a built-in direct cut-off thermostat (manual reset type). Protection device operating temperature must be above 80 °C. Protection device should not operate quickly, but water circuit must not boil even when a heater overshoots.</p> <p>(Reference value) Thermostat operation temperature used in our Cylinder unit : 85 °C ± 5°C</p> <p>(3) Connect a pressure relief valve on the sanitary water side.</p>																																						
Mixing valve	<p>Current: 0.1 A Max (If over 0.1 A you must use a relay)</p> <p>Power supply: 230V AC</p> <p>Connect earth cable, if there is one.</p> <p>Type: Refer to the right figure.</p> <div style="text-align: center;">  <p>Mixing valve</p> </div>																																					
Expansion Vessel (Primary circuit side) Expansion Vessel (Sanitary water side)	<p>When the water circuit is closed, select the expansion vessel according to water quantity of the water circuit.</p> <p>* Follow the national regulations.</p>																																					
Limits of TOTAL electric current when connecting local supply parts	<p>Option 1. (Power supply from outdoor unit)</p> <p>TOTAL current requirement MUST be ≤ 3A (otherwise, the fuse on the outdoor unit PCB will blow).</p> <p>Option 2. (Independent power supply (i.e. from the FTC unit itself))</p> <p>TOTAL current of the pump(s) MUST be ≤ 4A.</p> <p>The total current allowed for parts except pumps is ≤ 3A. (otherwise, the fuse on the FTC PCB will blow.)</p>																																					

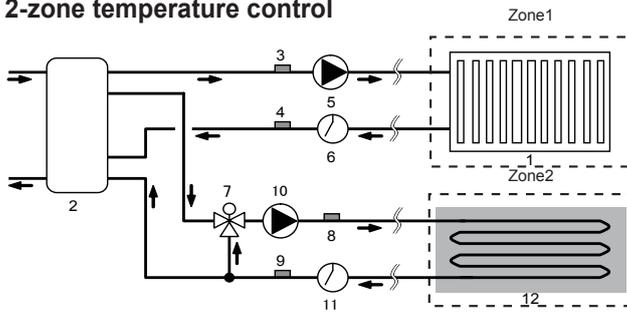
3. System

3.5 Local system

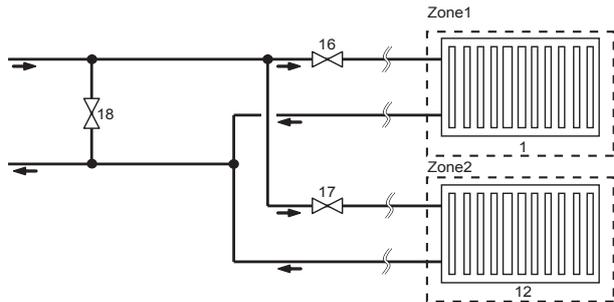
1-zone temperature control



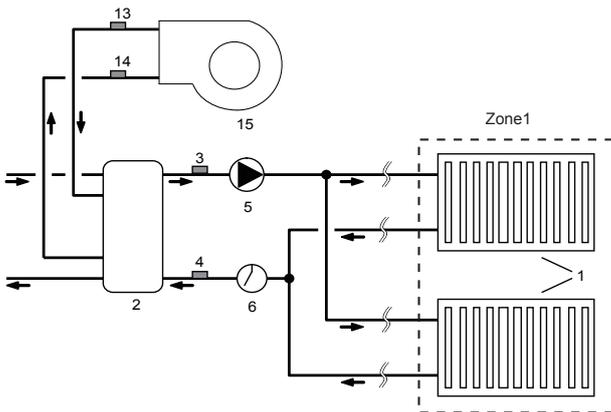
2-zone temperature control



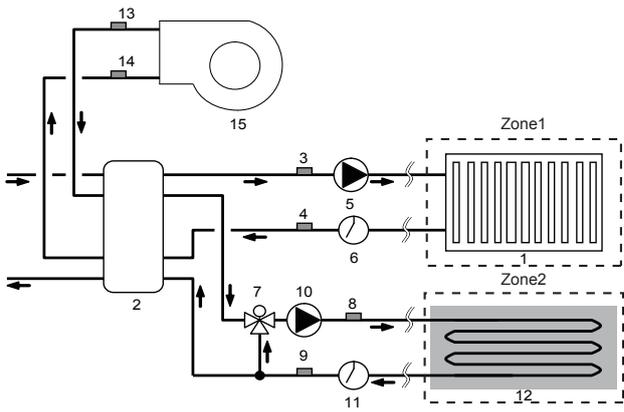
1-zone temperature control (2-zone valve ON/OFF control)



1-zone temperature control with boiler



2-zone temperature control with boiler



1. Zone1 heat emitters (e.g. radiator, fan coil unit) (local supply)
2. Mixing tank (local supply)
3. Zone1 flow water temp. thermistor (THW6) (option)
4. Zone1 return water temp. thermistor (THW7) (option)
5. Zone1 water circulation pump (local supply)
6. Zone1 flow switch (local supply)
7. Motorized mixing valve (local supply)
8. Zone2 flow water temp. thermistor (THW8) (option)
9. Zone2 return water temp. thermistor (THW9) (option)

10. Zone2 water circulation pump (local supply)
11. Zone2 flow switch (local supply)
12. Zone2 heat emitters (e.g. underfloor heating) (local supply)
13. Boiler flow water temp. thermistor (THWB1) (option)
14. Boiler return water temp. thermistor (THWB2) (option)
15. Boiler
16. Zone1 2-way valve (local supply)
17. Zone2 2-way valve (local supply)
18. Bypass valve (local supply)

Note: Cooling mode cannot run under 2-zone temperature control but can run both in Zone1 and Zone2 under 1-zone temperature control.

3.6 Piping diagram for 2-zone temperature control

The following component parts are required for piping for 2-zone control operation.

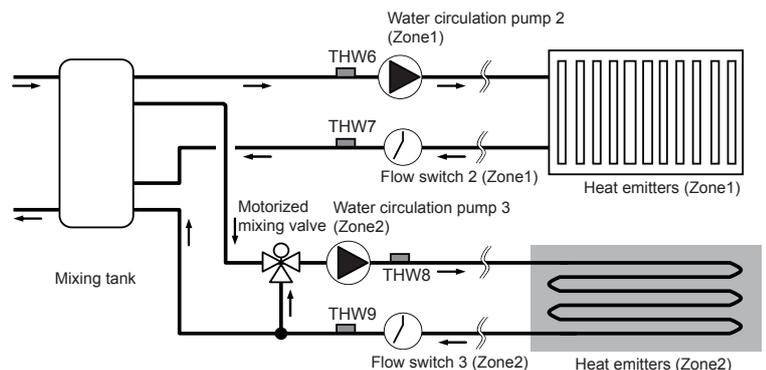
Arrange the following component parts.

- Mixing tank (local supply)
- Motorized mixing valve (local supply)
- Water circulation pump (x 2) (local supply)
- Flow switch (x 2) (local supply)
- Thermistor (x 4) *2 sets of (PAC-TH011-E) thermistors are required.

Wire the component parts to the water circuit referring to the figure below.

For more details on wiring, refer to "4.7 Wiring for 2-zone temperature controls".

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.



- Thermistor (THW6): Zone1 flow temp.
- Thermistor (THW7): Zone1 return temp.
- Thermistor (THW8): Zone2 flow temp.
- Thermistor (THW9): Zone2 return temp.

3. System

3.7 Energy monitor *3

End user can monitor accumulated*1 'Consumed electric energy' and 'Delivered heat energy' in each operation mode*2 on the main controller.

*1 Monthly and Year to date

*2 - DHW operation

- Space heating
- Space cooling

*3 Not available during Multiple outdoor unit control.

Refer to "7.2 Main controller" for how to check the energy, and "5.1 DIP switch functions" for the details on DIP-SW setting.

Either one of the following two method is used for monitoring.

Note: The method 1 should be used as a guide. If a certain accuracy is required, the method 2 should be used.

1. Calculation internally

Electricity consumption is calculated internally based on the energy consumption of outdoor unit, 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 locally supplied sensors.

Set the electric heater capacity and water pump(s) input according to indoor unit model and specs of additional pump(s) supplied locally. (Refer to the menu tree in "7.2 Main controller")

Booster heater1	Booster heater2	Immersion heater	Pump1	Pump2	Pump3
2kW*1	4kW*1	0kW*1	*** *1	0W*1	0W*1

<Table 3.7>

*1 Be sure to change the setting corresponding to the specification of locally supplied auxiliaries such as electric heater and pump.

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 "7.2 Main 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 controller.

(e.g. Meter 1 for H/P power line, Meter 2 for heater power line)

Refer to the [Signal inputs] section in "4.5 Connecting inputs/outputs" for more information on connectable electric energy meter and heat meter.

4. Electrical work

4.1 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.

For multiple outdoor units control with FTC (Slave), see section 9.

FTC (Master) can be powered in two ways.

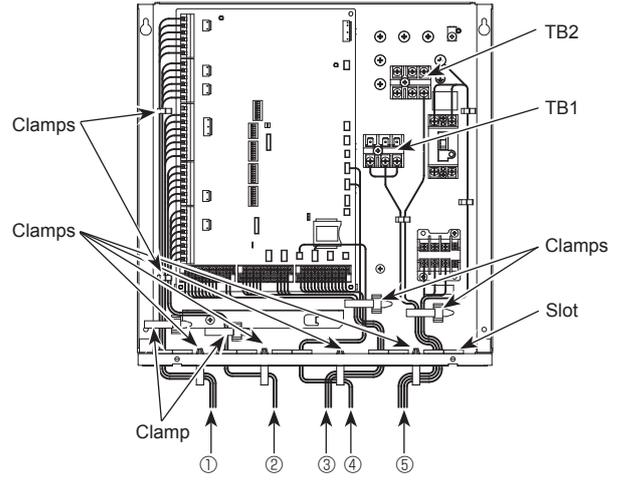
1. Power cable is run from the outdoor unit to FTC (Master).
2. FTC (Master) has independent power source

Connections should be made to the terminals indicated in the following figures depending on the phase.

Breaker abbreviation	Meaning
ECB	Earth leakage circuit breaker for immersion heater
TB1	Terminal bed 1
TB2	Terminal bed 2

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

- Notes:**
1. Do not run the low voltage cables through a slot that the high voltage cables go through.
 2. Do not run other cables except low voltage cables through a slot that the wireless receiver's cable goes through.
 3. Do not bundle power cables together with other cables.
 4. Bundle cables as figure above by using clamps.

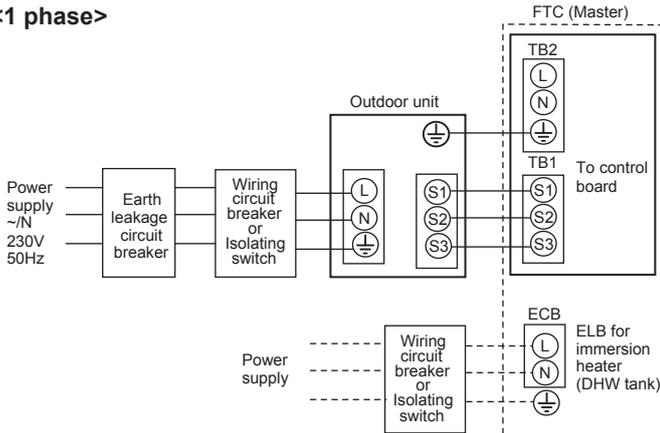


- ① High voltage cables (OUTPUT)
- ② High voltage cables (OUTPUT)
- ③ Low voltage cables (INPUT) and wireless receiver's cable
- ④ Thermistor cables
- ⑤ Power cables

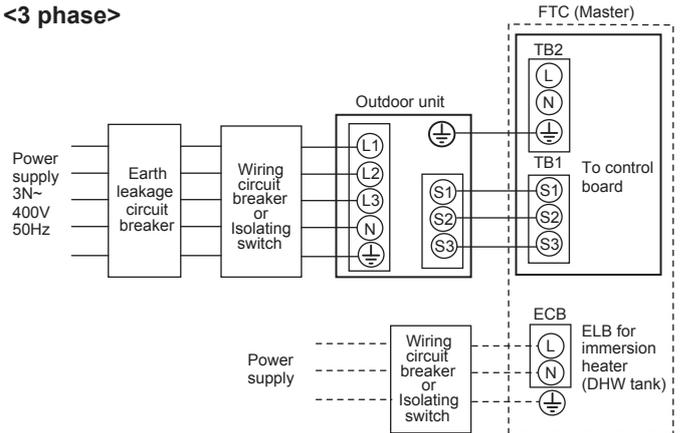
<Fig. 4.1.1> Wiring for PAC-IF062B-E

Option 1: FTC (Master) powered via outdoor unit

<1 phase>



<3 phase>



□ : PAC-IF061B-E

□ : PAC-IF062B-E

<Fig. 4.1.2>

Electrical connections 1 phase/3 phase

*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 Affix label A that is included with the manuals near each wiring diagram for FTC (Master) and outdoor units.

Note: In accordance with IEE regulations the circuit breaker/isolating switch located on the outdoor unit should be installed with lockable devices (health and safety).

Wiring No. Wiring size (mm ²)	FTC (Master) - Outdoor unit	*2	3 × 1.5 (polar)
	FTC (Master) - Outdoor unit earth	*2	1 × Min. 1.5
Circuit rating	FTC (Master) - Outdoor unit S1 - S2	*3	AC230V
	FTC (Master) - Outdoor unit S2 - S3	*3	DC24V

*1. 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.

*2. Max. 45 m

If 2.5 mm² used, Max. 50 m

If 2.5 mm² used and S3 separated, Max. 80 m

*3. The values given in the table above are not always measured against the ground value.

Notes: 1. Wiring size must comply with the applicable local and national codes.

2. FTC (Master)/outdoor unit connecting cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60245 IEC 57)
FTC (Master) power supply cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60227 IEC 53)

3. Install an earth longer than other cables.

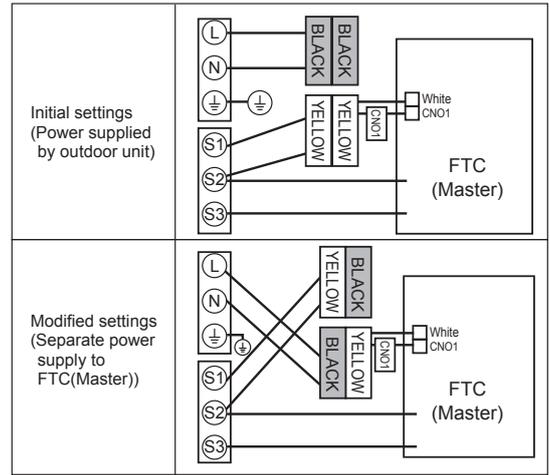
4. Please keep enough output capacity of power supply for each individual heater. Insufficient power supply capacity might cause chattering.

4. Electrical work

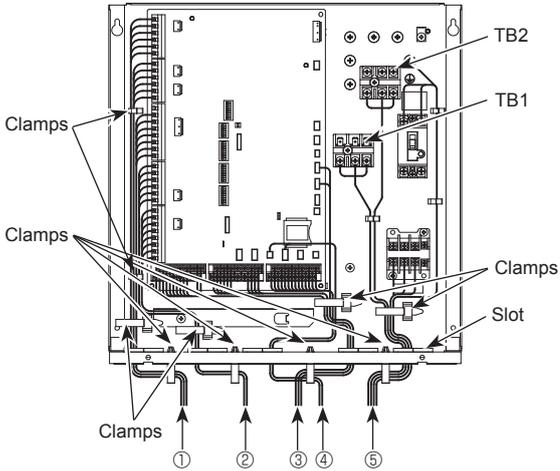
Option 2: FTC (Master) powered by independent source

If FTC (Master) and outdoor units have separate power supplies, the following requirements MUST be carried out:

- **FTC (Master) unit electrical box connector connections changed.** (see Fig. 4.1.3)
 - **Outdoor unit DIP switch settings changed to SW8-3 ON.**
 - **Turn on the outdoor unit before the FTC (Master).**
 - **Power by independent source is not available for particular models of outdoor unit model.**
- For more detail, refer to the connecting outdoor unit installation manual.



<Fig. 4.1.3>

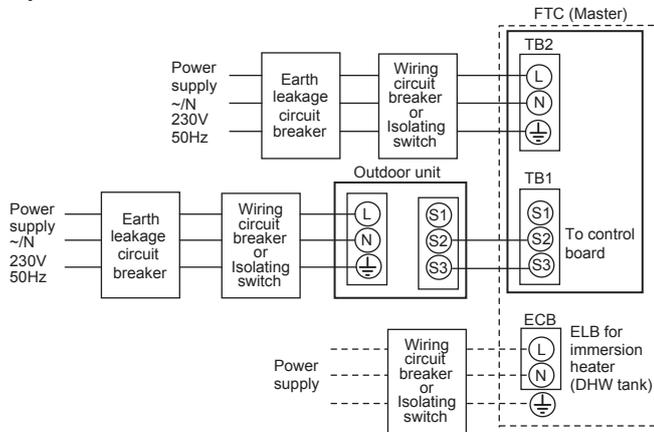


- ① High voltage cables (OUTPUT)
- ② High voltage cables (OUTPUT)
- ③ Low voltage cables (INPUT) and wireless receiver's cable
- ④ Thermistor cables
- ⑤ Power cables

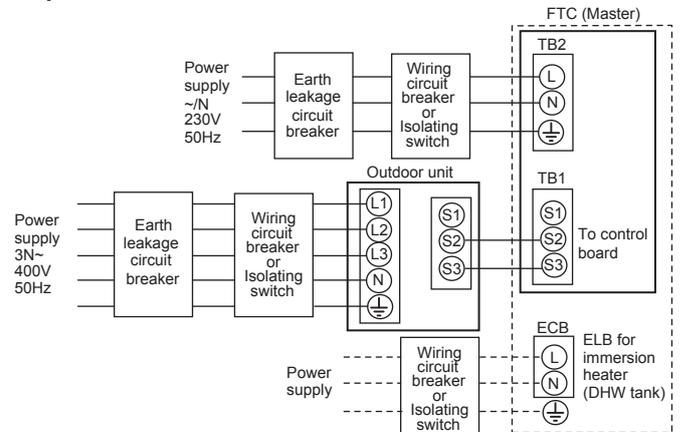
<Fig. 4.1.4> Wiring for PAC-IF062B-E

- Notes:
1. Do not run the low voltage cables through a slot that the high voltage cables go through.
 2. Do not run other cables except low voltage cables through a slot that the wireless receiver's cable goes through.
 3. Do not bundle power cables together with other cables.
 4. Bundle cables as figure above by using clamps.

<1 phase>



<3 phase>



<Fig. 4.1.5>

Electrical connections 1 phase/3 phase

□ : PAC-IF061B-E
 □ : PAC-IF062B-E

*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 Affix label B that is included with the manuals near each wiring diagram for FTC (Master) and outdoor units.

Note: In accordance with IEE regulations the circuit breaker/isolating switch located on the outdoor unit should be installed with lockable devices (health and safety).

FTC (Master) power supply		~N 230 V 50 Hz
FTC (Master) input capacity		16 A
Main switch (Breaker)		*1
Wiring No. x size (mm ²)	FTC (Master) power supply	2 × Min. 1.5
	FTC (Master) power supply earth	1 × Min. 1.5
Circuit rating	FTC (Master) - Outdoor unit	*2 2 × Min. 0.3
	FTC (Master) - Outdoor unit earth	—
Circuit rating	FTC (Master) L - N	*3 AC230V
	FTC (Master) - Outdoor unit S1 - S2	*3 —
	FTC (Master) - Outdoor unit S2 - S3	*3 DC24V

*1. 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.

*2. Max. 120 m

*3. The values given in the table above are not always measured against the ground value.

- Notes:
1. Wiring size must comply with the applicable local and national codes.
 2. FTC (Master) unit/outdoor unit connecting cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60245 IEC 57)
 3. Install an earth longer than other cables.
 4. Please keep enough output capacity of power supply for each individual heater. Insufficient power supply capacity might cause chattering.

4. Electrical work

4.2 Connecting the main controller

4.2.1 Connect the main controller cable to FTC (Master)

Connect the main controller cable to 1 and 2 on the terminal block (TBI. 2) on the FTC (Master) controller. <Fig. 4.2.1>

Wiring wire No. × size (mm²): 2 × 0.3 (non polar)

The 10 m wire is attached as an accessory. Max. 500 m

Wiring size must comply with the applicable local and national codes.

Circuit rating: 12V DC

Circuit rating is NOT always against the ground.

Location to place the main controller

When using the Remote controller options (refer to section 4.3), place the main controller on appropriate location that meets the following points to detect room temperature.

- Do not place the main controller in the periphery of a door or a window.
- Do not place the main controller near heat or cold sources, such as a radiator or the like.

Notes:

Wiring for main controller cable shall be (5 cm or more) apart from power source wiring so that it is not influenced by electric noise from power source wiring. (Do not insert main controller cable and power source wiring in the same conduit.) (Refer to Fig. 4.1.1)

When wiring to TBI.2, use the ring type terminals and insulate them from the cables of adjoining terminals.

4.2.2 Installing the main controller

1. The main controller can be installed either in the switch box or directly on the wall. Perform the installation properly according to the method.

- (1) Secure clearances shown in <Fig. 4.2.2> regardless of whether installing the main controller either directly on the wall or in the switch box.
- (2) Prepare the following items in the field.

- Double switch box
- Thin metal conduit
- Locknut and bushing
- Cable cover
- Wall plug

2. Drill an installation hole in the wall.

- Installation using a switch box
 - Drill a hole in the wall for the switch box, and install the switch box in the hole.
 - Fit the conduit tube into the switch box.
- Direct wall installation
 - Drill a cable access hole and thread the main controller cable through it.

⚠ Caution:

To prevent entry of dew, water, and insects, seal the gap between the cable and the hole through which the cable is threaded with putty. Otherwise, electric shock, fire, or failure may result.

3. Have the main controller ready.

Remove the back cover from the main controller.

4. Connect the main controller cable to the terminal block on the back cover.

Modify the main controller cable as shown in <Fig. 4.2.5>, and thread the cable from behind the back cover.

Completely thread the cable to the front so that the unsheathed part of the cable cannot be seen behind the back cover.

Connect the main controller cable to the terminal block on the back cover.

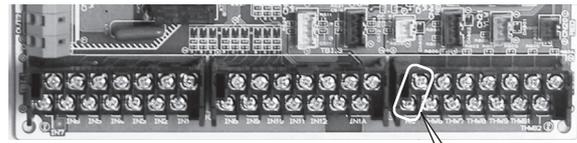
■ Direct wall installation

- Seal the gap between the cable and the hole through which the cable is threaded.

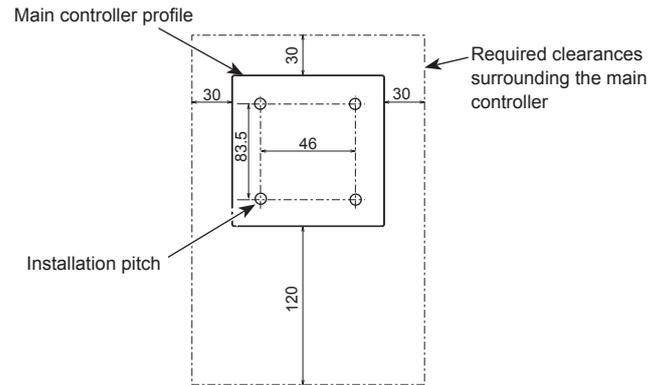
⚠ Caution

To prevent electric shock or failure, keep the sheath ends or any other foreign objects out of the terminal block.

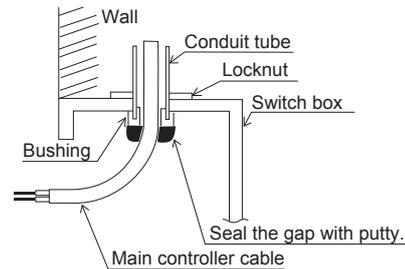
Do not use ring terminals to connect the wires to the terminal block on the back cover. The terminals will come in contact with the control board and the cosmetic cover, which will result in failure.



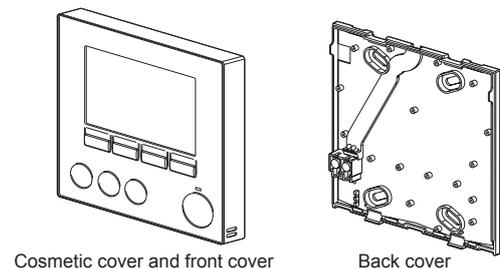
<Fig. 4.2.1>



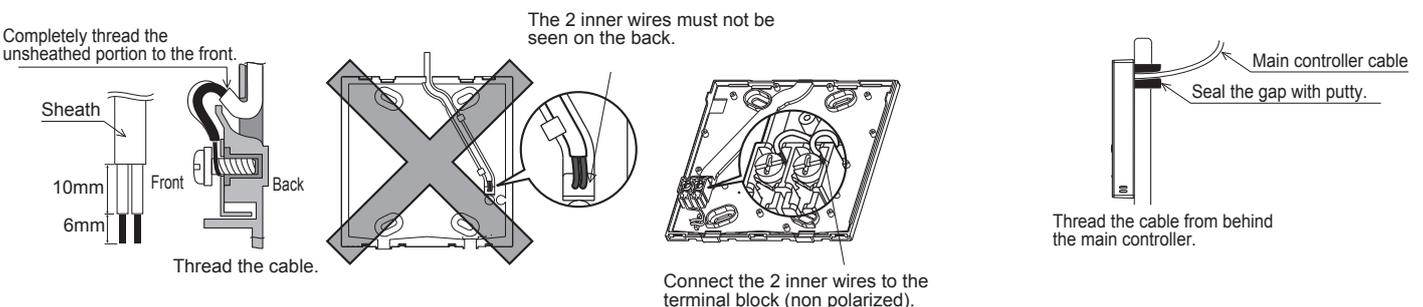
<Fig. 4.2.2>



<Fig. 4.2.3>



<Fig. 4.2.4>

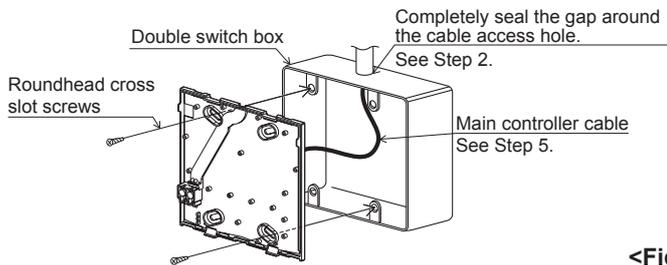


<Fig. 4.2.5>

4. Electrical work

5. Install the back cover.

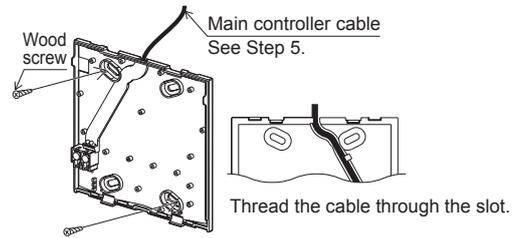
- Installation using a switch box
 - When installing the back cover in the switch box, secure at least two corners of the switch box with screws.



<Fig. 4.2.6>

■ Direct wall installation

- Thread the cable through the slot provided.
- When mounting the back cover on the wall, secure at least two corners of the main controller with screws.
- To prevent the back cover from lifting, use top-left bottom-right corners of the main controller (viewed from the front) to secure the back cover to the wall with wall plugs or the like.

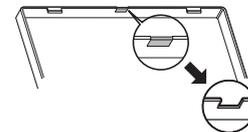


⚠ Caution:

To avoid causing deformation or cracks to the main controller, do not overtighten the screws and make an additional installation hole(s).

6. Cut out the cable access hole.

- Direct wall installation
 - Cut out the knockout hole (indicated with grey in <Fig. 4.2.7>) in the cosmetic cover by knife or nipper.
 - Thread the main controller cable from the slot behind the back cover through this access hole.



<Fig. 4.2.7>

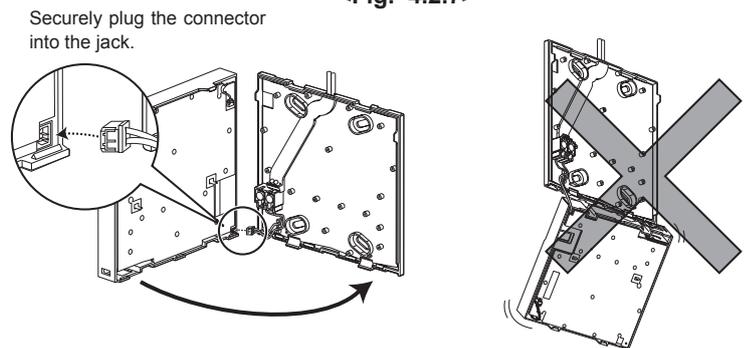
7. Plug the lead wire cable into the front cover.

Plug the lead wire cable coming from the back cover into the front cover.

⚠ Caution:

To avoid failures, do not remove the controller board protective sheet and the controller board from the front cover.

After the cable is plugged into the front cover, do not hang the front cover as shown in <Fig. 4.2.8>. Otherwise, the main controller cable could sever, which could cause malfunction to the main controller.

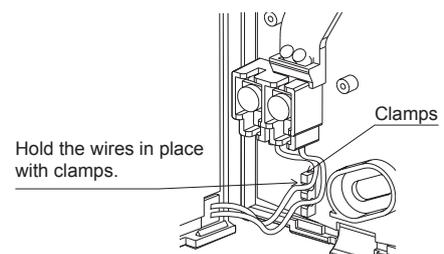


<Fig. 4.2.8>

8. Fit the lead wires into the clamps.

⚠ Caution:

Hold the wires in place with clamps to prevent excessive strain from being applied on the terminal block and causing cable breakage.



<Fig. 4.2.9>

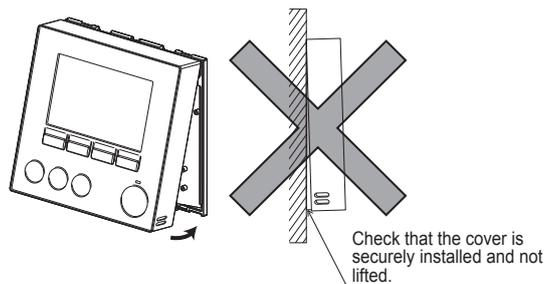
4. Electrical work

9. Fit the front cover and the cosmetic cover onto the back cover.

The front cover assembly (fitted with the cosmetic cover at factory shipment) has two tabs on top. Hook the tabs onto the back cover and snap the front cover onto the back cover into place. Check that the cover is securely installed.

⚠ Caution:

When the front cover is correctly attached to the back cover a click is heard. If the cover is not clicked into place it may fall off.

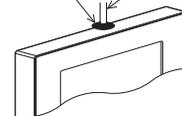


<Fig. 4.2.10>

- Direct wall installation (when routing the main controller cable along the wall surface)
 - Thread the main controller cable through the cable access hole at the top of the main controller.
 - Seal the gap between the cable and the access hole with putty.
 - Use a cable cover.

Seal the gap between the cable and the access hole with putty.

Use a cable cover.



Thread the main controller cable through the cable access hole at the top of the main controller.

<Fig. 4.2.11>

● Disassembling the front cover and the cosmetic cover

(1) Remove the cosmetic cover.

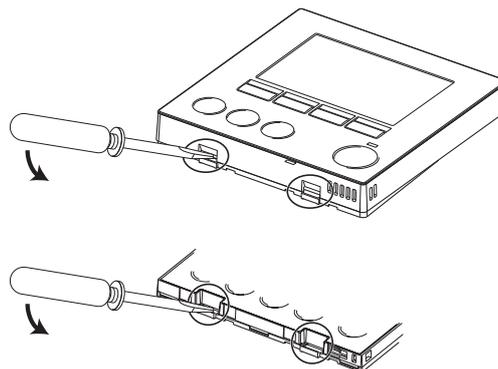
Insert a flat head screwdriver into either of two open slots at the bottom of the main controller and move the screwdriver handle downward as shown. The engagement of the tabs will be released. Then pull the cosmetic cover toward the front to remove the cosmetic cover.

(2) Remove the front cover.

Insert a flat head screwdriver into either of two open slots at the bottom of the main controller. The subsequent procedure is the same as that of the cosmetic cover.

⚠ Caution:

Use a 5 mm- flat head screwdriver. Do not turn the screwdriver forcibly while placing the blade in the slots. Doing so could break the covers.



4. Electrical work

4.3 Remote Controller Options

The FTC (cased) comes factory fitted with a main 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 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.

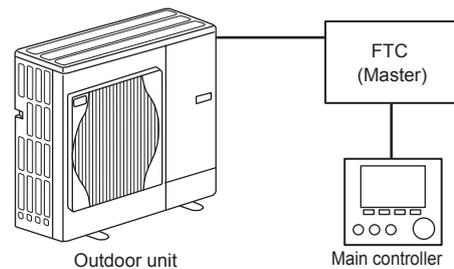
Refer to heating section of this manual for instructions on how to set compensation curve, flow temp or room temp (Auto adaptation).

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

The factory setting for space heating mode is set to Room temp. (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.

Note: Auto-adaptation is not available in Cooling mode.

Factory supplied standard



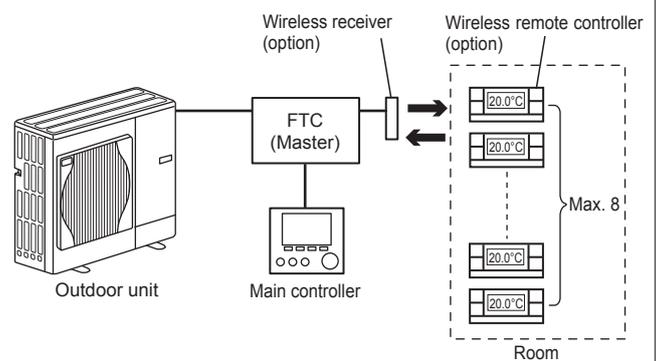
■ 1-zone temperature control

Control option A

This option features the main 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 (*1) and switch to holiday mode without having to directly use the main 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 (Master) 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.)

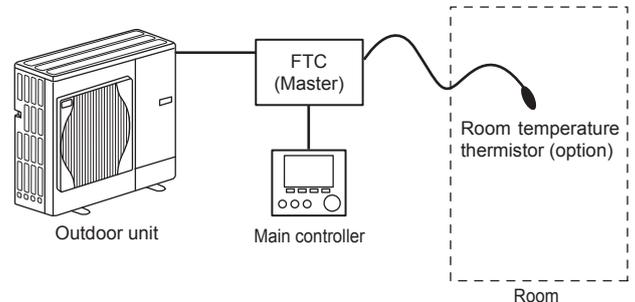


Control option B

This option features the main controller and the Mitsubishi Electric thermistor wired to FTC (Master). The thermistor is used to monitor room temperature but can not make any changes in control operation. Any changes to DHW (*1) must be made using the main controller mounted on the FTC (Master).

Wire the thermistor to the TH1 connector on FTC (Master).

The number of room temperature thermistors that can be connected to FTC (Master) is always one.

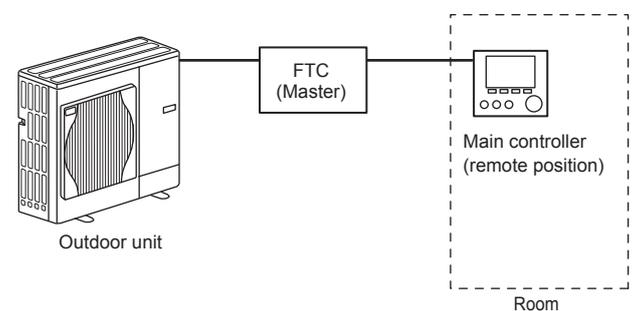


Control option C

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

The main controller and FTC (Master) 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 controller the main controller should come off from the FTC (Master). Otherwise it will detect the temperature of the FTC (Master) instead of room temperature. This will affect the output of the space heating.

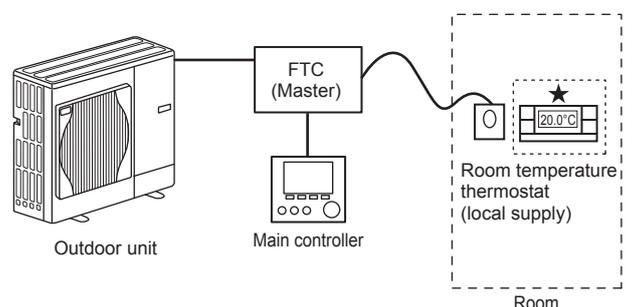


Control option D (Flow temp. or compensation curve only)

This option features the main controller and a locally supplied thermostat wired to FTC (Master). The thermostat is used to set the maximum temperature for heating room. Any changes to DHW (*1) must be made using main controller mounted on the FTC (Master).

The thermostat is wired to IN1 in TBI.1 on FTC (Master). The number of thermostats that can be connected to FTC (Master) is always one.

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



*1 If applicable

4. Electrical work

■ 2-zone temperature control

<p>Control option A</p> <p>This option features the main controller, the Mitsubishi Electric wireless remote controller and a locally supplied thermostat.</p> <p>The wireless remote controller is used to monitor the Zone1 room temperature and the thermostat is used to monitor the Zone2 room temperature.</p> <p>The thermostat can be also allocated to Zone1 and the wireless remote controller to Zone2.</p> <p>The wireless remote controller can be also used to make changes to the space heating settings, boost DHW (*1) and switch to holiday mode without having to use the main controller.</p> <p>If more than one wireless remote controller is used, the last temperature setting adjustment/demand will be applied to ALL rooms in same zone.</p> <p>Wire the wireless receiver to FTC (Master) 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.)</p> <p>The thermostat is used to set the maximum temperature for heating Zone2 room. The thermostat is wired to IN6 on FTC (Master). (If the thermostat is allocated to Zone1, it is wired to IN1 on TBI.1.) (Refer to 4.5.)</p>	<p>Zone1: Room temp. control (Auto adaptation) Zone2: Compensation curve or flow temp. control</p>
<p>Control option B</p> <p>This option features the main controller, the Mitsubishi Electric thermistor and a locally supplied thermostat that are wired to FTC (Master).</p> <p>The thermistor is used to monitor the Zone1 room temperature and the thermostat is used to control the Zone2 room temperature.</p> <p>The thermostat can be also allocated to Zone1 and the thermistor to Zone2.</p> <p>The thermistor can not make any changes in control operation. Any changes to DHW (*1) must be made using the main controller mounted on the FTC (Master).</p> <p>Wire the thermistor to the TH1 connector on FTC (Master).</p> <p>The number of room temperature thermistors that can be connected to FTC (Master) is always one.</p> <p>The thermostat is used to set the maximum temperature for heating Zone2 room. The thermostat is wired to IN6 on FTC (Master). (If the thermostat is allocated to Zone1, wire it to IN1 on TBI.1.) (Refer to 4.5)</p>	<p>Zone1: Room temp. control (Auto adaptation) Zone2: Compensation curve or flow temp. control</p>
<p>Control option C</p> <p>This option features the main controller (with in-built thermistor) that is removed from the FTC (Master) to monitor the Zone1 room temperature and a locally supplied thermostat to monitor the Zone2 room temperature.</p> <p>The thermostat can be also allocated to Zone1 and the thermistor to Zone2.</p> <p>A thermistor built into the main controller can be used for monitoring the room temperature for Auto Adaptation function whilst keeping all its features of the main controller available.</p> <p>The main controller and FTC (Master) are connected by a 2-core, 0.3 mm², non-polar cable (local supply) with a maximum length of 500 m.</p> <p>To use the sensor in the main controller the main controller should be detached from the FTC (Master). Otherwise it will detect the temperature of the FTC (Master) instead of room temperature. This will affect the output of the space heating.</p> <p>The thermostat is used to set the maximum temperature for heating Zone2 room. The thermostat is wired to IN6 on FTC (Master). (If the thermostat is allocated to Zone1, wire it to IN1 on TBI.1.) (Refer to 4.5.)</p>	<p>Zone1: Room temp. control (Auto adaptation) Zone2: Compensation curve or flow temp. control</p>
<p>Control option D</p> <p>This option features the locally supplied thermostats wired to FTC (Master). 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 (*1) must be made using the main controller mounted on the FTC (Master).</p> <p>The thermostat for Zone1 is wired to IN1 in TBI.1 on FTC (Master). The thermostat for Zone2 is wired to IN6 in TBI.1 on FTC (Master).</p>	<p>Zone1, Zone2: Compensation curve or flow temp. control</p>

*1 If applicable

*2 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.

4. Electrical work

4.4. Connecting the thermistor cables

Connect the thermistor for the FTC (Master) controller.

For multiple outdoor units control with FTC (Slave), see section 9.

4.4.1 Connecting the room temp. thermistor (TH1) cable

TH1 is an optional part (PAC-SE41TS-E).

TH1 is required to use the auto adaptation function. However, when room temperature detection is conducted by the main controller or the wireless remote controller (optional), this part is not required.

Connect the TH1 cable to the CN20 connector on FTC (Master).

When the TH1 cable is too long, bundle the excess cable outside the FTC (Master) unit.

For more details, refer to Section 4.3 in this manual or the installation manual that comes with PAC-SE41TS-E.

When using TH1, place this sensor on appropriate location to detect room temperature.

4.4.2. Connecting the refrigerant pipe temp. thermistor (TH2) cable

Connect the TH2 cable to the CN21 connector on FTC (Master).

For split Outdoor unit : Connect TH2.

For packaged Outdoor unit : It is NOT necessary to connect TH2.

When the TH2 cable is too long, bundle the excess cable outside the FTC (Master) unit.

Do not bind the wires in the FTC (Master) unit.

<Thermistor position>

Place TH2 on **refrigerant** piping (**liquid** side).

It is recommended to protect the thermistor with heat insulating materials so as not to be affected by ambient temperature.

Note: Be sure to place TH2 where it correctly detects refrigerant piping temp. (liquid side).

Because;

(1) TH2 is required to detect heating subcool correctly.

(2) Refrigerant temperature of water-to-refrigerant heat exchanger also needs to be detected for protection purpose.

4.4.3. Connecting the flow water temp. thermistor (THW1) cable and the return water temp. thermistor (THW2) cable

The THW1 and the THW2 cables share a connector, and the connector connects to CNW12 connector on FTC (Master).

When the THW1 and THW2 cables are too long, bundle the excess cables outside the FTC (Master) unit.

Do not bind the wires in the FTC (Master) unit.

<Thermistor position>

Place THW1 on **water** piping (water **outlet** side) after booster heater, and THW2 on the water inlet side.

It is recommended to protect the thermistor with heat insulating materials so as not to be affected by ambient temperature.

Note: Be sure to attach THW1 where it correctly detects Flow temp. (water outlet side). For more details, see Page 6.

4.4.4. Connecting the actual DHW tank thermistor (THW5) cable

THW5 is an optional part (PAC-TH011TK-E(5 m) or PAC-TH011TKL-E(30 m)).

Connect the THW5 cable to the CNW5 connector on FTC (Master) if the DHW tank is available.

When the THW5 cable supplied with FTC (Master) is too long, bundle the excess cable outside the FTC (Master) unit.

Do not bind the wires in the FTC (Master) unit.

<Thermistor position>

Place THW5 on the position where tank water temperature can be detected correctly.

It is recommended to position the thermistor at the mid height of the DHW tank (to control DHW heating with this sensor).

It is recommended to protect the thermistor with heat insulating materials so as not to be affected by ambient temperature.

Especially for double (insulated) tank, thermistor should be attached to the inner side (to detect the water temperature).

Note:

Connect the terminals by using the ring terminals and also insulate the cables of adjoining terminals when wiring to TBI.1-3.

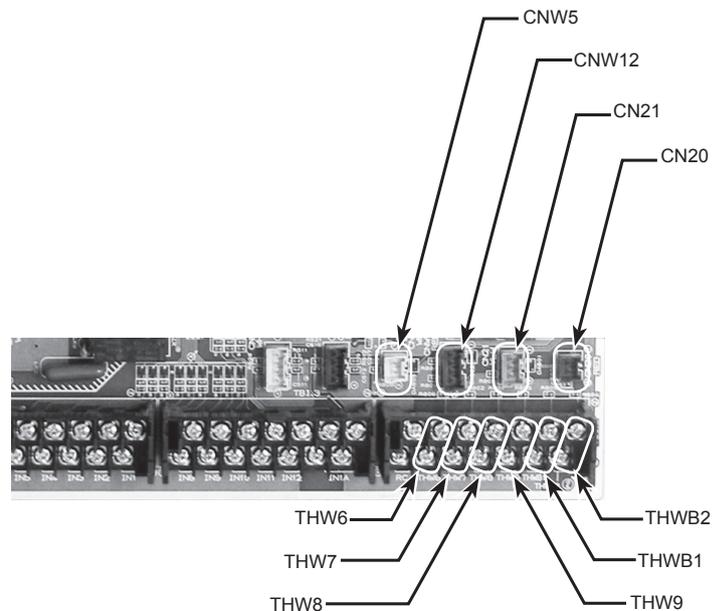
The necessary thermistor (THW6, THW7, THW8, THW9) connection for 2-zone temperature control, refer to "4.7 Wiring for 2-zone temperature control" .

The necessary thermistor (THWB1, THWB2, THW6, THW7) connection for back-up operation of boiler, refer to the installation manual of PAC-TH011HT-E .

⚠ **Caution:**

Do not route the thermistor cables together with power cables.

The sensor part of the thermistor should be installed where user can not access.



<Fig. 4.4.1>

4. Electrical work

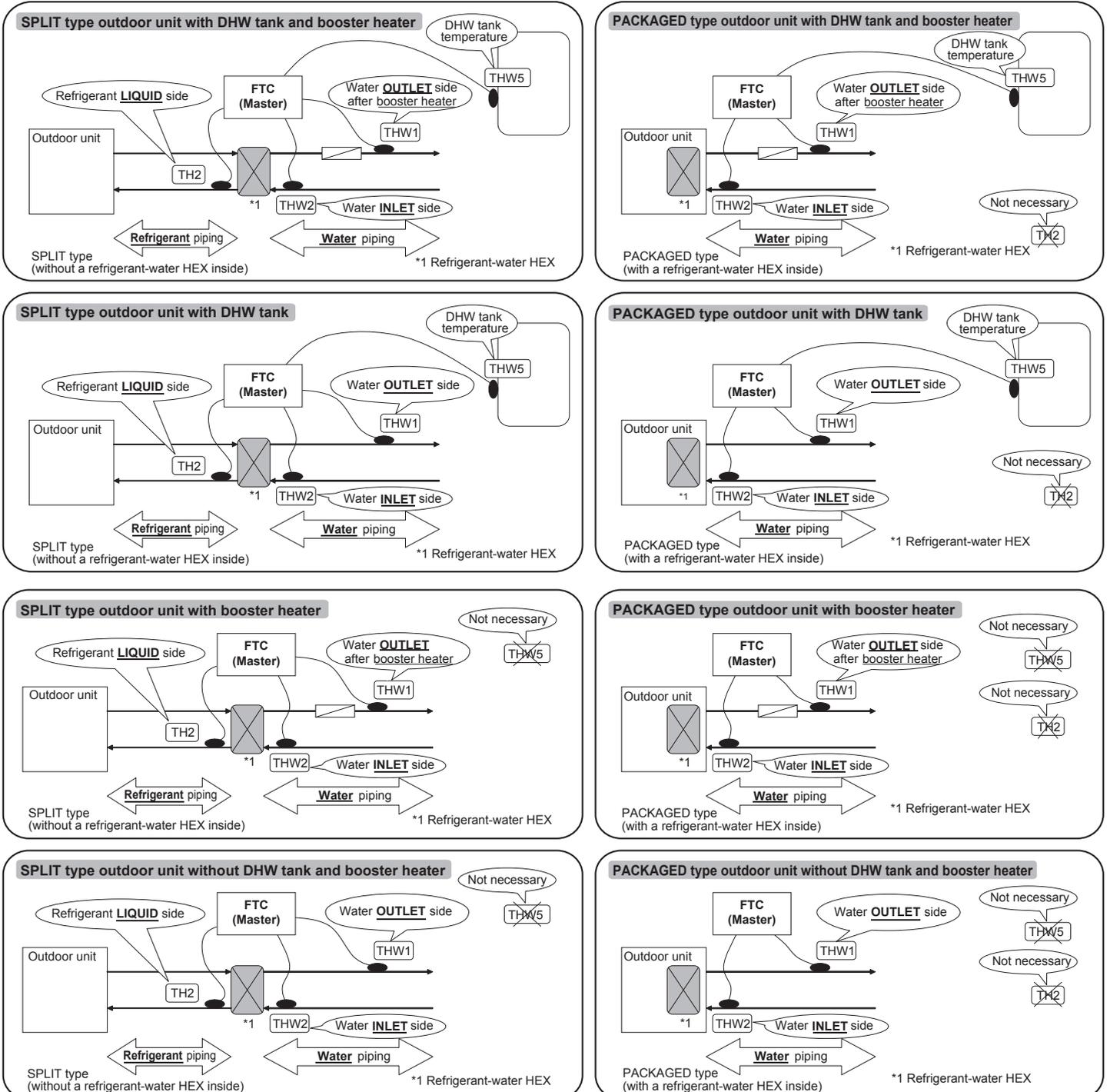
4.4.5. Thermistor position and necessity

<Thermistor position and necessity>

Outdoor unit type	DHW tank	TH2	THW1	THW2	THW5
Split	Present	✓	✓	✓	✓
	Absent	✓	✓	✓	—
Packaged	Present	—	✓	✓	✓
	Absent	—	✓	✓	—

✓: Necessary. Connect the thermistor.

—: Not necessary. The thermistor is not required, do not connect.

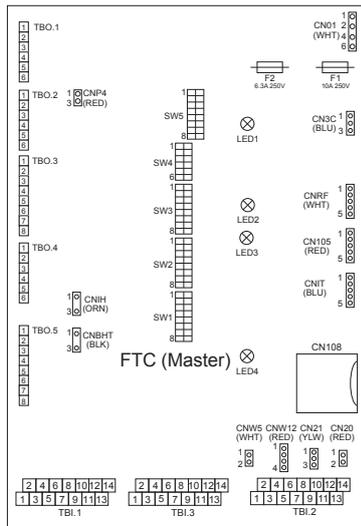


<Fig. 4.4.2>

4. Electrical work

4.5 Connecting inputs/outputs

For multiple outdoor units control with FTC (Slave), see section 9.



When the wires are wired to adjacent terminals use ring terminals and insulate the wires.

<Fig. 4.5.1>

Signal inputs

Name	Terminal block	Connector	Item	OFF (Open)	ON (Short)
IN1	TBI.1 13-14	—	Room thermostat 1 input	Refer to SW2-1 in <5.1 DIP Switch Functions>.	
IN2	TBI.1 11-12	—	Flow switch 1 input	Refer to SW2-2 in <5.1 DIP Switch Functions>.	
IN3	TBI.1 9-10	—	Flow switch 2 input (Zone1)	Refer to SW3-2 in <5.1 DIP Switch Functions>.	
IN4	TBI.1 7-8	—	Demand control input	Normal	Heat source OFF/ Boiler operation *2
IN5	TBI.1 5-6	—	Outdoor thermostat input *1	Standard operation	Heater operation/ Boiler operation *2
IN6	TBI.1 3-4	—	Room thermostat 2 input	Refer to SW3-1 in <5.1 DIP Switch Functions>.	
IN7	TBI.1 1-2	—	Flow switch 3 input (Zone2)	Refer to SW3-3 in <5.1 DIP Switch Functions>.	
IN8	TBI.3 1-2	—	Electric energy meter 1	*3	
IN9	TBI.3 3-4	—	Electric energy meter 2		
IN10	TBI.3 5-6	—	Heat meter		
IN1A	TBI.3 12-14	—	Flow sensor input	*4	

*1. If using outdoor thermostat for controlling operation of heaters, the lifetime of the heaters and related parts may be reduced.

*2. To turn on the boiler operation, use the main controller to select "Boiler" in "External input setting" screen in the service menu.

*3. Connectable electric energy meter and heat meter

- Pulse type Voltage free contact for 12VDC detection by FTC (TBI.3 1, 3 and 5 pin 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

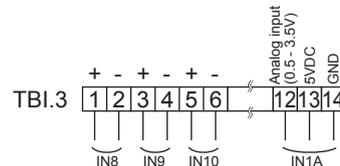
Those values can be set by the main controller. (Refer to the menu tree in "7.2 Main Controller".)

*4. Connectable flow sensor

- Power supply 5V DC
- Measuring range 5 to 100 l/min
Those valves can be set by the main controller (Refer to <Auxiliary setting> on Page 44.)
- Flow signal 0.5V (at minimum flow rate) to 3.5V (at maximum flow rate)

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 mm ² to 1.25 mm ² Solid wire: ø0.4 mm to ø1.2 mm
	Switch	Non-voltage "a" contact signals Remote switch: minimum applicable load 12V DC, 1mA



4. Electrical work

■ Thermistor inputs

Name	Terminal block	Connector	Item	Optional part model
TH1	—	CN20	Thermistor (Room temp.) (Option) *1	PAC-SE41TS-E
TH2	—	CN21	Thermistor (Ref. liquid temp.) *2	—
THW1	—	CNW12 1-2	Thermistor (Flow water temp.)	—
THW2	—	CNW12 3-4	Thermistor (Return water temp.)	—
THW5	—	CNW5	Thermistor (DHW tank water temp.)	PAC-TH011TK-E(5 m) or PAC-TH011TKL-E(30 m)
THW6	TBI.2 3-4	—	Thermistor (Zone1 flow water temp.) (Option) *1	PAC-TH011-E
THW7	TBI.2 5-6	—	Thermistor (Zone1 return water temp.) (Option) *1	PAC-TH011-E
THW8	TBI.2 7-8	—	Thermistor (Zone2 flow water temp.) (Option) *1	PAC-TH011-E
THW9	TBI.2 9-10	—	Thermistor (Zone2 return water temp.) (Option) *1	PAC-TH011-E
THWB1	TBI.2 11-12	—	Thermistor (Boiler flow water temp.) (Option) *1	PAC-TH011HT-E
THWB2	TBI.2 13-14	—	Thermistor (Boiler return water temp.) (Option) *1	PAC-TH011HT-E

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.

*2. Except PAC-IF062B-E.

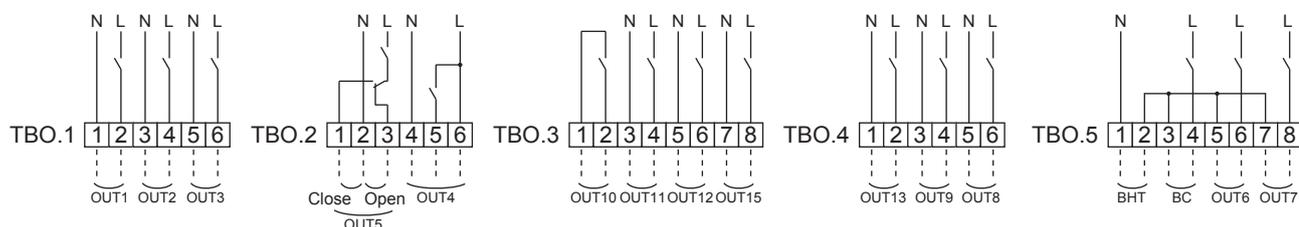
■ Outputs

Name	Terminal block	Connector	Item	OFF	ON	Signal/Max current	Max. total current
OUT1	TBO.1 1-2	—	Water circulation pump 1 output (Space heating/cooling & DHW)	OFF	ON	230V AC 1.0A Max	4.0A (a)
OUT2	TBO.1 3-4	—	Water circulation pump 2 output (Space heating/cooling for Zone1)	OFF	ON	230V AC 1.0A Max	
OUT3	TBO.1 5-6	—	Water circulation pump 3 output (Space heating/cooling 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 1.0A Max	3.0A (b)
OUT4	TBO.2 4-6	—	3-way valve (2-way valve 1) output	Heating	DHW	230V AC 0.1A Max	
OUT5	TBO.2 1-2	—	Mixing valve output *1	Stop	Close	230V AC 0.1A Max	
	TBO.2 2-3			Open			
OUT6	TBO.5 5-6	—	Booster heater 1 output	OFF	ON	230V AC 0.5A Max (Relay)	
OUT7	TBO.5 7-8	—	Booster heater 2 output	OFF	ON	230V AC 0.5A Max (Relay)	
OUT8	TBO.4 5-6	—	Cooling signal output	OFF	ON	230V AC 0.5A Max	
OUT9	TBO.4 3-4	CNIH	Immersion heater output	OFF	ON	230V AC 0.5A Max (Relay)	
OUT11	TBO.3 3-4	—	Error output	Normal	Error	230V AC 0.5A Max	
OUT12	TBO.3 5-6	—	Defrost output	Normal	Defrost	230V AC 0.5A Max	
OUT13	TBO.4 1-2	—	2-way valve 2a output *2	OFF	ON	230V AC 0.1A Max	
OUT15	TBO.3 7-8	—	Comp ON signal	OFF	ON	230V AC 0.5A Max	
BC	TBO.5 3-4	—	Booster heater protection output	OFF (BHT open)	ON (BHT short)	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	—
BHT	TBO.5 1-2	CNBHT	Thermostat for booster heater	Thermostat Normal: short	High temp. : open		

Do not connect to the terminals that are indicated as “—” in the “Terminal block” field.

*1 For 2-zone temperature control.

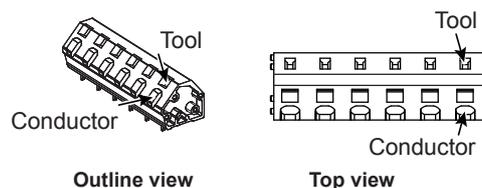
*2 For 2-zone valve ON/OFF control.



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 mm ² to 1.5 mm ² Solid wire: 0.25 mm ² to 1.5 mm ²

How to use TBO.1 to 5



Connect them using either way as shown above.
<Fig. 4.5.2>

Note:

1. When the FTC is powered via outdoor unit, the maximum grand total current of (a)+(b) is 3.0 A.
2. 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).
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).

4. Electrical work

4.6 Wiring for heater

<Care to be taken when connecting a booster heater(s)>

The initial setting assumes that the connected booster heater(s) has a built-in direct cut-off thermostat. <Fig. 4.6.1>

When the connected booster heater(s) has a built-in indirect cut-off thermostat, perform wiring according to the following items. < Fig. 4.6.2>

- Connect the thermostat signal to BHT (TBO.5 1-2).
- Remove the jumper wire from connector CNBHT.
- Connect a contactor (or relay) for protecting the booster heater.
(Connect the electromagnetic coil terminals to BC (TBO.5 3-4).

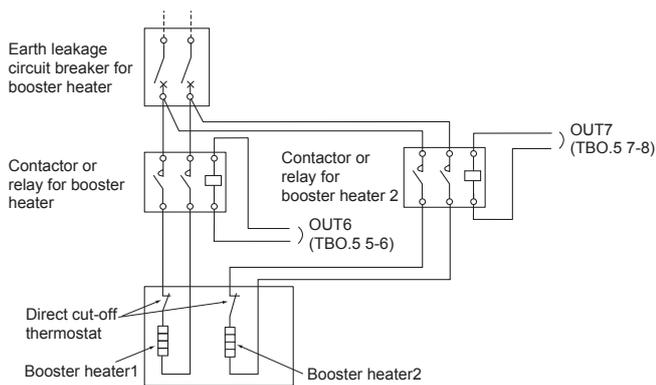
* Do not remove the jumper wire from connector CNBHT when the connected booster heater(s) has a built-in direct cut-off thermostat. < Fig. 4.6.1>

<Care to be taken when connecting an immersion heater>

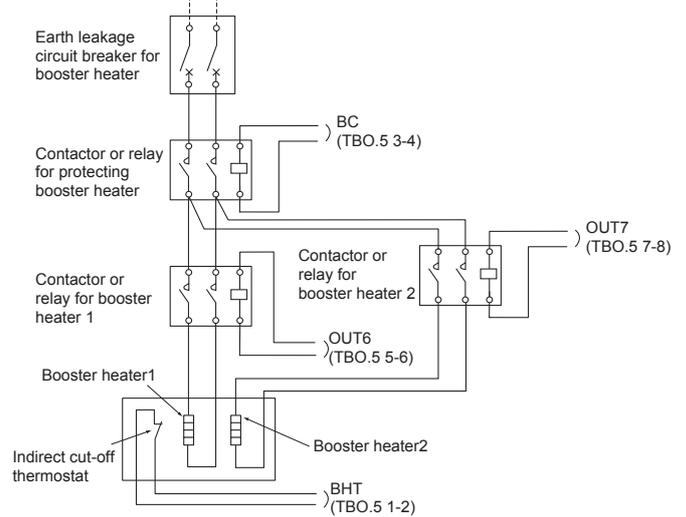
The initial setting assumes that the connected immersion heater has a built-in direct cut-off thermostat. <Fig. 4.6.3>

<Wiring for booster heater with a built-in direct cut-off thermostat>

<Wiring for booster heater with a built-in indirect cut-off thermostat>

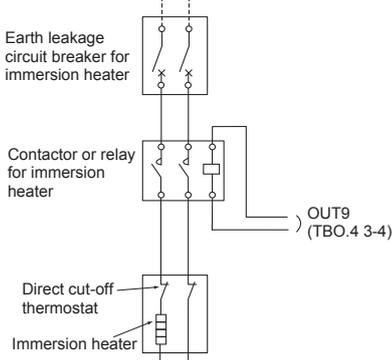


<Fig. 4.6.1>

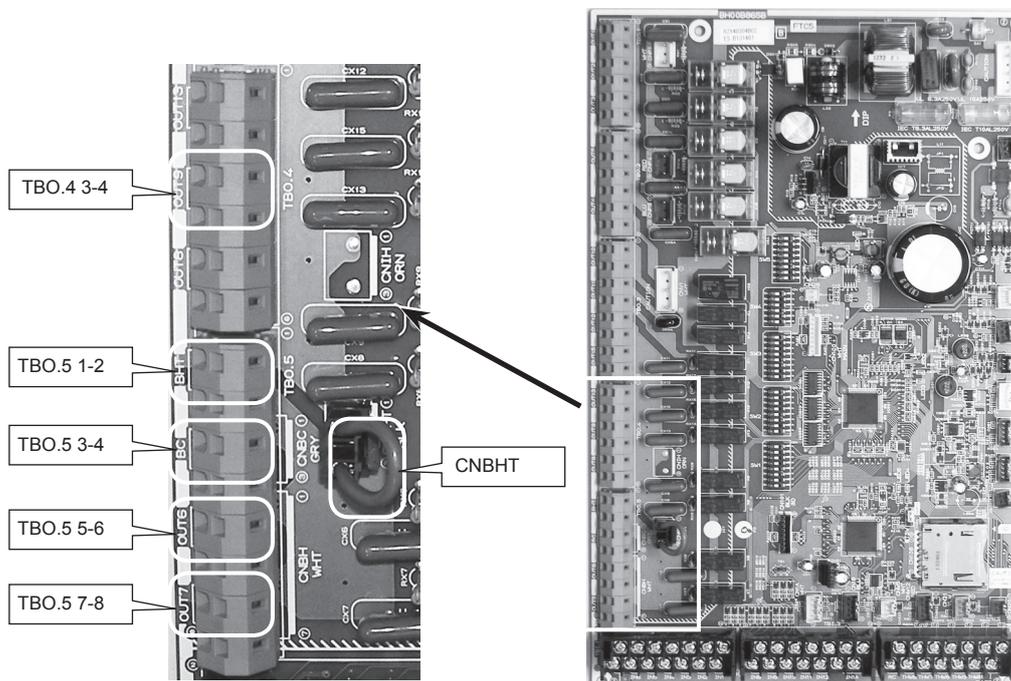


<Fig. 4.6.2>

<Wiring for immersion heater with a built-in direct cut-off thermostat>



<Fig. 4.6.3>



4. Electrical work

4.7 Wiring for 2-zone temperature control

- Water circulation pump 2 (Zone1 water circulation pump) / Water circulation pump 3 (Zone2 water circulation pump)
Electrically wire water circulation pumps 2 and 3 to the appropriate output terminals. (Refer to "Outputs" in 4.5.)
- Flow switch 2 (Zone1 flow switch) / Flow switch 3 (Zone2 flow switch)
Connect flow switches 2 and 3 to the appropriate terminals. (Refer to "Signal inputs" in 4.5.)
Set dip switches 3-2 and 3-3 according to the functions of individual flow switches 2 and 3. (Refer to "Dip switch setting" in section 5.)
- Thermistor
Connect the thermistor to monitor the Zone1 flow temp. to the THW6 (TBI. 2-3 and 2-4) terminals.
Connect the thermistor to monitor the Zone1 return temp. to the THW7 (TBI. 2-5 and 2-6) terminals.
Connect the thermistor to monitor the Zone2 flow temp. to the THW8 (TBI. 2-7 and 2-8) terminals.
Connect the thermistor to monitor the Zone2 return temp. to the THW9 (TBI. 2-9 and 2-10) terminals.

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.

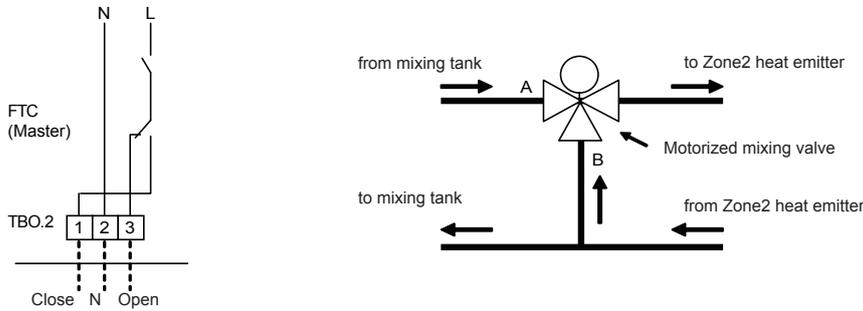
The length of the optional thermistors are 5 m. If you need to splice and extend the wirings, following points must be carried out.

- 1) Connect the wirings by soldering.
- 2) Insulate each connecting point against dust and water.

4. Motorized mixing valve

Connect three wires coming from the motorized mixing valve to the appropriate terminals referring to "Outputs" in 4.5.

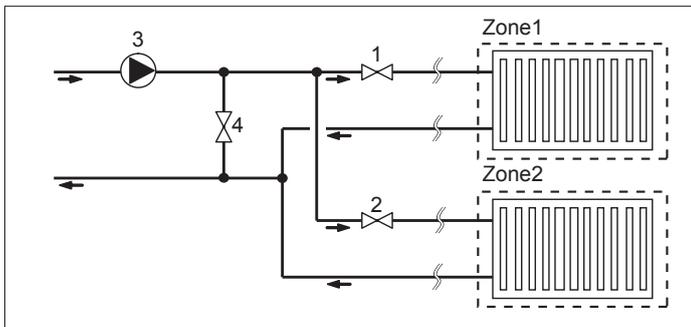
Note: Connect the signal line to open Port A (hot water inlet port) to TBO. 2-3 (Open), the signal line to open Port B (cold water inlet port) to TBO. 2-1 (Close), and the neutral terminal wire to TBO. 2-2 (N).



4.8 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 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 4.5)

4. Room thermostat connection

Heating operation mode	Zone1	Zone2
Room temp. control (Auto adaptation) *3	<ul style="list-style-type: none"> • Wireless remote controller (option) • Room temperature thermistor (option) • Main controller (remote position) 	<ul style="list-style-type: none"> • Wireless remote controller (option)
Compensation curve or flow temp. control	<ul style="list-style-type: none"> • Wireless remote controller (option) *4 • Room temperature thermostat (local supply) 	<ul style="list-style-type: none"> • 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.

4. Electrical work

4.9 Installation procedure for DHW tank

Note:

- Be aware that the respective DHW operations are greatly effected by the selections of the components such as tank, immersion heater, or the like.
- Follow your local regulations to perform system configuration.

1. To enable switching of the water circulation circuit between the DHW mode and the heating mode, install a 3-way valve (local supply). The 3-way valve and the DHW tank should be positioned as shown in the system diagram in section 3. The use of two 2-way valves can perform the same function as a 3-way valve.

2. Install the optional thermistor THW5 (optional part PAC-TH011TK-E(5 m) or PAC-TH011TKL-E(30 m)) on the DHW tank.

It is recommended to position the thermistor at the mid point of the DHW tank capacity. Insulate thermistor from ambient air. Especially for double (insulated) tank, thermistor should be attached to the inner side (to detect the water temperature).

3. Connect the thermistor lead to the CNW5 connector on the FTC (Master).

4. The output terminals for the 3-way valve is TBO.2 4-6 (OUT4).

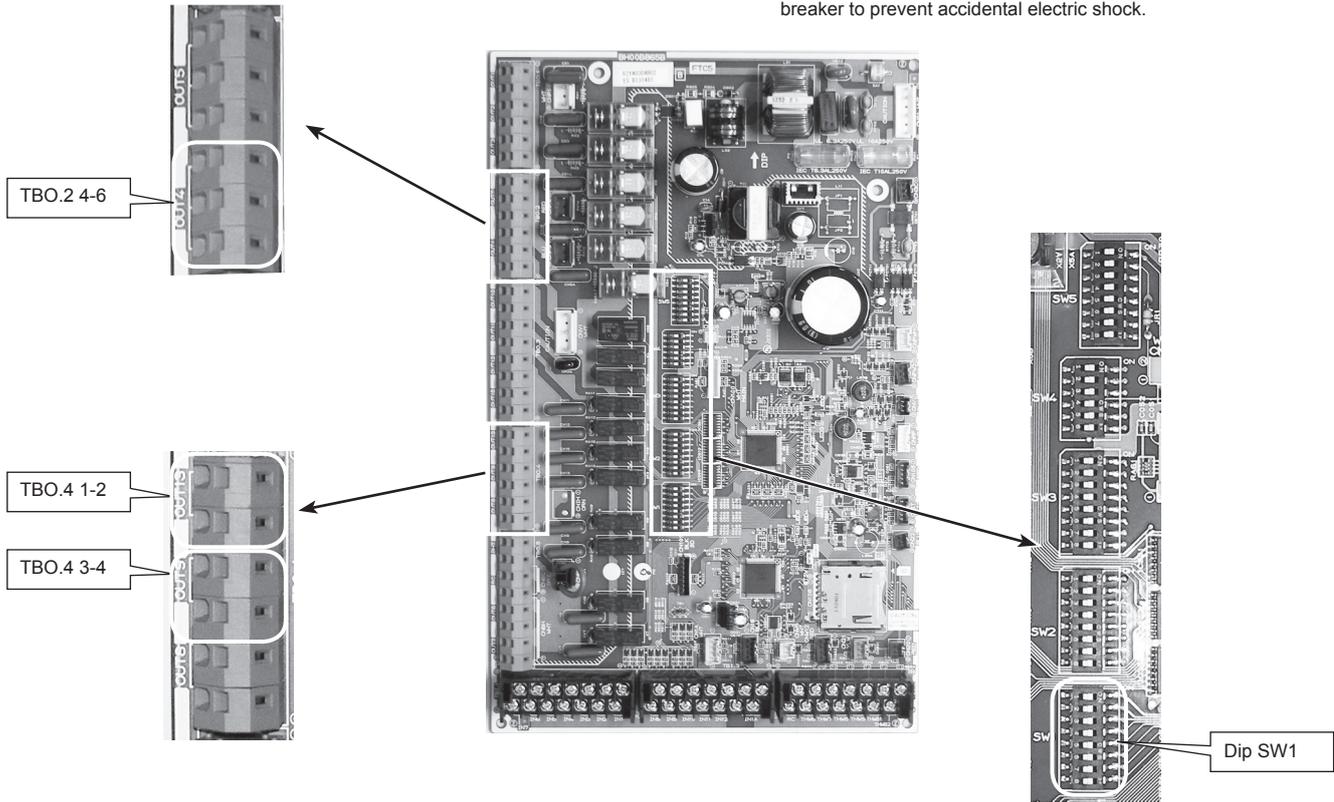
The TBO.2 4-6 terminals on the FTC (Master) are shown in the wiring diagram on the page 21.

Choose the terminals that the 3-way valve is connected to between TBO.2 4-5, or TBO.2 4-6, according to the rated voltage.

When the rated current of the 3-way valve exceeds 0.1A, be sure to use a relay with maximum voltage and current ratings of 230V AC / 0.1A when connecting to the FTC (Master). Do not directly connect the 3-way valve cable to the FTC (Master). Connect the relay cable to the TBO.2 4-5 terminals.

3-way valve must be of SPST type. SPDT type can NOT be used.

For systems using 2-way valves instead of a 3-way valve please read the following;



Specification of 2-way valve (local supply)

- Power supply: 230V AC
- Current: 0.1A Max (**If over 0.1A you must use a relay**)
- Type: Normally closed

	Installation position	Electrical connection terminal block	Output signal		
			Heating	DHW	System OFF
2-way valve1	DHW	TBO.2 4-5	OFF (closed)	ON (open)	OFF (closed)
2-way valve2	Heating	TBO.4 1-2	ON (open)	OFF (closed)	OFF (closed)

Note: Should the 2-way valve become blocked the water circulation will stop.

A by-pass valve or circuit should be installed between pump and 2-way valve for safety.

The TBO.4 1-2 terminals on the FTC (Master) are shown in the wiring diagram. The 2-way valve (local supply) should be installed according to the instructions supplied with it. Follow 2-way valve's manufacturer's instructions as to whether to connect an earth cable or not.

- For the 2-way valve, choose the one that slowly opens and shuts off to prevent water hammer sound.
- Choose the 2-way valve equipped with manual override, which is necessary for topping up or draining of water.

5. Turn the DIP SW1-3 on the FTC (Master) to ON.

6. When using an immersion heater (local supply), connect a contact relay cable for the immersion heater to TBO.4 3-4 (OUT9), and turn the Dip SW1-4 to ON. Do NOT directly connect the power cable to the FTC (Master).

Note:

- When an immersion heater is installed, select appropriate breaker capacity and a cable with appropriate diameter on the basis of heater output.
- When wiring an immersion heater in the field, always install an earth leakage breaker to prevent accidental electric shock.

⚠ WARNING: When connecting DHW tank

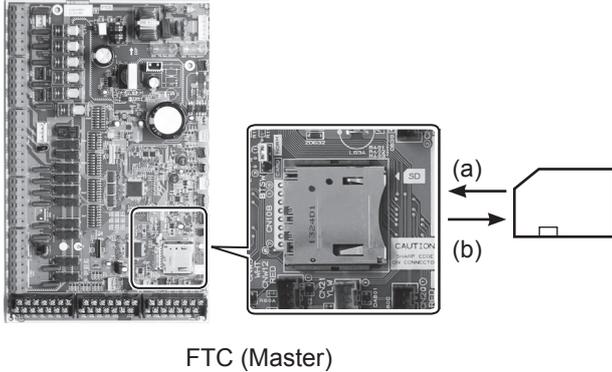
- (1) Attach the optional thermistor THW5 (PAC-TH011TK-E (5 m) or PAC-TH011TKL-E (30 m)).
- (2) Always use earth leakage breaker when connecting immersion heater.
- (3) When installing an immersion heater, be sure that the immersion heater has a built-in direct cut-off thermostat.
- (4) Connect a pressure relief valve on the sanitary water side.

4. Electrical work

4.10 Using SD memory card

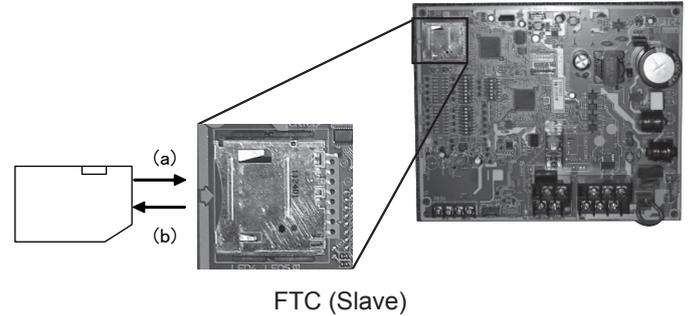
FTC is equipped with an SD memory card interface.

Using an SD memory card can simplify main controller settings and can store operating logs. *1



- (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.



<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 55°C.
- (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 whilst 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.

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 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.

Manufacturer	Model	Tested in
Verbatim	#44015 0912-61	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

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 4.1.
 (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.

5. Dip Switch setting

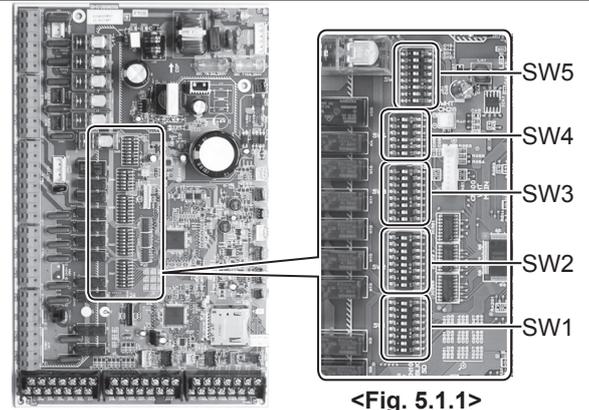
5.1 DIP Switch Functions

Located on the FTC printed circuit board are 5 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.

Make sure to turn off both indoor unit and outdoor unit power supplies before changing the switch settings.

For multiple outdoor units control with FTC (slave), see section 9.3.2.



<Fig. 5.1.1>

DIP switch	Function	OFF	ON	Default settings: Indoor unit model
SW1	SW1-1 Boiler	WITHOUT Boiler	WITH Boiler	OFF
	SW1-2 Heat pump maximum outlet water temperature	55°C	60°C	ON *1
	SW1-3 DHW tank	WITHOUT DHW tank	WITH DHW tank	OFF: PAC-IF061B-E, PAC-SIF051B-E ON : PAC-IF062B-E
	SW1-4 Immersion heater	WITHOUT Immersion heater	WITH Immersion heater	OFF: PAC-IF061B-E, PAC-SIF051B-E ON : PAC-IF062B-E
	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 Outdoor unit type	Split type	Packaged type	OFF: PAC-IF061B-E, PAC-SIF051B-E ON : PAC-IF062B-E
	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 Cooling mode function	Inactive	Active	OFF
	SW2-5 Automatic switch to backup heat source operation (When outdoor unit stops by error)	Inactive	Active *2	OFF
	SW2-6 Mixing tank	WITHOUT Mixing tank	WITH Mixing tank	OFF
	SW2-7 2-zone temperature control	Inactive	Active *6	OFF
	SW2-8 Flow sensor	WITHOUT Flow sensor	WITH Flow sensor	OFF
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 input (IN3) logic change	Failure detection at short	Failure detection at open	OFF
	SW3-3 Flow switch 3 input (IN7) logic change	Failure detection at short	Failure detection at open	OFF
	SW3-4 Electric energy meter	WITHOUT Electric energy meter	WITH Electric energy meter	OFF
	SW3-5 Heating mode function *3	Inactive	Active	OFF: PAC-IF061B-E, PAC-SIF051B-E ON : PAC-IF062B-E
	SW3-6 2-zone valve ON/OFF control	Inactive	Active	OFF
	SW3-7 Heat exchanger for DHW	Coil in tank	External plate HEX	OFF
	SW3-8 Heat meter	WITHOUT Heat meter	WITH Heat meter	OFF
SW4	SW4-1 Multiple outdoor unit control	Inactive	Active	OFF: PAC-IF061B-E, PAC-IF062B-E ON :PAC-SIF051B-E
	SW4-2 Position of multiple outdoor unit control *7	Slave	Master	OFF
	SW4-3	—	—	OFF
	SW4-4 Indoor unit only operation (during installation work) *4	Inactive	Active	OFF
	SW4-5 Emergency mode (Heater only operation)	Normal	Emergency mode (Heater only operation)	OFF *5
	SW4-6 Emergency mode (Boiler operation)	Normal	Emergency mode (Boiler operation)	OFF *5
SW5	SW5-1	—	—	OFF
	SW5-2	—	—	OFF
	SW5-3	—	—	OFF
	SW5-4	—	—	OFF
	SW5-5	—	—	OFF
	SW5-6	—	—	OFF
	SW5-7	—	—	OFF
	SW5-8	—	—	OFF

<Table 5.1.1>

- Note:**
- *1. When the FTC unit is connected with a PUAZ-RP/SUHZ-SW outdoor unit of which maximum outlet water temperature is 55°C, DIP SW1-2 must be changed to OFF.
 - *2. 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.)
 - *3. This switch functions only when the cylinder unit is connected with a PUAZ-FRP outdoor unit. When another type of outdoor unit is connected, the heating mode function is active regardless of the fact that this switch is ON or OFF.
 - *4. Space heating and DHW can be operated only in indoor unit, like an electric boiler. (Refer to "5.7 Indoor unit only operation".)
 - *5. If emergency mode is no longer required, return the switch to OFF position.
 - *6. Active only when SW3-6 is set to OFF.
 - *7. SW4-2 is available only when SW4-1 is ON.

5. Dip Switch setting

5.2 Outdoor unit type

Set Dip SW 1-7 to set the outdoor unit type.

Dip SW 1-7	Setting	Note
OFF	Split type	Necessary to connect TH2
ON	Packaged type	Not necessary to connect TH2

Set Dip SW 1-2 to set the heat pump maximum outlet water temperature.

Dip SW 1-2	Setting
OFF	55 °C
ON	60 °C

When the outdoor unit is a PUHZ-RP/SUHZ-SW series set the Dip SW1-2 to ON, other than that, set the Dip SW 1-2 to OFF.

Note: When Dip SW 1-2 is OFF (55°C) and an electric heater is not installed (*), 'Legionella Prevention Mode' is NOT available.

* Dip SW settings set when no electric heater is installed.

Dip SW 1-2	Dip SW 1-4	Dip SW 1-5	Dip SW 1-6
OFF	OFF	ON	OFF
OFF	OFF	OFF	(ON/OFF)

5.3 Functions setting

Set Dip SW 1-1 to set whether the system has a boiler.

Dip SW 1-1	Setting
OFF	WITHOUT boiler
ON	WITH boiler

When Dip SW 1-1 is OFF, back-up operation of boiler is not available.

Set Dip SW 1-3 to set whether the system has a DHW tank.

Dip SW 1-3	Setting	Note
OFF	WITHOUT DHW tank	Not necessary to connect THW5
ON	WITH DHW tank	Necessary to connect THW5

When Dip SW 1-3 is OFF, DHW mode is not available.

Set Dip SW 1-4 to set whether the system has an immersion heater.

Dip SW 1-4	Setting
OFF	WITHOUT immersion heater
ON	WITH immersion heater

Set Dip SW 1-5 to set whether the system has a booster heater.

Dip SW 1-5	Setting
OFF	WITHOUT booster heater
ON	WITH booster heater

Set Dip SW 1-6 to set the booster heater function.

Dip SW 1-6	Setting
OFF	For heating only
ON	For heating and DHW

Set Dip SW 2-6 to set whether the system has a mixing tank.

Dip SW 2-6	Setting
OFF	WITHOUT mixing tank
ON	WITH mixing tank

When Dip SW 2-6 is OFF, back-up operation of boiler is not available.

When Dip SW 2-7 is OFF, 2-zone temperature control is not available.

Set Dip SW 2-7 to set activate or deactivate 2-zone temperature control.

Dip SW 2-7	Setting
OFF	Inactive
ON	Active

When Dip SW 2-7 is OFF, 2-zone temperature control is not available.

Set Dip SW 2-8 to set whether the system has a flow sensor.

Dip SW 2-8	Setting
OFF	WITHOUT flow sensor
ON	WITH flow sensor

Set Dip SW 3-4 to set whether the system has an electric energy meter.

Dip SW 3-4	Setting
OFF	WITHOUT electric energy meter
ON	WITH electric energy meter

Set Dip SW 3-6 to set activate or deactivate 2-zone valve ON/OFF control.

Dip SW 3-6	Setting
OFF	Inactive
ON	Active

Set Dip SW 3-7 to set type of the heat exchanger for DHW.

Dip SW 3-7	Setting
OFF	Coil in tank
ON	External plate HEX

Set Dip SW 3-8 to set whether the system has a heat meter.

Dip SW 3-8	Setting
OFF	WITHOUT heat meter
ON	WITH heat meter

Set Dip SW 4-1 to set activate or deactivate multiple units control.

Dip SW 4-1	Setting
OFF	Inactive
ON	Active

When Dip SW 4-1 is OFF, 2-zone temperature control is not available.

Set Dip SW 4-2 to set master or slave of multiple units control.

Dip SW 4-2	Setting
OFF	Slave
ON	Master

When multiple units control is not available, setting of Dip SW 4-2 is not necessary.

5. Dip Switch setting

<Summary of Function setting>

Dip SW 1-3 (DHW tank)	Dip SW 1-4 (Immersion heater)	Dip SW 1-5 (Booster heater)	Dip SW 1-6 (BH function)	System diagram
ON (WITH DHW tank)	OFF (WITHOUT immersion heater)	ON (WITH booster heater)	ON (For heating and DHW)	
ON (WITH DHW tank)	ON (WITH immersion heater)	ON (WITH booster heater)	ON (For heating and DHW)	
ON (WITH DHW tank)	OFF (WITHOUT immersion heater)	ON (WITH booster heater)	OFF (For heating only)	
ON (WITH DHW tank)	OFF (WITHOUT immersion heater)	OFF (WITHOUT booster heater)	—	
ON (WITH DHW tank)	ON (WITH immersion heater)	ON (WITH booster heater)	OFF (For heating only)	
ON (WITH DHW tank)	ON (WITH immersion heater)	OFF (WITHOUT booster heater)	—	
OFF (WITHOUT DHW tank)	OFF (WITHOUT immersion heater)	ON (WITH booster heater)	OFF	
OFF (WITHOUT DHW tank)	OFF (WITHOUT immersion heater)	OFF (WITHOUT booster heater)	—	

* The use of two 2-way valves can perform same function as a 3-way valve.

5. Dip Switch setting

5.4 Operation setting

Set Dip SW 1-8 to set whether the system has a wireless remote controller.

Dip SW 1-8	Setting
OFF	WITHOUT wireless remote controller
ON	WITH wireless remote controller

Set Dip SW 2-1 to set the room thermostat 1 input (IN1) logic.

Dip SW 2-1	Setting
OFF	Operation stop at thermostat short
ON	Operation stop at thermostat open

Set Dip SW 2-2 to set the flow switch 1 input (IN2) logic.

Dip SW 2-2	Setting
OFF	Failure detection at short
ON	Failure detection at open

Set Dip SW 2-3 to set the restriction on the capacity of booster heater.

Dip SW 2-3	Setting
OFF	Inactive
ON	Active

When Dip SW 2-3 is ON, booster heater 2 operation is not available. (Only booster heater 1 is available)

Notes: ① When installing one booster heater, use OUT6 (Booster Heater 1) and switch SW2-3 to ON.

② When installing two booster heaters, use OUT6 (Booster Heater 1) and OUT7 (Booster heater 2). In such cases, use OUT7 (Booster heater 2) to connect the one with higher capacity.

Reference: Summary of Booster heater control

The booster heater is controlled in the following three steps.

		Booster heater 1 (OUT6)	Booster heater 2 (OUT7)
OFF		OFF	OFF
ON	STEP 1	ON	OFF
	STEP 2	OFF	ON
	STEP 3	ON	ON

Controlled to this extent when SW2-3 is ON.

Set Dip SW 2-4 to set activate or deactivate cooling mode.

Dip SW 2-4	Setting
OFF	Inactive
ON	Active

When Dip SW 2-4 is OFF, cooling mode is not available.

Set Dip SW 2-5 to set the automatic switch to backup heater only operation. (When outdoor unit stops by error.)

Dip SW 2-5	Setting
OFF	Inactive
ON	Active

Set Dip SW 3-1 to set the room thermostat 2 input (IN6) logic.

Dip SW 3-1	Setting
OFF	Operation stop at thermostat short
ON	Operation stop at thermostat open

Set Dip SW 3-2 to set the flow switch 2 input (IN3) logic.

Dip SW 3-2	Setting
OFF	Operation stop at thermostat short
ON	Operation stop at thermostat open

Set Dip SW 3-3 to set the flow switch 3 input (IN7) logic.

Dip SW 3-3	Setting
OFF	Operation stop at thermostat short
ON	Operation stop at thermostat open

Set Dip SW 3-5 to set activate or deactivate heating mode.

Dip SW 3-5	Setting
OFF	Inactive
ON	Active

When the connected outdoor unit is not of PUHZ-FRP model, heating mode is always active regardless of Dip SW3-5 setting.

Set Dip SW 4-4 to set activate or deactivate indoor unit only operation.

Dip SW 4-4	Setting
OFF	Inactive
ON	Active

5. Dip Switch setting

5.5 Emergency mode (Heater only operation)

The emergency mode is available when a failure on the outdoor unit of the heat pump or a communication error occurs.

This mode uses booster heater or immersion heater as a heat source and automatically controls between the DHW mode and the heating mode. When the system is not incorporated with heater, the emergency mode is not available.

Before starting the emergency mode, turn off the outdoor unit and FTC (Master), and then turn Dip SW 4-5 to ON. Then, turn on FTC (Master) to start the emergency mode. FTC (Master) can be power-supplied by the outdoor unit or directly by power source.

If emergency mode is no longer required, please turn off both outdoor and indoor unit power supply before returning Dip SW4-5 to OFF position.

5.6 Emergency mode (Boiler operation)

The emergency mode is available when a failure on the outdoor unit of the heat pump or a communication error occurs.

This mode uses boiler as a heat source and automatically controls the heating mode. When the system is not incorporated with boiler, the emergency mode is not available.

Before starting the emergency mode, turn off the outdoor unit and FTC (Master), and then turn Dip SW 4-6 to ON. Then, turn on FTC (Master) to start the emergency mode. FTC (Master) can be power-supplied by the outdoor unit or directly by power source.

If emergency mode is no longer required, please turn off both outdoor and indoor unit power supply before returning Dip SW4-6 to OFF position.

5.7 Indoor unit only operation (during installation work)

In the case when DHW or heating operation is required prior to connection of the outdoor unit; i.e. during installation work, an electric heater in indoor unit (*1) can be used.

*1 Model with electric heater only.

*2 Not available during Multiple outdoor unit control.

1. To start operation

- Check if the indoor unit power supply is OFF, and turn DIP switch 4-4 and 4-5 ON.
- Turn ON the indoor unit power supply.

2. To end operation*

- Turn OFF the indoor unit power supply.
- Turn DIP switch 4-4 and 4-5 OFF.

*When the indoor unit only operation is ended, ensure to check over the settings after outdoor unit is connected.

Note:

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

6. Before test run

6.1. Check

After completing installation and the wiring and piping of the local application and outdoor units, check for refrigerant leakage, looseness in the power supply or control wiring, wrong polarity, and power cable is securely connected.

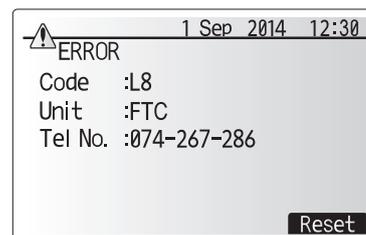
Use a 500-volt megohmmeter to check that the resistance between the power supply terminals and ground is at least 1.0MΩ.

Warning:

Do not use the system if the insulation resistance is less than 1.0MΩ.

Caution:

Do not carry out this test on the control wiring (low voltage circuit) terminals.



6.2. Self-check

When an error occurs when power is applied or during operation

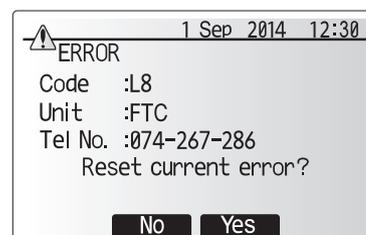
- Indication of error details

The code, unit, address, and telephone number are displayed.

The telephone number is displayed if registered.

- Resetting the error

Press the F4 (RESET) button, and the F3 (Yes) button to reset the current error.



Code	Error	Action
L3	Circulation water temperature overheat protection	Flow rate may be reduced check for; <ul style="list-style-type: none"> • 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	Indoor unit temperature thermistor (THW1, THW2, THW5, THW6, THW7, THW8, THW9) failure	Check resistance across the thermistor.
L6	Circulation water freeze protection	See Action for L3.
L8	Heating operation error	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.
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-TH011HT-E") <ul style="list-style-type: none"> • water leakage • strainer blockage • water circulation pump function
LD	Boiler temperature thermistor (THWB1, THWB2) 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 <ul style="list-style-type: none"> • water leakage • strainer blockage • water circulation pump function
LJ	DHW operation error (type of external plate HEX)	<ul style="list-style-type: none"> • Check for disconnection of DHW tank water temp. thermistor (THW5). • 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).
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 controller and FTC	Check connection cable for damage or loose connections.
E6 - EF	Communication failure between FTC and outdoor unit	Check that the outdoor unit has not been turned off. Check connection cable for damage or loose connections. Refer to outdoor unit service manual.
E9	Outdoor unit receives no signal from indoor unit.	Check both units are switched on. Check connection cable for damage or loose connections. Refer to outdoor unit service manual.
U*, F*	Outdoor unit failure	Refer to outdoor unit service manual.

Note: To cancel error codes please switch system off (Press button E, on Main Controller, for 3 secs).

For description of each LED (LED1 to 3) provided on the FTC, refer to the following table.

LED 1 (Power for microcomputer)	Indicates whether control power is supplied. Make sure that this LED is always lit.
LED 2 (Power for main controller)	Indicates whether power is supplied to the main controller. This LED lights only in the case of the FTC (Master) unit which is connected to the outdoor unit refrigerant address "0".
LED 3 (Communication between FTC and outdoor unit)	Indicates state of communication between the FTC and outdoor unit. Make sure that this LED is always blinking.

7. Main controller operation

Note (Marking for WEEE)



This symbol mark is for EU countries only.

This symbol mark is according to the directive 2012/19/EU Article 14 Information for users and Annex IX.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and re-used.

This symbol means that electrical and electronic equipment, at their end-of-life, should be disposed of separately from your household waste.

Please, dispose of this equipment at your local community waste collection/recycling centre.

In the European Union there are separate collection systems for used electrical and electronic product.

Please, help us to conserve the environment we live in!

7.1. Safety precautions **FOR USER**

- ▶ Before installing the unit, make sure you read all the “Safety Precautions”.
- ▶ The “Safety Precautions” provide very important points regarding safety. Make sure you follow them.
- ▶ Please report to or take consent by the supply authority before connection to the system.

Symbols used in the text

⚠ Warning:

Describes precautions that should be observed to prevent danger of injury or death to the user.

⚠ Caution:

Describes precautions that should be observed to prevent damage to the unit.

Symbols used in the illustrations

 : Indicates a part which must be grounded.

⚠ Warning:

- For appliances not accessible to the general public.
- The unit must not be installed by the user. Ask the dealer or an authorized company to install the unit. If the unit is installed improperly, water leakage, electric shock or fire may result.
- Do not stand on, or place any items on the unit.
- Do not splash water over the unit and do not touch the unit with wet hands. An electric shock may result.
- Do not spray combustible gas close to the unit. Fire may result.
- Do not place a gas heater or any other open-flame appliance where it will be exposed to the air discharged from the unit. Incomplete combustion may result.
- Do not remove the front panel or the fan guard from the outdoor unit when it is running.
- When you notice exceptionally abnormal noise or vibration, stop operation, turn off the power switch, and contact your dealer.

- Never insert fingers, sticks etc. into the intakes or outlets.
- If you detect odd smells, stop using the unit, turn off the power switch and consult your dealer. Otherwise, a breakdown, electric shock or fire may result.
- If the supply cable is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- If the refrigeration gas blows out or leaks, stop the operation of the air conditioner, thoroughly ventilate the room, and contact your dealer.
- Do not install in location that is hot or humid for long periods of time.

⚠ Caution:

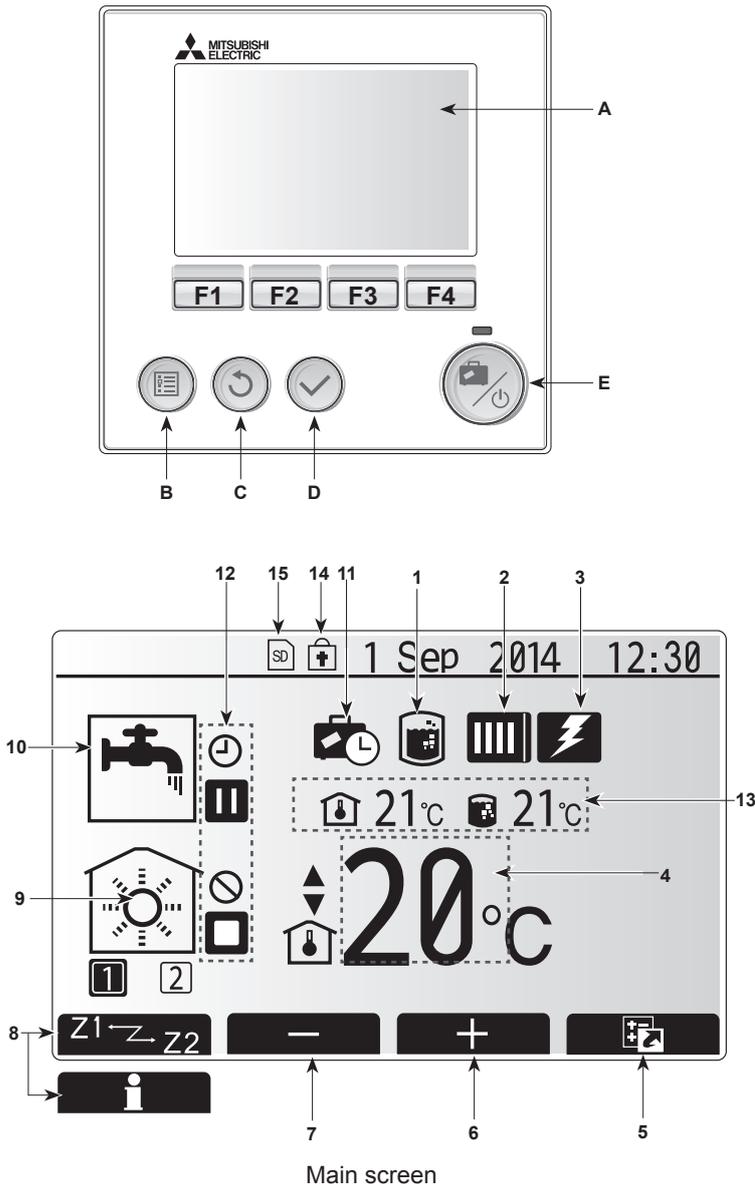
- Do not use any sharp object to push the buttons, as this may damage the main controller.
- Never block or cover the indoor or outdoor unit's intakes or outlets.

Disposing of the unit

When you need to dispose of the unit, consult your dealer.

7. Main controller operation

7.2 Main Controller



<Main 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 secs 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 system protection functions (e.g. freeze stat. function) will NOT operate. Please beware that without these safety functions enabled the system 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.
		Defrosting.
		Emergency heating.
3	Electric heater	When this icon is displayed the 'Electric heaters' (booster or 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/cooling mode	Heating mode Zone1 or Zone2
		Cooling mode
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
	⏹	Stand-by (*2)
	⏻	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.(*3)
15	SD	SD memory card is inserted. Normal operation.
		SD memory card is inserted. Abnormal operation.

*2 This unit is in Stand-by whilst other indoor unit(s) is in operation by priority.

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

7. Main controller operation

■ Setting the Main Controller

After the power has been connected to the outdoor and FTC unit (See chapter 4.1) the initial system settings can be entered via the main controller.

1. Check all breakers and other safety devices are correctly installed and turn on power to the system.
2. When the main controller switched on for the first time, the screen automatically goes to Initial settings menu, Language setting screen and Date/Time setting screen in order.
3. Main controller will automatically start up. Wait approximately 6 mins whilst the control menus load.
4. When the controller is ready a blank screen with a line running across the top will be displayed.
5. Press button E (Power) (refer to page 34) to turn on the system. Before turning on the system, perform initial settings as instructed below.

■ 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

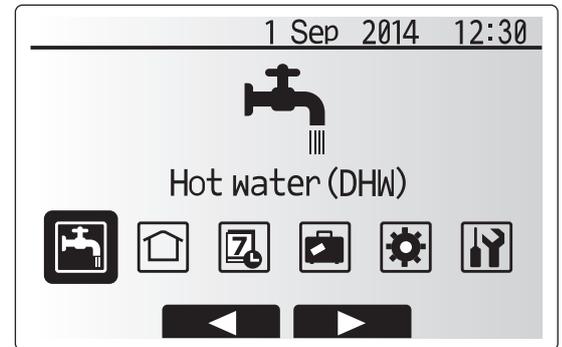
If the MENU button is pressed once for a short time the main settings will be displayed but without the edit function. This will enable the user to view current settings but **NOT** change the parameters.

Installer Level – Long press

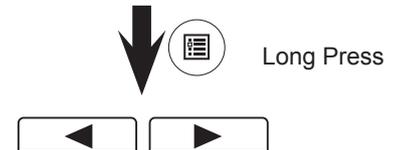
If the MENU button is pressed down for 3 secs the main settings will be displayed with all functionality available.

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

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



Main menu

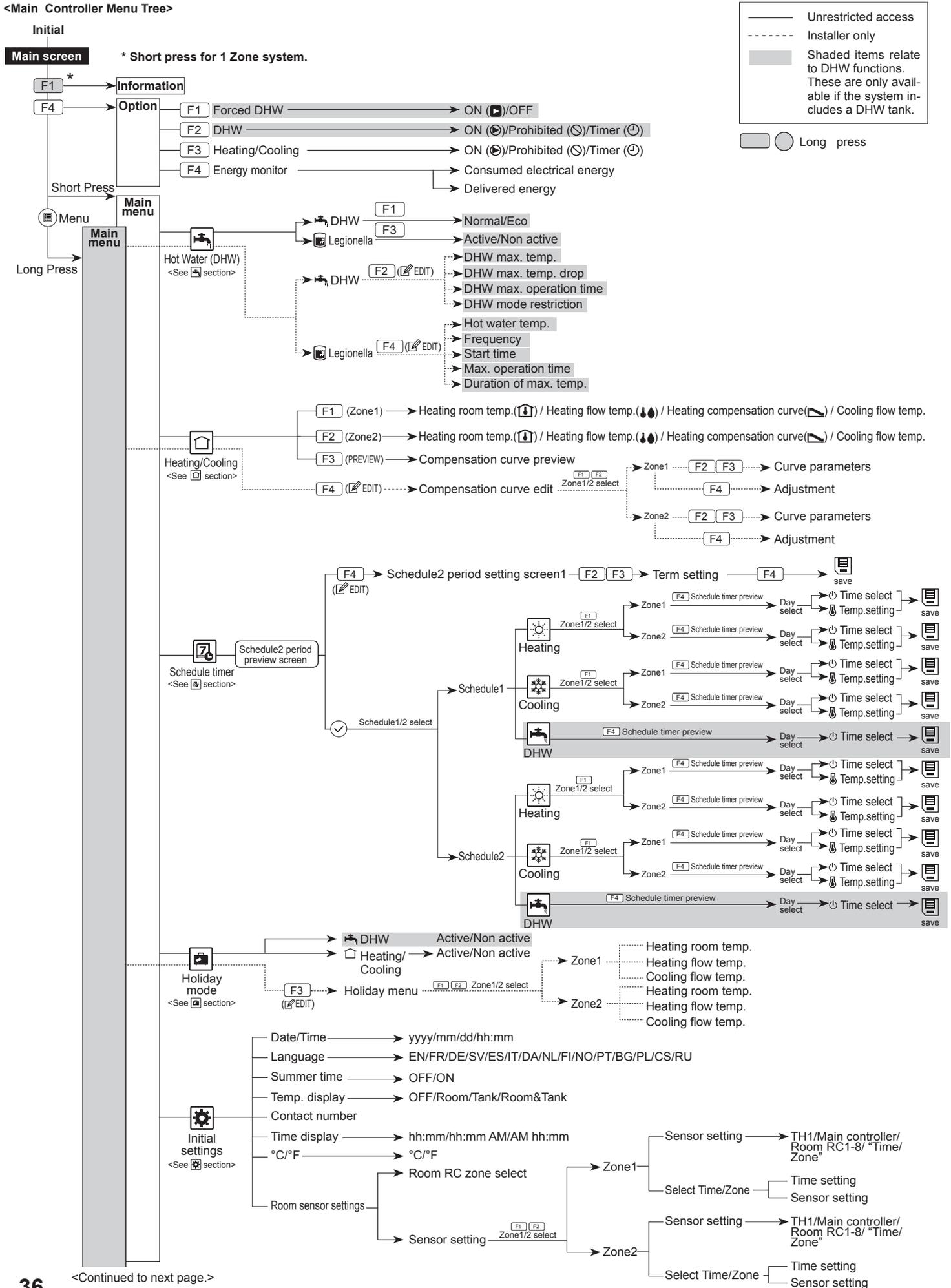


General Operation

- To find the icon that you wish to set, use the F2 and F3 buttons to move between the icons.
- The highlighted icon will appear as a larger version of the center of the screen.
- Press CONFIRM to select and edit the highlighted mode.
- Follow the <Main Controller Menu Tree> for further setting, using ◀▶ buttons for scrolling or F1 to F4 for selecting.

7. Main controller operation

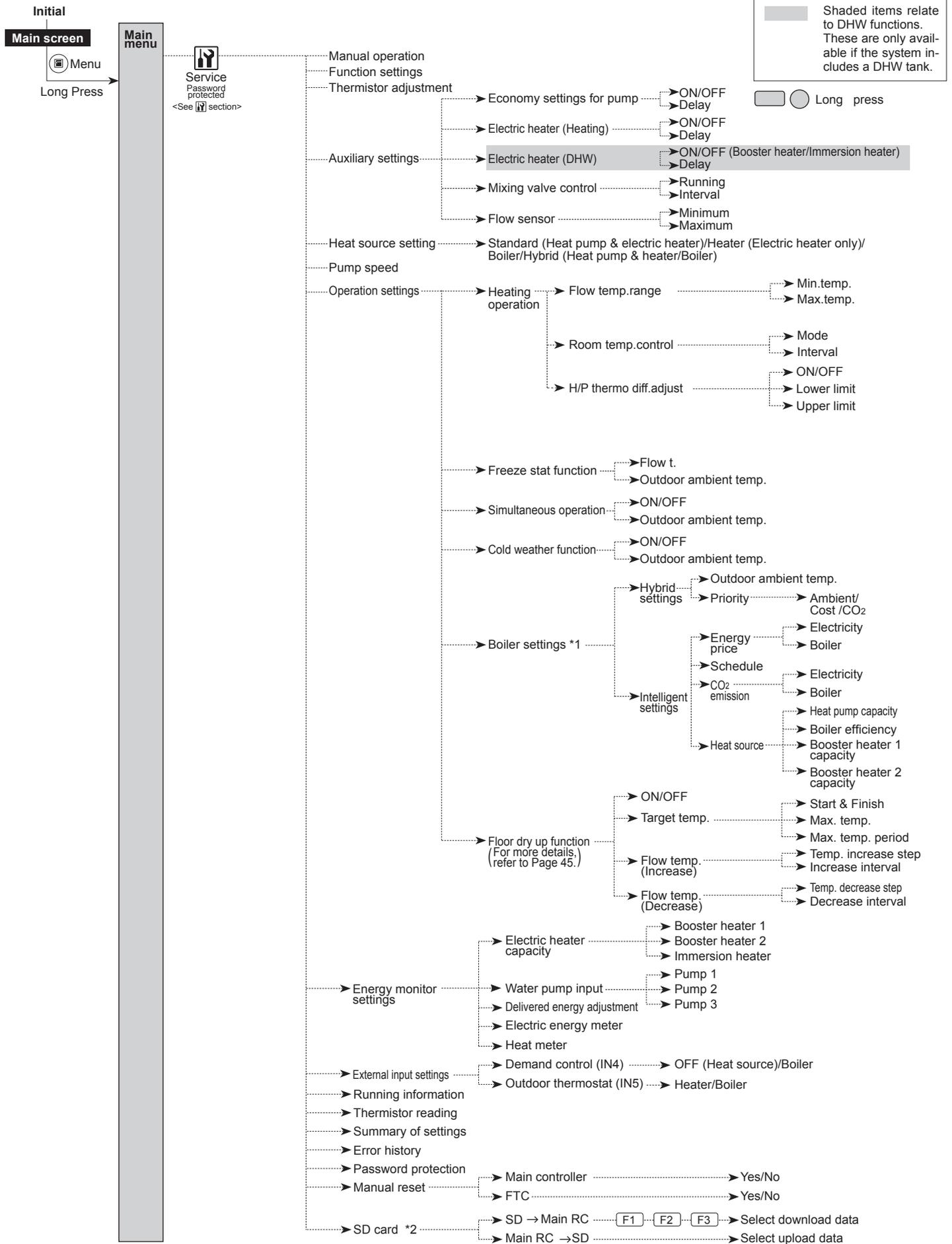
<Main Controller Menu Tree>



7. Main controller operation

<Main Controller Menu Tree>

<Continued from the previous page.>



*1 For more details, refer to the installation manual of PAC-TH011HT-E.

*2 The SD card setting for multiple outdoor units control should be done after turning the power supply of all FTC units (Master/ Slave) ON. If "COMPLETE!" does not appear, it means the operation is not properly completed. Reset the whole system before re-try.

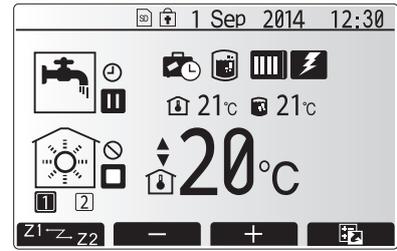
7. Main controller operation

General Operation

In general operation the screen displayed on the main controller will be shown as in the figure on the right.

This screen shows the target temperature, space heating mode, DHW mode (if DHW tank is present in system), any additional heat sources being used, holiday mode, and the date and time.

You should use the function buttons to access more information. When this screen is displayed pressing F1 will display the current status and pressing F4 will take the user to the option menu screen.



Home screen

<Option screen>

This screen shows the main operating modes of the system.

Use function buttons to switch between Operating (▶), Prohibited (⊘) and Timer (⌚) for DHW and space heating/cooling, or detailed information on energy or capacity.

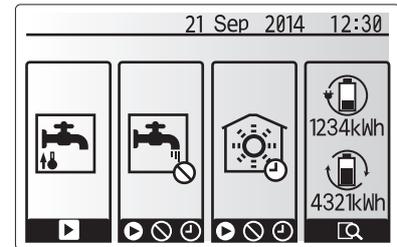
The option screen allows quick setting of the following;

- Forced DHW (if DHW tank present) — to turn ON/OFF press F1
- DHW operating mode (if DHW tank present) — to change mode press F2
- Space heating/cooling operating mode — to change mode press F3
- Energy monitor

Following accumulated energy values are displayed.

- ⌚ : Consumed electric energy in total (month-to-date)
- ⌚ : Produced heat energy in total (month-to-date)

To monitor the energy values in each operation mode for [month-to-date/ last month/ the month before last/ year-to-date/ last year], press F4 to access to the Energy monitor menu.



Option screen

Note:

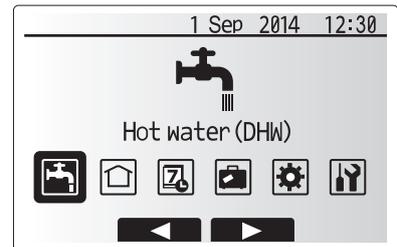
If a certain accuracy is required for the monitoring, the method to display captured data from external energy meter(s) should be set up. Contact your installer for further details.

Main Settings Menu

To access the main settings menu press button B 'MENU'

The following menus will be displayed;

- DHW (FTC unit plus locally supplied DHW tank)
- Heating/Cooling
- Schedule timer
- Holiday mode
- Initial settings
- Service (Password protected)



Main settings menu screen

Initial Settings

1. From the main settings menu use F2 and F3 buttons to highlight 'Initial settings' icon and select by pressing CONFIRM.
2. Use F1 and F2 buttons to scroll through the menu list. When the required title is highlighted then press CONFIRM to edit.
3. Use the relevant function buttons to edit each initial setting then press CONFIRM to save the setting.

Initial settings that can be edited are

- Date/Time *Be sure to set it to the local standard time.
- Language
- Summer time
- Temp. display
- Contact number
- Time display
- °C/°F
- Room sensor settings

To return to the main settings menu press the BACK button.

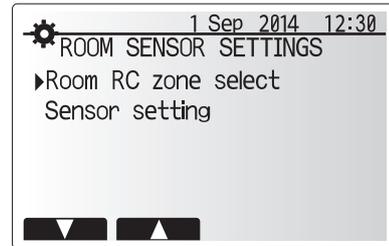
Icon	Description
	Hot water (DHW)
	Heating/Cooling
	Schedule timer
	Holiday mode
	Initial settings
	Service

7. Main controller operation

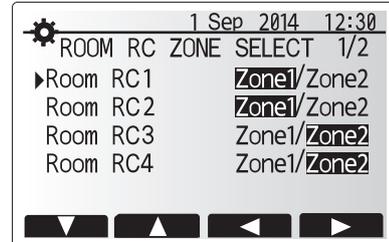
<Room sensor settings>

For room sensor settings it is important to choose the correct room sensor depending on the heating mode the system will operate in.

1. From the Initial settings menu select Room sensor settings.



2. When 2-zone temperature control is active and wireless remote controllers are available, from Room RC zone select screen, select zone no. to assign to each remote controller.

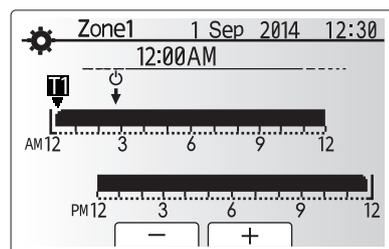
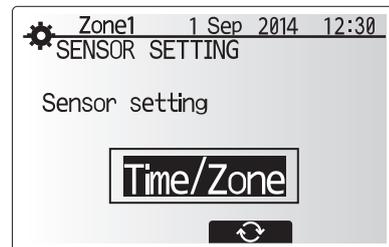
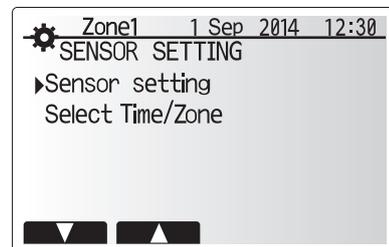


3. From Sensor setting screen, select a room sensor to be used for monitoring the room temperature from Zone1 and Zone2 separately.

Control option ("Remote Controller Options" (Installation manual))	Corresponding initial settings room sensor	
	Zone1	Zone2
A	Room RC1-8 (one each for Zone1 and Zone2)	*
B	TH1	*
C	Main controller	*
D	*	*

* Not specified (if a field-supplied room thermostat is used)
Room RC1-8 (one each for Zone1 and Zone2) (if a wireless remote controller is used as a room thermostat)

4. From Sensor setting screen, select Time/Zone to make it possible to use different room sensors according to the time schedule set in the Select Time/Zone menu. The room sensors can be switched up to 4 times within 24 hours.



Time/Zone schedule setting screen

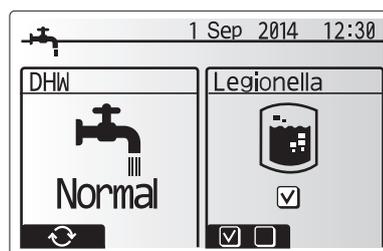
7. Main controller operation

Domestic Hot Water (DHW)/Legionella Prevention

The domestic hot water and legionella prevention menus control the operation of DHW tank heat ups.

<DHW mode settings>

1. Highlight the hot water icon and press CONFIRM.
2. Use button F1 to switch between Normal and ECO heating modes.
3. To edit the mode, press down the MENU button for 3 secs, then select "hot water".
4. Press F2 key to display the HOTWATER (DHW) SETTING menu.
5. Use F2 and F3 keys to scroll through the menu selecting each component in turn by pressing CONFIRM. See the table below for description of each setting.
6. Enter the desired number using the function keys and press CONFIRM.



Menu subtitle	Function	Range	Unit	Default value
DHW max. temp	Desired temperature of stored hot water	40 - 60	°C	50
DHW max. temperature drop	Difference in temperature between DHW max. temp and the temperature at which DHW mode restarts	5 - 30	°C	10
DHW max. operation time	Max time allowed for stored water heating DHW mode	30 - 120	min	60
DHW mode restriction	The time period after DHW mode when space heating has priority over DHW mode temporarily preventing further stored water heating (Only when DHW max. operation time has passed.)	30 - 120	min	30

If you wish to make changes contact installer.

Explanation of DHW operation

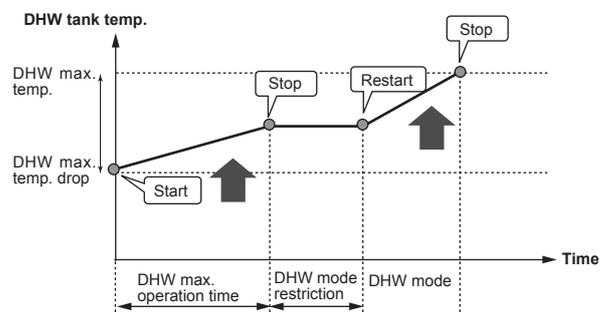
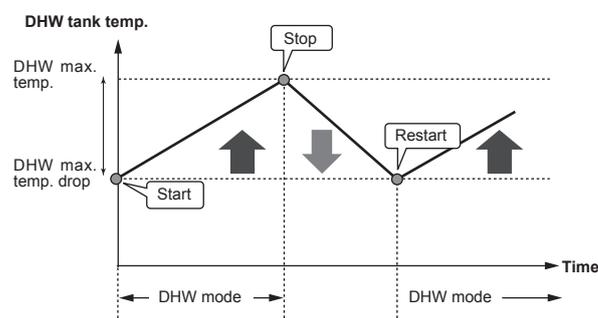
- When the DHW tank temperature drops from "DHW max. temp" by more than the "DHW max. temperature drop" (set by installer), DHW mode operates and the flow from the primary heating/cooling circuit is diverted to heat the water in the DHW tank.
- When the temperature of the stored water reaches the 'DHW max. temp.' set by the installer or if the 'DHW max. operation time' set by the installer is exceeded DHW mode ceases to operate.
- Whilst DHW mode is in operation primary hot water is not directed to the space heating/cooling circuit.
- Directly after DHW max. operation time 'DHW mode restriction' will routinely operate. The duration of this feature is set by the installer and during its operation, DHW mode can not (normally) be reactivated, allowing time for the system to deliver primary hot water to the space heating/cooling if required. However, if at this time there is no current demand for space heating/cooling, the system will automatically resume DHW mode. This will continue until it receives a demand for space heating.
- After the 'DHW mode restriction' operation the DHW mode can operate again and DHW tank heating will continue according to system demand.

<Eco mode>

DHW mode can run in either 'Normal' or 'Eco' mode. Normal mode will heat the water in the DHW tank more quickly using the full power of the heat pump. Eco mode takes a little longer to heat the water in the DHW tank but the energy used is reduced. This is because heat pump operation is restricted using signals from the FTC based on measured DHW tank temperature.

Note: The actual energy saved in Eco mode will vary according to outdoor ambient temperature.

Return to the DHW/legionella prevention menu.

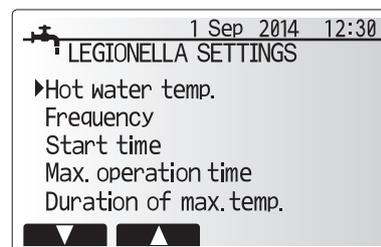


Legionella Prevention Mode settings (LP mode)

1. Use button F3 to choose legionella mode active YES/NO.
2. To edit the legionella function, press down the MENU button for 3 secs and select "hot water", then press F4 key.
3. Use F1 and F2 keys to scroll through the menu selecting each subtitle in turn by pressing CONFIRM. See the table below for description of each setting.
4. Enter the desired number using the function keys and press CONFIRM.

During Legionella Prevention Mode the temperature of the stored water is increased above 60°C to inhibit legionella bacterium growth. It is strongly recommended that this is done at regular intervals. Please check local regulations for the recommended frequency of heat ups.

Note: When failures occur on the FTC unit, the LP mode may not function normally.



Menu subtitle	Function	Range	Unit	Default value
Hot water temp.	Desired temp of stored hot water	60-70	°C	65
Frequency	Time between LP mode DHW tank heat ups	1-30	day	15
Start time	Time when LP mode will begin	0:00-23:00	-	03:00
Max. operation time	Maximum time allowed for LP mode DHW tank heat	1-5	hour	3
Duration of max. temp.	The time period after LP mode max. water temp has been reached	1-120	min	30

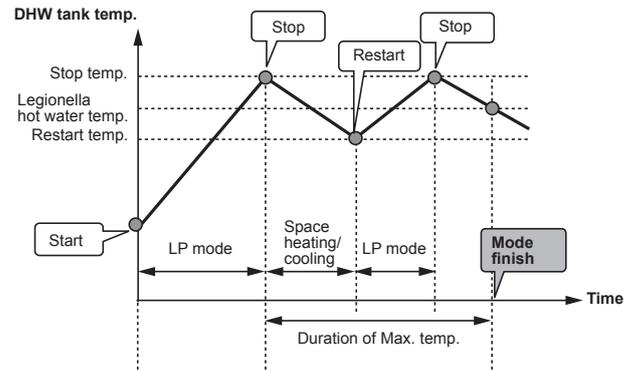
If you wish to make changes contact installer.

7. Main controller operation

Explanation of Legionella Prevention Mode operation

- At the time entered by the installer 'Start time' flow of useful heat from the system is diverted to heat the water in the DHW tank.
- When the temperature of the stored water exceeds the 'Hot Water temp.' set by the installer (above 65°C) primary circuit water is no longer diverted to heat the DHW tank.
- Whilst LP mode is in operation hot water is not directed to the space heating / cooling circuit.
- Directly after LP mode operation 'Duration of max. temp.' will operate. The duration of this feature is set by the installer and during its operation stored water temperature will be monitored.
- If stored water temperature should drop to LP restart temp, LP mode will restart and primary water flow from the heat source(s) will be directed to the DHW tank to boost the temperature. Once the set time for Duration of Max. temp has passed LP mode will not recur for the set interval (set by installer).
- It is the responsibility of the installer to ensure the settings for legionella prevention are compliant with local and national guidelines.

Please note that LP mode uses the assistance of electric heaters (if present) to supplement the energy input of the heat pump. Heating water for long periods of time is not efficient and will increase running costs. The installer should give careful consideration to the necessity of legionella prevention treatment whilst not wasting energy by heating the stored water for excessive time periods. The end user should understand the importance of this feature. **ALWAYS COMPLY WITH LOCAL AND NATIONAL GUIDANCE FOR YOUR COUNTRY REGARDING LEGIONELLA PREVENTION.**



(LP mode: Legionella Prevention mode)

Forced DHW

The forced DHW function is used to force the system to operate in DHW mode. In normal operation the water in the DHW tank will be heated either to the set temperature or for the maximum DHW time, whichever occurs first. However should there be a high demand for hot water 'Forced DHW' function can be used to prevent the system from routinely switching to space heating/cooling and continue to provide DHW tank heating.

Forced DHW operation is activated by pressing button F1 and Back button in the 'Option Screen'. After DHW operation finishes, the system will automatically return to normal operation. To cancel forced DHW operation hold down button F1 in the 'Option Screen'.

Heating/Cooling

The heating/cooling menus deal with space heating/cooling using normally either a radiator, fan-coil, or underfloor heating/cooling system depending on the installation.

There are 3 heating modes

- Heating room temp. (Auto adaptation) (🏠)
- Heating flow temp (💧)
- Heating compensation curve (📈)
- Cooling flow temp (💧)

<Room temp (Auto adaptation) mode>

This mode is explained in detail in 'Overview of Controls' Section (Operation manual, page 4).

<Flow temp mode>

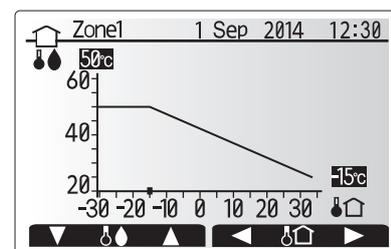
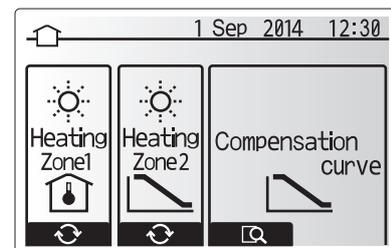
The temperature of the water flowing to the heating circuit is set by the installer to best suit the space heating/cooling system design, and user's desired requirements.

Explanation of compensation curve

During late spring and summer usually the demand for space heating is reduced. To prevent the heat pump from producing excessive flow temperatures for the primary circuit the compensation curve mode can be used to maximise efficiency and reduce running costs.

The compensation curve is used to restrict the flow temperature of the primary space heating circuit dependent on the outdoor temperature. The FTC uses information from both an outdoor temperature sensor and a temperature sensor on the primary circuit supply to ensure the heat pump is not producing excessive flow temperatures if the weather conditions do not require it.

Your installer will set the parameters of the graph depending on local conditions and type of space heating used in your home. It should not be necessary for you to alter these settings. If however you find that over a reasonable operating period the space heating is not heating or is overheating your home, please contact your installer so they can check your system for any problems and update these settings if necessary.



🏠 : Flow temp.
🏠 : Outdoor ambient temp.

7. Main controller operation

Holiday Mode

Holiday mode can be used to keep the system running at lower flow temperatures and thus reduced power usage whilst the property is unoccupied. Holiday mode can run either flow temp, room temp, heating, compensation curve heating and DHW all at reduced flow temperatures to save energy if the occupier is absent.

From the main menu screen press button E should be pressed. Be careful not to hold down button E for too long as this will turn off the controller and system.

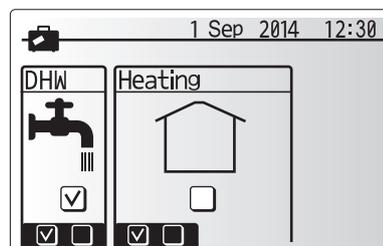
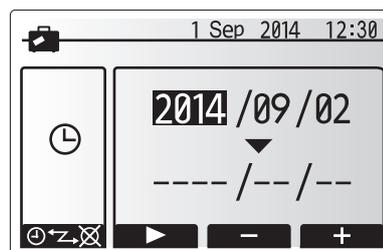
Once the holiday mode activation screen is displayed you can activate/deactivate and select the duration that you would like holiday mode to run for.

- Press button F1 to activate or deactivate holiday mode
- Use buttons F2, F3 and F4 to input the date which you would like holiday mode to activate or deactivate holiday mode for space heating.

<Editing holiday mode>

Refer to the menu tree in "7.2 Main controller" of Installation Manual.

Should you require the Holiday mode settings e.g. the flow temp, room temp to be altered you should contact your installer.



Schedule timer

Scheduled timer can be set in two ways, for example; one for summer and the other for winter. (Refer to as "Schedule 1" and "Schedule 2" respectively.) Once the term (months) for the Schedule 2 is specified, rest of the term will be specified as Schedule 2. In each Schedule, an operational pattern of modes (Heating / DHW) can be set. If no operational pattern is set for Schedule2, only the pattern for Schedule 1 will be valid. If Schedule 2 is set to full-year (i.e. March to Feb.), only the operational pattern for Schedule 2 will be valid.

The schedule timer is activated or deactivated in the option screen. (See 'General Operation' section)

<Setting the Schedule period>

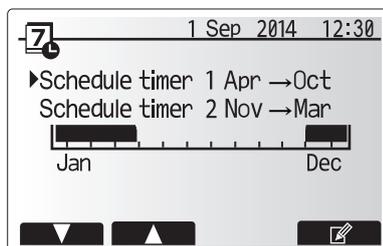
1. From the main settings menu use F2 and F3 to highlight the schedule icon then press CONFIRM.
2. The Schedule period preview screen is displayed.
3. To change the Schedule period, press F4. button.
4. The time bar edit screen is displayed.
5. Use F2/F3 button to point at a starting month of the Schedule2, then press CONFIRM.
6. Use F2/F3 button to point at an ending month of the Schedule2, then press CONFIRM.
7. Press F4 to save settings.

<Setting the Schedule timer>

1. From the main settings menu use F2 and F3 to highlight the schedule icon then press CONFIRM.
2. From the schedule 2 period preview screen use F1 and F2 to scroll through the selecting each subtitle in turn by pressing CONFIRM.
3. The schedule timer sub menu will be displayed. The icons show the following modes;
 - Heating
 - Cooling
 - DHW
4. Use F2 and F3 buttons to move between mode icons press CONFIRM to be shown the PREVIEW screen for each mode.

The preview screen allows you to view the current settings. In 2-zone heating operation, press F1 to switch between Zone1 and Zone2. Days of the week are displayed across the top of the screen. Where day appears underlined the settings are the same for all those days underlined.

Hours of the day and night are represented as a bar across the main part of the screen. Where the bar is solid black, space heating/cooling and DHW (whichever is selected) is allowed.



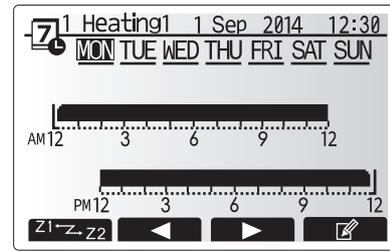
Schedule2 period preview screen



Schedule1 mode select screen

7. Main controller operation

5. In the preview menu screen press F4 button.

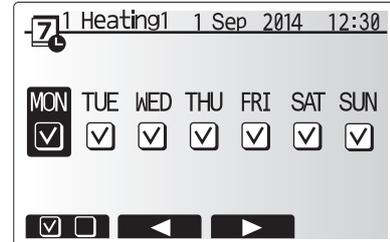


Preview screen

6. First select the days of the week you wish to schedule.

7. Press F2/F3 buttons to move between days and F1 to check or uncheck the box.

8. When you have selected the days press CONFIRM.



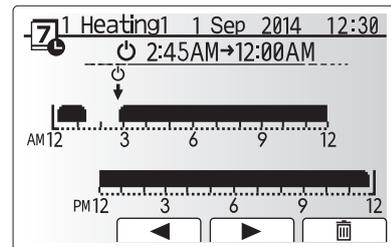
Day of week select screen

9. The time bar edit screen will be displayed.

10. Use buttons F2/F3 to move to the point at which you do not want the selected mode to be active press CONFIRM to start.

11. Use F3 button to set the required time of inactivity then press CONFIRM.

12. You can add up to 4 periods of inactivity within a 24 hour interval.



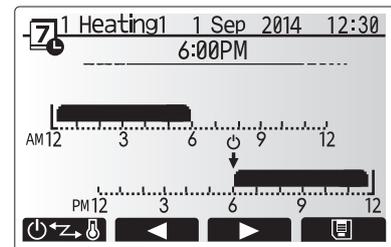
Time of period setting screen 1

13. Press F4 to save settings.

When scheduling heating, button F1 changes the scheduled variable between time and temperature. This enables a lower temperature to be set for a number of hours e.g. a lower temperature may be required at night when the occupants are sleeping.

Note:

- The schedule timer for space heating/cooling and DHW are set in the same way. However for DHW only time can be used as scheduling variable.
- A small rubbish bin character is also displayed choosing this icon will delete the last unsaved action.
- It is necessary to use the SAVE function F4 button to save settings. CONFIRM does NOT act as SAVE for this menu.



Time of period setting screen 2

7. Main controller operation

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. Operation settings
8. Energy monitor settings
9. External input settings
10. Running information
11. Thermistor reading
12. Summary of settings
13. Error history
14. Password protection
15. Manual reset
16. 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. Pump speed
5. Operation settings
6. Energy monitor settings
7. External input settings
8. Password protection
9. Manual reset
10. SD card

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

Many functions can not be set whilst the indoor 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 controller will display a reminder message prompting the installer to stop operation before continuing. By selecting "Yes" the unit will cease operation.

<Manual operation>

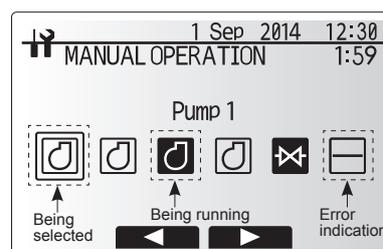
During the filling of the system the water circulation pump and 3-way valve can be manually overridden using manual operation mode.

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 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.



Manual operation menu screen

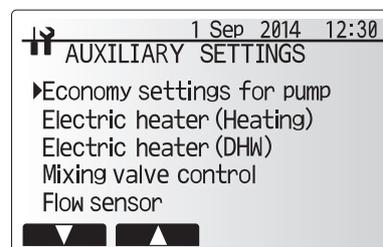
<Auxiliary settings>

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 in certain period of time from when operation is finished.
Delay	Time before pump switched off *1
Electric heater (Heating)	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 from 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	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	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/Cooling mode.

*2. Set the Running time according to the specifications of the actuators 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.



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.

7. Main controller operation

<Operation settings>

Heating operation

This function allows operational setting of flow temperature range from the Ecodan 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.	25 - 45	°C	30
	Maximum temp.	To set max. possible flow temperature according to the type of heat emitters.	35 - 60	°C	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.*3	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 - 60	mins.	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 - -1	°C	-5
	Upper limit	Allows heat pump operation until the flow temperature rises above the target flow temperature plus upper limit value.	+3 - +5	°C	+5

<Table 7.2.1> Heating operation (Room temp. control table)

Note:

1. The minimum flow temperature that prohibits heat pump operation is 20°C.
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	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 - 20°C) 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 20°C 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 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 heating or DHW is provided only by the electric booster heater (and immersion if present). This function is intended for use during extreme cold periods only. Extensive use of direct electrical heaters ONLY will result in higher power consumption and may reduce working life of heaters and related parts.

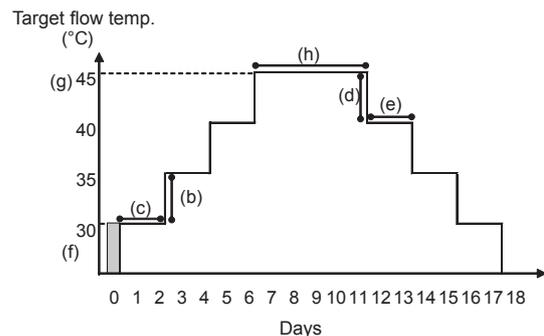
- Range of outdoor ambient temperature at which cold weather function starts is -30°C to -10°C (default -15°C).
- System shall automatically return to routine operation. This will happen when the outdoor ambient temperature rises above the selected temp for this specific mode of operation.

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.



- This function is not available when a PUHZ-FRP outdoor unit is connected.
- 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 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 - +10	°C	+5
	Increase interval	c	Sets the period for which the same target flow temperature is maintained.	1 - 7	day	2
Flow temp. (decrease)	Flow temp. decrease step	d	Sets the decrease step of the target flow temperature.	-1 - -10	°C	-5
	Decrease interval	e	Sets the period for which the same target flow temperature is maintained.	1 - 7	day	2
Target temperature	Start & Finish	f	Sets the target flow temperature at the start and the finish of the operation.	25 - 60	°C	30
	Max. target temp.	g	Sets the maximum target flow temperature.	25 - 60	°C	45
	Max. temp. period	h	Sets the period for which the maximum target flow temperature is maintained.	1 - 20	day	5

7. Main controller operation

<Energy monitor settings>

In this menu, all parameters required to record the consumed electric energy and the delivered heat energy which is displayed on the main 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.

Refer to the section [Energy Monitor] in "3. system"

<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 secs
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**.

<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.

<SD card>

The use of an SD memory card simplifies the main controller settings in the field.

Notes:

1. Ecodan service tool (for use with PC tool) is necessary for the setting.
2. The SD card setting for multiple outdoor units control should be done after turning the power supply of all FTC units (Master/ Slave) ON.
3. If "COMPLETE!" does not appear, it means the operation is not properly completed. Reset the whole system before re-try.



Password input screen



Password verify screen

7. Main controller operation

■ 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 controller screen		Parameters	Default setting	Field setting	Notes	
Main	Zone1 heating room temp.		10°C - 30°C	20°C		
	Zone2 heating room temp. *1		10°C - 30°C	20°C		
	Zone1 heating flow temp.		25°C - 60°C	45°C		
	Zone2 heating flow temp. *1		25°C - 60°C	35°C		
	Zone1 cooling flow temp.		5°C - 25°C	15°C		
	Zone2 cooling flow temp.		5°C - 25°C	20°C		
	Zone1 heating compensation curve		-9°C - + 9°C	0°C		
	Zone2 heating compensation curve *1		-9°C - + 9°C	0°C		
	Holiday mode		Active/Non active/Set time	—		
Option	Forced DHW operation		On/Off	—		
	DHW		On/Off/Timer	On		
	Heating/Cooling		On/Off/Timer	On		
	Energy monitor		Consumed electric energy/Delivered energy	—		
Setting	DHW *13	Operation mode	Normal/Eco	Normal		
		DHW max. temp.	40°C - 60°C *2	50°C		
		DHW temp. drop	5°C - 30°C	10°C		
		DHW max. operation time	30 - 120 mins	60 mins		
		DHW mode restriction	30 - 120 mins	30 mins		
	Legionella prevention *13	Active	Yes/No	Yes		
		Hot water temp.	60°C - 70°C *2	65°C		
		Frequency	1 - 30 days	15 days		
		Start time	00.00 - 23.00	03.00		
		Max. operation time	1 - 5 hours	3 hours		
		Duration of maximum temp.	1 - 120 mins	30 min		
	Heating/ Cooling *12	Zone1 operation mode	Heating room temp/ Heating flow temp/ Heating compensation curve/ Cooling flow temp	Room temp		
		Zone2 operation mode *1	Heating room temp/ Heating flow temp/ Heating compensation curve/ Cooling flow temp	Compensation curve		
	Compensation curve	Hi flow temp. set point	Zone1 outdoor ambient temp.	-30°C - +33°C *3	-15°C	
			Zone1 flow temp.	25°C - 60°C	50°C	
			Zone2 outdoor ambient temp. *1	-30°C - +33°C *3	-15°C	
			Zone2 flow temp. *1	25°C - 60°C	40°C	
		Lo flow temp. set point	Zone1 outdoor ambient temp.	-28°C - +35°C *4	35°C	
			Zone1 flow temp.	25°C - 60°C	25°C	
			Zone2 outdoor ambient temp. *1	-28°C - +35°C *4	35°C	
			Zone2 flow temp.	25°C - 60°C	25°C	
		Adjust	Zone1 outdoor ambient temp.	-29°C - +34°C *5	—	
			Zone1 flow temp.	25°C - 60°C	—	
			Zone2 outdoor ambient temp. *1	-29°C - +34°C *5	—	
			Zone2 flow temp. *1	25°C - 60°C	—	
	Holiday	DHW *13		Active/Non active	Non active	
		Heating/ Cooling		Active/Non active	Active	
Zone1 heating room temp.		10°C - 30°C	15°C			
Zone2 heating room temp. *1		10°C - 30°C	15°C			
Zone1 heating flow temp.		25°C - 60°C	35°C			
Zone2 heating flow temp. *1		25°C - 60°C	25°C			
Zone1 cooling flow temp.		5°C - 25°C	25°C			
Zone2 cooling flow temp.		5°C - 25°C	25°C			
Initial settings	Language		EN/FR/DE/SV/ES/IT/DA/NL/FI/NO/PT/BG/PL/CS/RU	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		
Service menu	Thermistor adjustment	THW1	-10°C - +10°C	0°C		
		THW2	-10°C - +10°C	0°C		
		THW5	-10°C - +10°C	0°C		
		THW6	-10°C - +10°C	0°C		
		THW7	-10°C - +10°C	0°C		
		THW8	-10°C - +10°C	0°C		
		THW9	-10°C - +10°C	0°C		
		THWB1	-10°C - +10°C	0°C		
		THWB2	-10°C - +10°C	0°C		
		Auxiliary settings	Economy settings for pump.		On/Off *6	On
	Delay			10 mins		
	Electric heater (Heating)		Space heating: On (used)/Off (not used)	On		
	Electric heater (DHW) *12		Electric heater delay timer (5 - 180 mins)	30 mins		
	Booster heater		DHW: On (used)/Off (not used)	On		
	Immersion heater		DHW: On (used)/Off (not used)	On		
	Electric heater delay timer (15 - 30 mins)			15 mins		
	Mixing valve control	Running (10 - 240 secs)			120 secs	
Interval (1 - 30 mins)			2 mins			
Flow sensor		Minimum (0 - 100L/min.)	5 L/min.			
		Maximum (0 - 100L/min.)	100 L/min.			

*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 are ON).

*2 For the model without both booster and immersion heater, it may not reach the set temperature depending on the outside ambient temperature.

*3 The lower limit is -15°C depending on the connected outdoor unit.

*4 The lower limit is -13°C depending on the connected outdoor unit.

*5 The lower limit is -14°C depending on the connected outdoor unit.

7. Main controller operation

Engineers Forms

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

Main controller screen			Parameters	Default setting	Field setting	Notes	
Service menu	Pump speed		Pump speed (1 - 5)	5			
	Heat source setting		Standard/Heater/Boiler/Hybrid *7	Standard			
	Operation settings	Heating operation *8	Flow temp.range *10	Min.temp. (25 - 45°C)	30°C		
			Room temp.control	Max.temp. (35 - 60°C)	50°C		
				Mode (Normal/Fast)	Normal		
			Heat pump thermo diff.adjust	Interval (10 - 60min.)	10min.		
		On/Off *6		On			
		Freeze stat function *11		Outdoor ambient temp. (3 - 20°C) / **	5°C		
		Simultaneous operation (DHW/Heating)		On/Off *6	Off		
		Cold weather function		On/Off *6	Off		
		Boiler operation		Outdoor ambient temp. (-30 - +10°C) *4	-15°C		
		Hybrid settings		Priority mode (Ambient/Cost/CO ₂)	Ambient		
	Intelligent settings		Energy price *9	Electricity (0.001 - 999 */kWh) Boiler (0.001 - 999 */kWh)	0.5 */kWh 0.5 */kWh		
	CO ₂ emission		Electricity (0.001 - 999 kg -CO ₂ /kWh) Boiler (0.001 - 999 kg -CO ₂ /kWh)	0.5 kg -CO ₂ /kWh 0.5 kg -CO ₂ /kWh			
	Heat source		Heat pump capacity (1 - 40 kW) Boiler efficiency (25 - 150%) Booster heater 1 capacity (0 - 30 kW) Booster heater 2 capacity (0 - 30 kW)	11.2 kW 80% 2 kW 4 kW			
	Floor dry up function		On/Off *6	Off			
	Target temp.		Start&Finish (25 - 60°C) Max. temp. (25 - 60°C) Max. temp. period (1 - 20 days)	30°C 45°C 5 days			
	Flow temp. (Increase)		Temp. increase step (+1 - +10°C) Increase interval (1 - 7 days)	+5°C 2 days			
	Flow temp. (Decrease)		Temp. decrease step (-1 - -10°C) Decrease interval (1 - 7 days)	-5°C 2 days			
	Energy monitor settings		Electric heater capacity	Booster heater 1 capacity Booster heater 2 capacity Immersion heater capacity	2kW 4kW 0kW		
	Delivered energy adjustment			-50 - +50%	0%		
	Water pump input		Pump 1 Pump 2 Pump 3	0 - 200W or ***(factory fitted pump) 0 - 200W 0 - 200W	*** 0W 0W		
	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		

*6 On: the function is active; Off: the function is inactive.

*7 When DIP SW1-1 is set to OFF "WITHOUT Boiler" or SW2-6 is set to OFF "WITHOUT Mixing tank", neither Boiler nor Hybrid can be selected.

*8 Valid only when operating in Room temp. control mode.

9 "" of "*/kwh" represents currency unit (e.g. € or £ or the like)

*10 Valid only when operating in Heating room temperature.

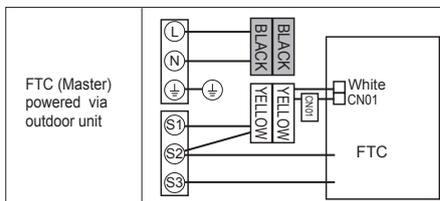
*11 If asterisk (**) is chosen freeze stat function is deactivated. (i.e. primary water freeze risk)

*12 Only available if DHW tank present in system.

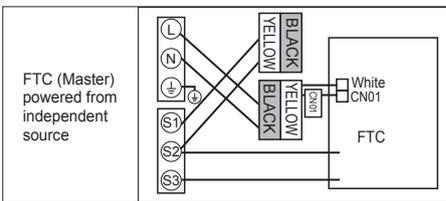
8. Troubleshooting

<Troubleshooting by inferior phenomena>

No.	Fault symptom	Possible cause	Explanation - Solution
1	Main controller display is blank.	<ol style="list-style-type: none"> There is no power supply to main controller. Power is supplied to main controller, however, the display on the main controller does not appear. 	<ol style="list-style-type: none"> Check LED2 on FTC (Master). (See <Figure 4.5.1>.) <ol style="list-style-type: none"> When LED2 is lit. <ul style="list-style-type: none"> Check for damage or contact failure of the main controller wiring. When LED2 is blinking. <ul style="list-style-type: none"> Refer to No. 5 below. When LED2 is not lit. <ul style="list-style-type: none"> Refer to No. 4 below. Check the following: <ul style="list-style-type: none"> Disconnection between the main controller cable and the FTC (Master) control board Failure of the main controller if "Please Wait" is not displayed. Refer to No. 2 below if "Please Wait" is displayed.
2	"Please Wait" remains displayed on the main controller.	<ol style="list-style-type: none"> "Please Wait" is displayed for up to 6 minutes. Communication failure between the main controller and FTC (Master). Communication failure between FTC (Master) and outdoor unit. 	<ol style="list-style-type: none"> Normal operation. 3. Main controller start up checks/procedure. <ol style="list-style-type: none"> If "0%" or "50-99%" is displayed below "Please Wait" there is a communication error between the main controller and the FTC (Master) control board. <ul style="list-style-type: none"> Check wiring connections on the main controller. Replace the main controller or the FTC (Master) control board. If "1-49%" is displayed there is a communication error between the outdoor unit's and FTC (Master) control boards. <ul style="list-style-type: none"> Check the wiring connections on the outdoor unit control board and the FTC (Master) control board. (Ensure S1 and S2 are not cross-wired and S3 is securely wired with no damage. (See section 4.1.) Replace the outdoor unit's and/or the FTC (Master) control boards.
3	The main screen appears with a press of the "ON" button, but disappears in a second.	The main controller operations do not work for a whilst after the settings are changed in the service menu. This is because the system takes time to apply the changes.	<p>Normal operation.</p> <p>The indoor unit is applying updated settings made in the service menu. Normal operation will start shortly.</p>
4	LED2 on FTC (Master) is off. (See <Figure 4.5.1>.)	<p>When LED1 on FTC (Master) is also off. (See <Figure 4.5.1>.)</p> <p><FTC (Master) powered via outdoor unit.></p> <ol style="list-style-type: none"> The outdoor unit is not supplied at the rated voltage. Defective outdoor controller circuit board. FTC (Master) is not supplied with 220 to 240V AC. FTC (Master) failure. Faulty connector wiring. 	<ol style="list-style-type: none"> Check the voltage across the terminals L and N or L3 and N on the outdoor power board. (See section 4.1.) <ul style="list-style-type: none"> When the voltage is not 220 to 240V AC, check wiring of the outdoor unit and of the breaker. When the voltage is at 220 to 240V AC, go to "2." below. Check the voltage across the outdoor unit terminals S1 and S2. (See section 4.1.) <ul style="list-style-type: none"> When the voltage is not 220 to 240V AC, check the fuse on the outdoor control board and check for faulty wiring. When the voltage is 220 to 240V AC, go to "3." below. Check the voltage across the indoor unit terminals S1 and S2. (See section 4.1.) <ul style="list-style-type: none"> When the voltage is not 220 to 240V AC, check FTC (Master)-outdoor unit wiring for faults. When the voltage is 220 to 240V AC, go to "4." below. Check the FTC (Master) control board. <ul style="list-style-type: none"> Check the fuse on FTC (Master) control board. Check for faulty wiring. If no problem found with the wiring, the FTC (Master) control board is faulty. Check the connector wiring. <ul style="list-style-type: none"> When the connectors are wired incorrectly, re-wire the connectors referring to below. (See section 4.1.)



8. Troubleshooting

No.	Fault symptom	Possible cause	Explanation - Solution
4.	LED2 on FTC (Master) is off. (See Figure <4.5.1>)	<FTC (Master) powered on independent source>	<ol style="list-style-type: none"> 1. Check the voltage across the L and N terminals on the indoor power supply terminal block. (See section 4.1.) <ul style="list-style-type: none"> • When the voltage is not 220 to 240V AC, check for faulty wiring to power supply. • When the voltage is 220 to 240V AC, go to 2. below. 2. Check for faulty wiring between the connectors. <ul style="list-style-type: none"> • When the connectors are wired incorrectly re-wire them correctly referring to below. (See section 4.1 and a wiring diagram on the control and electrical box cover.)  <ol style="list-style-type: none"> 3. FTC (Master) failure. <ul style="list-style-type: none"> • If no problem found with the wiring, go to 3. below.
		<ol style="list-style-type: none"> 1. FTC (Master) is not supplied with 220 to 240V AC. 2. There are problems in the method of connecting the connectors. 	
		When LED1 on FTC (Master) is lit. Incorrect setting of refrigerant address for outdoor unit. (None of the refrigerant address is set to "0".)	Recheck the refrigerant address setting on the outdoor unit. Set the refrigerant address to "0". (Set refrigerant address SW1(3 - 6) on outdoor controller circuit board.)
5	LED2 on FTC (Master) is blinking. (See Figure <4.5.1>)	When LED1 is also blinking on FTC (Master). Faulty wiring between FTC (Master) and outdoor unit	Check for faulty wiring between FTC (Master) and outdoor unit.
		<ol style="list-style-type: none"> 1. Faulty wiring in main controller Multiple indoor units have been wired to a single outdoor unit. 2. Short-circuited wiring in main controller 3. Main controller failure 	<ol style="list-style-type: none"> 1. Check for faulty wiring in main controller. The number of indoor units that can be wired to a single outdoor unit is one. Additional indoor units must be wired individually to a single outdoor unit. 2,3. Remove main controller wires and check LED2 on FTC (Master). (See Figure 4.5.1.) <ul style="list-style-type: none"> • If LED2 is blinking check for short circuits in the main controller wiring . • If LED2 is lit, wire the main controller again and: <ul style="list-style-type: none"> - if LED2 is blinking, the main controller is faulty; - if LED2 is lit, faulty wiring of the main controller has been corrected.
6	LED4 on FTC (Master) is off. (See figure <4.5.1>)	<ol style="list-style-type: none"> 1. SD memory card is NOT inserted into the memory card slot with correct orientation. 2. Not an SD standards compliant memory card. 	<ol style="list-style-type: none"> 1. Correctly insert SD memory card in place until a click is heard. 2. Use an SD standards compliant memory card. (Refer to section 4.10.)
	LED4 on FTC (Master) is blinking. (See Figure <4.5.1>)	<ol style="list-style-type: none"> 1. Full of data. 2. Write-protected. 3. NOT formatted. 4. Formatted in NTFS file system. 	<ol style="list-style-type: none"> 1. Move or delete data, or replace SD memory card with a new one. 2. Release the write-protect switch. 3. Refer to "4.10 Using SD memory card". 4. FTC is Not compatible with NTFS file system. Use an SD memory card formatted in FAT file system.
7	No water at hot tap.	<ol style="list-style-type: none"> 1. Cold main off 2. Strainer (local supply) blocked. 	<ol style="list-style-type: none"> 1. Check and open stop cock. 2. Isolate water supply and clean strainer.
8	Cold water at tap.	<ol style="list-style-type: none"> 1. Hot water run out. 2. Prohibit, schedule timer or holiday mode selected. 3. Heat pump not working. 4. Booster heater cut-out tripped. 5. The earth leakage circuit breaker for booster heater breaker (ECB1) tripped. 6. The booster heater thermal cut-out has tripped and cannot be reset using the manual reset button. 7. Immersion heater cut-out tripped. 8. Immersion heater breaker (ECB2) tripped. 9. 3-way valve fault 	<ol style="list-style-type: none"> 1. Ensure DHW mode is operating and wait for DHW tank to re-heat. 2. Check settings and change as appropriate. 3. Check heat pump – consult outdoor unit service manual. 4. Check booster heater thermostat and press reset button if safe. 5. Check the cause and reset if safe. 6. Check resistance across the thermal cut-out, if open then the connection is broken and the booster heater will have to be replaced. Contact your Mitsubishi Electric dealer. 7. Check immersion heater thermostat and press reset button, located on immersion heater boss, if safe. If the heater has been operated with no water inside it may have failed, so please replace it with a new one. 8. Check the cause and reset if safe. 9. Check plumbing/wiring to 3-way valve. <ol style="list-style-type: none"> (i) Manually override 3-way valve using the main controller. (Refer to <Manual operation> in section 7.2.) If the valve does not still function, go to (ii) below. (ii) Replace 3-way valve coil. If the valve does not still function, go to (iii) below. (iii) Replace 3-way valve. (Refer to the service manual.)

8. Troubleshooting

No.	Fault symptom	Possible cause	Explanation - Solution
9	Water heating takes longer.	<ol style="list-style-type: none"> Heat pump not working. Booster heater cut-out tripped. Booster heater breaker tripped. The booster heater thermal cut-out has tripped and cannot be reset using the manual reset button. Immersion heater cut-out has been triggered. Immersion heater breaker tripped. Decreased flow rate in DHW circuit. (Only when the external plate HEX for DHW is used.) 	<ol style="list-style-type: none"> Check heat pump – consult outdoor unit service manual. Check booster heater thermostat and press reset button if safe. Check the cause and reset if safe. Check resistance across the thermal cut-out, if open then connection is broken and the booster heater will have to be replaced. Contact your Mitsubishi Electric dealer. Check immersion heater thermostat and press reset button located on immersion heater boss, if safe. If the heater kept running with no water inside, this may have resulted in failure, so replace it with a new one. Check the cause and reset if safe. Check the water circulation pump 4 (DHW)
10	Temperature of DHW tank water dropped.	<p>When DHW operation is not running, the DHW tank emits heat and the water temperature decreases to a certain level. If water in the DHW tank is reheated frequently because of a significant drop in water temperature, check for the following.</p> <ol style="list-style-type: none"> Water leakage in the pipes that connect to the DHW tank Insulation material coming loose or off. 3-way valve failure 	<ol style="list-style-type: none"> Take the following measures. <ul style="list-style-type: none"> Retighten the nuts holding the pipes onto the DHW tank. Replace seal materials. Replace the pipes. Fix insulation. Check plumbing/wiring to 3-way valve. <ol style="list-style-type: none"> Manually override 3-way valve using the main controller. (Refer to <Manual operation> in section 7.2.) If the valve does not still function, go to (ii) below. Replace 3-way valve coil. If the valve does not still function, go to (iii) below. Replace 3-way valve. (Refer to the service manual.)
11	Hot or warm water from cold tap.	Heat of hot water pipe is transferred to cold water pipe.	Insulate/re-route pipework.
12	Water leakage	<ol style="list-style-type: none"> Poorly sealed connections of water circuit components Water circuit components reaching the end of life 	<ol style="list-style-type: none"> Tighten connections as required. Refer to PARTS CATALOG in the service manual for expected part lifetimes and replace them as necessary.
13	Heating system does not reach the set temperature.	<ol style="list-style-type: none"> Prohibit, schedule timer or holiday mode selected. Check settings and change as appropriate. The temperature sensor is located in a room that has a different temperature relative to that of the rest of the house. Heat pump not working. Booster heater cut-out tripped. Booster heater breaker (ECB1) tripped. The booster heater thermal cut-out tripped and can not be reset using the manual reset button. Incorrectly sized heat emitter. 3-way valve failure Battery problem (*wireless control only) If a mixing tank is installed, the flow rate between the mixing tank and the heat exchanger is less than that between the mixing tank and the local system. 	<ol style="list-style-type: none"> Check settings and change as appropriate. Check the battery power and replace if flat. Relocate the temperature sensor to a more suitable room. Check heat pump – consult outdoor unit service manual. Check booster heater thermostat and press reset button if safe. Check the cause of the trip and reset if safe. Check resistance across the thermal cut-out, if open then the connection is broken and the booster heater will have to be replaced. Contact your Mitsubishi Electric dealer. Check the heat emitter surface area is adequate. Increase size if necessary. Check plumbing/wiring to 3-way valve. Check the battery power and replace if flat. Increase the flow rate between the mixing tank and the heat exchanger decrease that between the mixing tank and the local system.

8. Troubleshooting

No.	Fault symptom	Possible cause	Explanation - Solution
14	In 2-zone temperature control, only Zone2 does not reach the set temperature.	<ol style="list-style-type: none"> When Zone1 and Zone2 are both in heating mode, the hot water temperature in Zone2 does not exceed that in Zone1. Faulty wiring of motorized mixing valve Faulty installation of motorized mixing valve Incorrect setting of Running time Motorized mixing valve failure 	<ol style="list-style-type: none"> Normal action no action necessary. Refer to "4.7 Wiring for 2-zone temperature control". Check for correct installation. (Refer to the manual included with each motorized mixing valve.) Check for correct setting of Running time. Inspect the mixing valve. (Refer to the manual included with each motorized mixing valve.)
15	After DHW operation room temperature rises slightly.	At the end of the DHW mode operation the 3-way valve diverts hot water away from the DHW circuit into space heating circuit. This is done to prevent the system components from overheating. The amount of hot water directed into the space heating circuit varies according to the type of the system.	Normal operation no action necessary.
16	The room temperature rises during DHW operation.	3-way valve failure	Check the 3-way valve.
17	Water discharges from pressure relief valve. (Primary circuit)	<ol style="list-style-type: none"> If continual – pressure relief valve may be damaged. If intermittent – expansion vessel charge may have reduced/bladder perished. 	<ol style="list-style-type: none"> Turn the handle on the pressure relief valve to check for foreign objects in it. If the problem is not still solved, replace the pressure relief valve with a new one. Check pressure in expansion vessel. Recharge to 1 bar if necessary. If bladder perished replace expansion vessel with a new one.
18	Water discharges from pressure relief valve (field supplied item). (Sanitary circuit)	<ol style="list-style-type: none"> If continual – field supplied pressure reducing valve not working. If continual – pressure relief valve seat may be damaged. If intermittent – expansion vessel charge may have reduced/bladder perished. DHW tank may have subjected to backflow. 	<ol style="list-style-type: none"> Check function of pressure reducing valve and replace if necessary. Turn the handle on the pressure relief valve to check for foreign objects inside. If the problem is not still solved, replace the pressure relief valve. Check gas-side pressure in expansion vessel. Recharge to correct precharge pressure if necessary. If bladder perished replace expansion vessel with a new one with appropriate pre-charge. Check gas-side pressure in DHW tank. If pressure in DHW tank is similar to that in incoming mains, cold water supply that merges with incoming mains water supply could flow back to DHW tank. Investigate source of back-feed and rectify error in pipework/fitting configuration. Adjust pressure in cold supply.
19	Noisy water circulation pump	Air in water circulation pump.	Use manual and automatic air vents to remove air from system. Top up water if necessary to achieve 1 bar on primary circuit.
20	Noise during hot water draw off typically worse in the morning.	<ol style="list-style-type: none"> Loose airing cupboard pipework. Heaters switching on/off. 	<ol style="list-style-type: none"> Install extra pipe fastening clips. Normal operation no action necessary.
21	Mechanical noise heard coming from the system.	<ol style="list-style-type: none"> Heaters switching on/off. 3-way valve changing position between DHW and heating mode. 	Normal operation no action necessary.
22	Water circulation pump runs for a short time unexpectedly .	Water circulation pump jam prevention mechanism (routine) to inhibit the build-up of scale.	Normal operation no action necessary.
23	Milky/Cloudy water (Sanitary circuit)	Oxygenated water	Water from any pressurised system will release oxygen bubbles when water is running. The bubbles will settle out.
24	Heating mode has been on standby for a long time (does not start operation smoothly.)	The time of "Delay" set in "Economy settings for pump" is too short. (Go to "Service menu" → "Auxiliary settings" → "Economy settings for pump").	Increase the time of "Delay" in "Economy settings for pump" .
25	The FTC unit that was running in the heating mode before power failure is running in the DHW mode after power recovery.	The FTC unit is designed to run in an operation mode with a higher priority (i.e. DHW mode in this case) at power recovery.	<ul style="list-style-type: none"> Normal operation. After the DHW max. operation time has elapsed or the DHW max. temperature has been reached, the DHW mode switches to the other mode (ex. Heating mode).
26	Cooling mode is NOT available.	Dip SW2-4 is OFF.	Turn Dip SW2-4 to ON. (Refer to "5.1 Dip Switch Functions" in this manual.)

8. Troubleshooting

No.	Fault symptom	Possible cause	Explanation - Solution
27	The cooling system does not cool down to the set temperature.	<ol style="list-style-type: none"> 1. When the water in the circulation circuit is unduly hot, Cooling mode starts with a delay for the protection of the outdoor unit. 2. When the outdoor temperature is lower than the preset temperature below which the freeze stat. function is activated, Cooling mode does not start running. 	<ol style="list-style-type: none"> 1. Normal operation. 2. To run Cooling mode overriding the freeze stat. function, adjust the preset temperature below which the freeze stat. function is activated. (Refer to "<Freeze stat function>" on Page 45.
28	The electric heaters are activated shortly after DHW or LP mode starts running after Cooling mode.	The setting time period of Heat-pump-only operation is short.	Adjust the setting time period of Heat-pump only operation. (Refer to "<Electric heater (DHW)>" on Page 45.
29	During DHW or LP mode following the cooling mode, error L6 (circulation water freeze protection) occurs and operation stops frequently.	If the preset temperature below which the freeze stat. function is activated is low, error L6 is more likely to occur interruption operation before the freeze stat. function is activated.	Adjust the preset temperature below which the freeze stat. function is activated. (Refer to "<Freeze stat function>" on Page 45.

9. Multiple outdoor units control

9.1 Wiring for multiple outdoor units control

To establish a larger system, up to 6 outdoor units of the same model can be connected in one system.

Note: PUHZ-FRP outdoor unit is not available for multiple outdoor units control.

9.1.1 Requirements

<Outdoor unit>

- (a) Up to 6 units can be connected.
- (b) All the outdoor units must be of the same model.
- (c) The outdoor units must be connected to slave units.

<FTC: Master unit>

Each slave unit is controlled by the master unit.

- (a) The outdoor units must NOT be connected to the master unit.

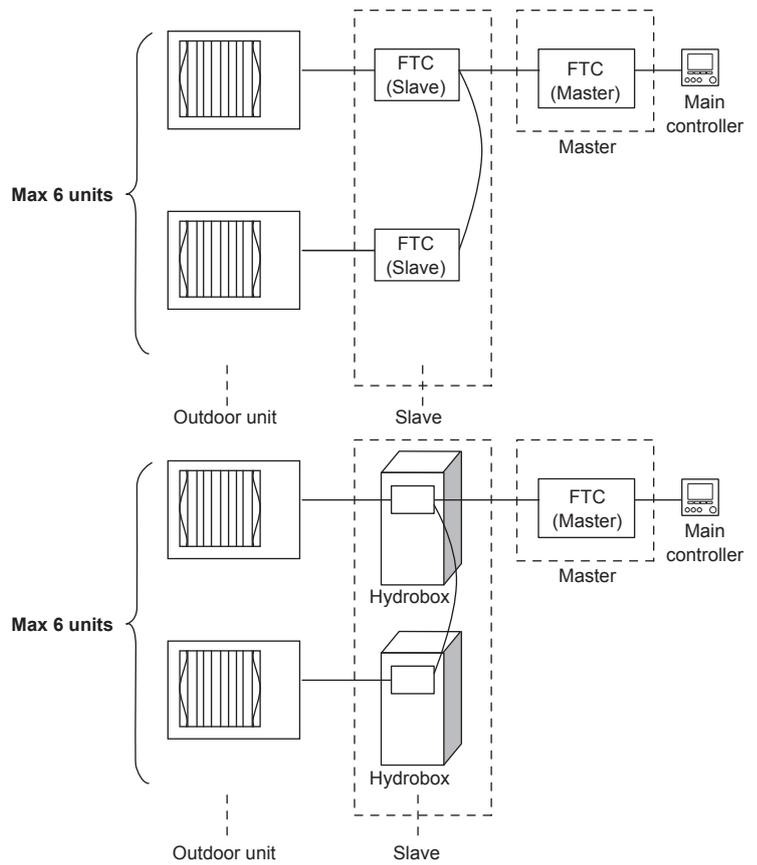
Make sure that the master unit is powered by independent source.

- (b) Wire the main controller to TBI.2 13-14 on the master unit.
- (c) Wire the electric heater to the master unit.

<FTC: Slave unit>

The hydrobox or PAC-SIF051B-E or master unit is used as a slave unit

- (a) Connect each outdoor unit to a slave unit.
- (b) The main controller must NOT be wired to a slave unit.

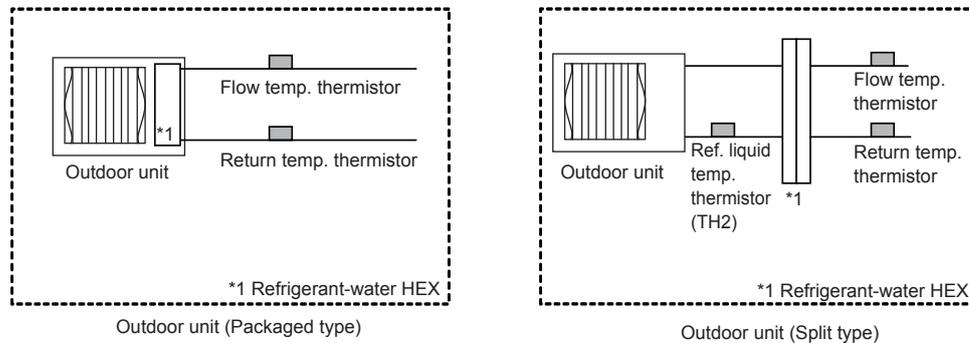


9.2 Pipe work

Following is the system example of two outdoor units being connected in one system.

IMPORTANT NOTE

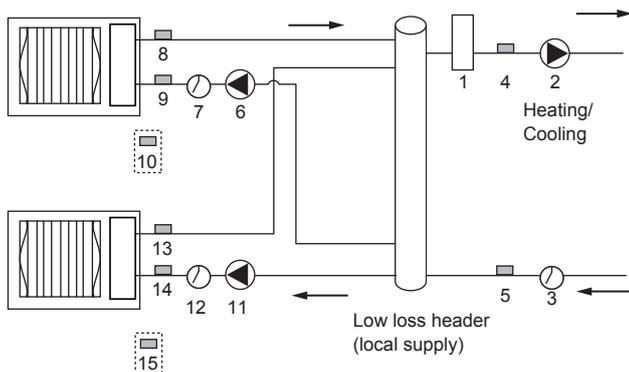
Keep the minimum amount of water required in the space heating circuit according to the number of outdoor units.



<Fig. 9.2.1>

System 1: Heating/Cooling system

- Install a low loss header (local supply).
- Install booster heater toward the local system, relative to the low loss header.



<Fig. 9.2.2>

No.	Component	Wiring		
		Master	Slave 1	Slave 2
1	Booster heater (local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Flow temp. thermistor (THW1)	✓		
5	Return temp. thermistor (THW2)	✓		
6	Slave1 circulation pump1 (local supply)		✓	
7	Slave1 flow switch (local supply) *2		✓	
8	Slave1 flow temp. thermistor (THW1)		✓	
9	Slave1 return temp. thermistor (THW2)		✓	
10	Slave1 ref. liquid temp. thermistor (TH2) *1		✓	
11	Slave2 circulation pump1 (local supply)			✓
12	Slave2 flow switch (local supply) *2			✓
13	Slave2 flow temp. thermistor (THW1)			✓
14	Slave2 return temp. thermistor (THW2)			✓
15	Slave2 ref. liquid temp. thermistor (TH2) *1			✓

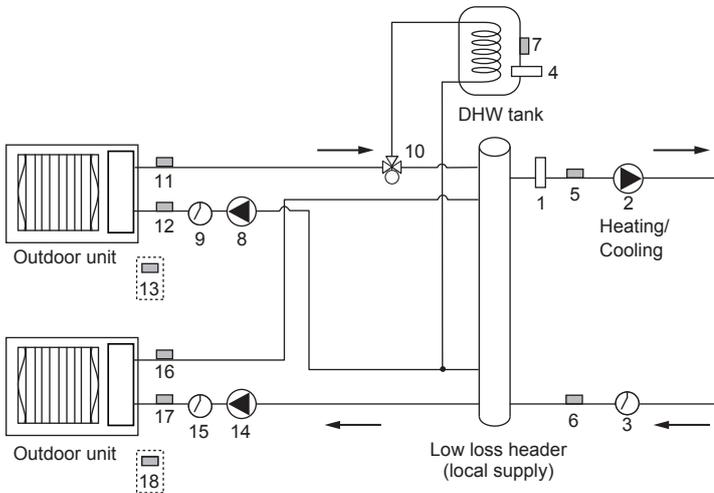
*1 When the outdoor unit is split type, TH2 needs to be installed. <Fig. 9.2.1>

*2 For safety protection, it is recommended to install a flow switch.

9. Multiple outdoor units control

System 2: Heating/Cooling & DHW system

- Install DHW tank toward the outdoor unit, relative to the low loss header.
- Wire 3-way valve (or 2-way valve 1, 2 to FTC (slave unit).
- LP mode uses assistance of electric heater. Place an immersion heater on the DHW circuit.
- Install a low loss header (local supply).
- Install booster heater toward the local system, relative to the low loss header.



<Fig. 9.2.3>

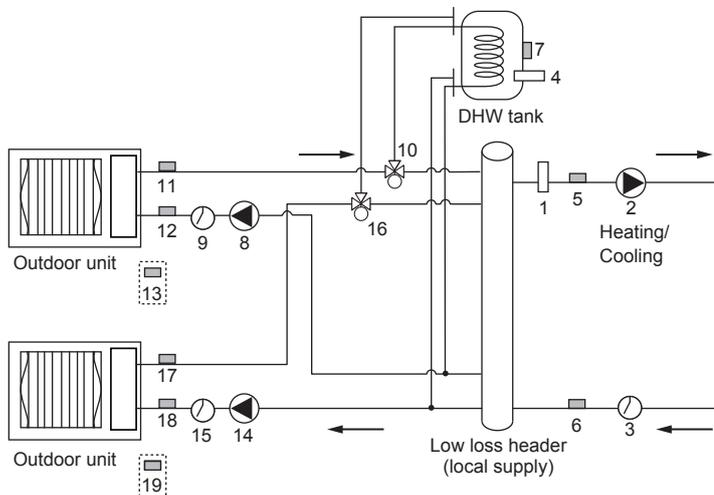
No.	Component	Wiring		
		Master	Slave 1 *4	Slave 2
1	Booster heater (local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Immersion heater (local supply)	✓		
5	Flow temp. thermistor (THW1)	✓		
6	Return temp. thermistor (THW2)	✓		
7	Tank water temp. (THW5)	✓		
8	Slave1 circulation pump1 (field supply)		✓	
9	Slave1 flow switch (local supply) *2		✓	
10	Slave1 3-way valve (local supply) *3		✓	
11	Slave1 flow temp. thermistor (THW1)		✓	
12	Slave1 return temp. thermistor (THW2)		✓	
13	Slave1 ref. liquid temp. thermistor (TH2) *1		✓	
14	Slave2 circulation pump1 (local supply)			✓
15	Slave2 flow switch (local supply) *2			✓
16	Slave2 flow temp. thermistor (THW1)			✓
17	Slave2 return temp. thermistor (THW2)			✓
18	Slave2 ref. liquid temp. thermistor (TH2) *1			✓

*1 When the outdoor unit is split type, TH2 needs to be installed. <Fig. 9.2.1>

*2 For safety protection, it is recommended to install a flow switch.

*3 The use of two 2-way valves can perform the same function as a 3-way valve.

*4 DHW operation requires to use the master unit (or hydro box) as the slave controller.



<Fig. 9.2.4>

No.	Component	Wiring		
		Master	Slave 1 *4	Slave 2 *4
1	Booster heater (local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Immersion heater (local supply)	✓		
5	Flow temp. thermistor (THW1)	✓		
6	Return temp. thermistor (THW2)	✓		
7	Tank water temp. (THW5)	✓		
8	Slave1 circulation pump1 (local supply)		✓	
9	Slave1 flow switch (local supply) *2		✓	
10	Slave1 3-way valve (local supply) *3		✓	
11	Slave1 flow temp. thermistor (THW1)		✓	
12	Slave1 return temp. thermistor (THW2)		✓	
13	Slave1 ref. liquid temp. thermistor (TH2) *1		✓	
14	Slave2 circulation pump1 (local supply)			✓
15	Slave2 flow switch (local supply) *2			✓
16	Slave2 3-way valve (local supply) *3			✓
17	Slave2 flow temp. thermistor (THW1)			✓
18	Slave2 return temp. thermistor (THW2)			✓
19	Slave2 ref. liquid temp. thermistor (TH2) *1			✓

*1 When the outdoor unit is split type, TH2 needs to be installed. <Fig. 9.2.1>

*2 For safety protection, it is recommended to install a flow switch.

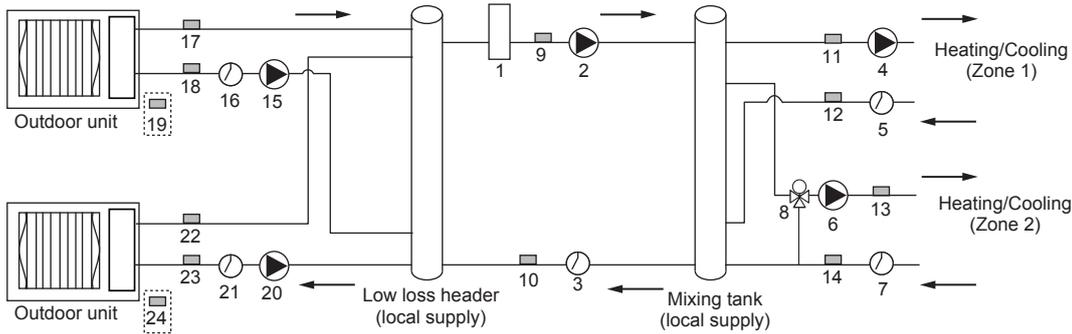
*3 The use of two 2-way valves can perform the same function as a 3-way valve.

*4 DHW operation requires to use the master unit (or hydro box) as the slave controller.

9. Multiple outdoor units control

System 3: 2-zone temperature control

- Install a mixing tank (local supply) for 2-zone temperature control.
- Install a low loss header (local supply).
- Install booster heater toward the local system, relative to the low loss header.
- For details on 2-zone installation, refer to "3.6 Piping diagram for 2-zone temperature control".



<Fig. 9.2.5>

No.	Component	Wiring		
		Master	Slave 1	Slave 2
1	Booster heater (local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Circulation pump2 (local supply)	✓		
5	Flow switch2 (local supply) *2	✓		
6	Circulation pump3 (local supply)	✓		
7	Flow switch3 (local supply) *2	✓		
8	Motorized mixing valve (local supply)	✓		
9	Flow temp. thermistor (THW1)	✓		
10	Return temp. thermistor (THW2)	✓		
11	Zone1 flow temp. thermistor (THW6) (option)	✓		
12	Zone1 return temp. thermistor (THW7) (option)	✓		

No.	Component	Wiring		
		Master	Slave 1	Slave 2
13	Zone2 flow temp. thermistor (THW8) (option)	✓		
14	Zone2 return temp. thermistor (THW9) (option)	✓		
15	Slave1 circulation pump1 (local supply)		✓	
16	Slave1 flow switch (local supply) *2		✓	
17	Slave1 flow temp. thermistor(THW1)		✓	
18	Slave1 return temp. thermistor (THW2)		✓	
19	Slave1 ref. liquid temp. thermistor (TH2) *1		✓	
20	Slave2 circulation pump1 (local supply)			✓
21	Slave2 flow switch (local supply) *2			✓
22	Slave2 flow temp. thermistor (THW1)			✓
23	Slave2 return temp. thermistor (THW2)			✓
24	Slave2 ref. liquid temp. thermistor (TH2) *1			✓

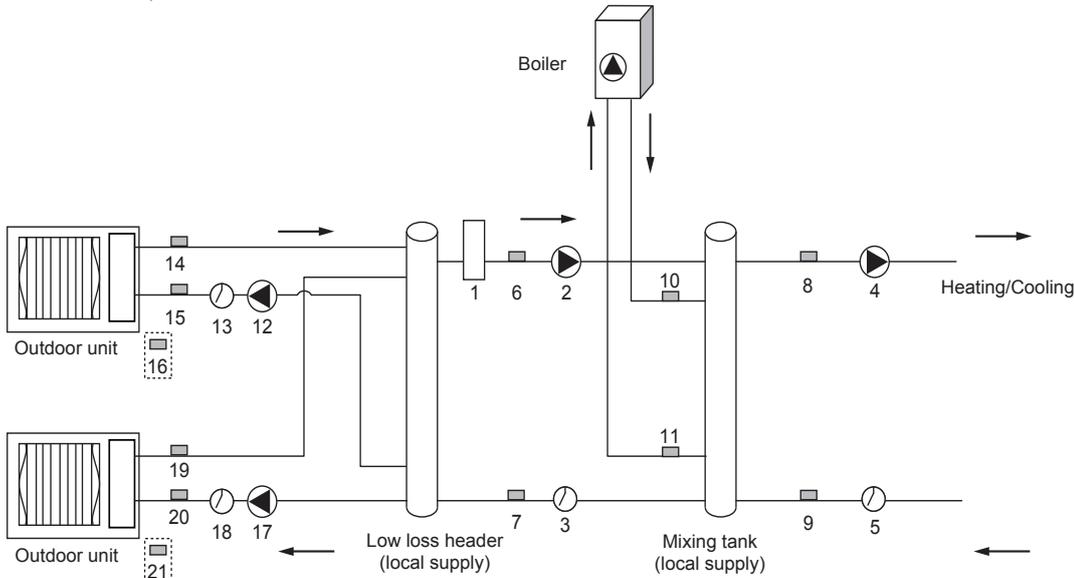
*1 When the outdoor unit is split type, TH2 needs to be installed. <Fig. 9.2.1>

*2 For safety protection, it is recommended to install a flow switch.

9. Multiple outdoor units control

System 4: Heating/Cooling system (with Boiler)

- Install a mixing tank (local supply) for connection of the boiler.
- Install a low loss header (local supply).
- Install booster heater between low loss header and mixing tank.
- For more details, refer to the installation manual of PAC-TH011HT-E.



<Fig. 9.2.6>

No.	Component	Wiring		
		Master	Slave 1	Slave 2
1	Booster heater (local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Circulation pump2 (local supply)	✓		
5	Flow switch2 (local supply) *2	✓		
6	Flow temp. thermistor (THW1)	✓		
7	Return temp. thermistor (THW2)	✓		
8	Flow temp. thermistor (THW6) (option)	✓		
9	Return temp. thermistor (THW7) (option)	✓		
10	Boiler flow temp. thermistor (THWB1) (option)	✓		

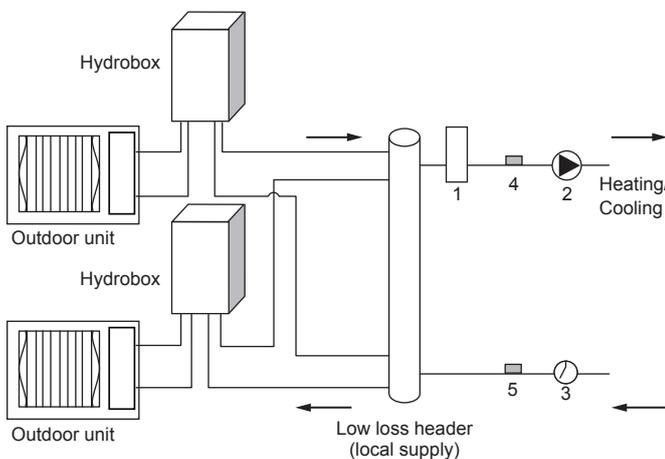
*1 When the outdoor unit is split type, TH2 needs to be installed. <Fig. 9.2.1>

*2 For safety protection, it is recommended to install a flow switch.

No.	Component	Wiring		
		Master	Slave 1	Slave 2
11	Boiler return temp. thermistor (THWB2) (option)	✓		
12	Slave1 circulation pump1 (local supply)		✓	
13	Slave1 flow switch (local supply) *2		✓	
14	Slave1 flow temp. thermistor (THW1)		✓	
15	Slave1 return temp. thermistor (THW2)		✓	
16	Slave1 ref. liquid temp. thermistor (TH2) *1		✓	
17	Slave2 circulation pump1 (local supply)			✓
18	Slave2 flow switch (local supply) *2			✓
19	Slave2 flow temp. thermistor (THW1)			✓
20	Slave2 return temp. thermistor (THW2)			✓
21	Slave2 ref. liquid temp. thermistor (TH2) *1			✓

System 5: Heating/Cooling system (with Hydrobox)*1

- Install a low loss header (local supply).
- Install booster heater toward the local system, relative to the low loss header.



<Fig. 9.2.7>

No.	Component	Wiring		
		Master	Slave 1 (Hydrobox)	Slave 2 (Hydrobox)
1	Booster heater(local supply)	✓		
2	Circulation pump1 (local supply)	✓		
3	Flow switch1 (local supply) *2	✓		
4	Flow temp. thermistor (THW1)	✓		
5	Return temp. thermistor (THW2)	✓		

*1 Cooling system is available only with ERS models.

*2 For safety protection, it is recommended to install a flow switch.

9. Multiple outdoor units control

9.3 Electrical connection

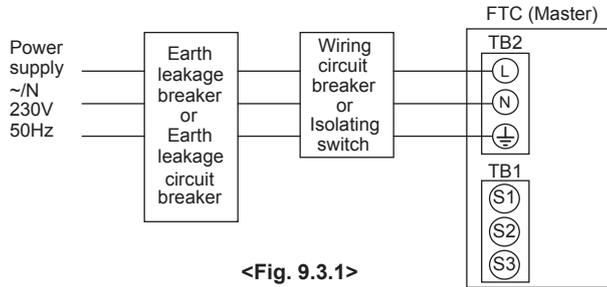
All electrical work should be carried out by a suitably qualified technician. Failure to comply with this could lead to electrocution, fire, and death. It will also invalidate product warranty. All wiring should be according to national wiring regulations.

9.3.1 Master unit

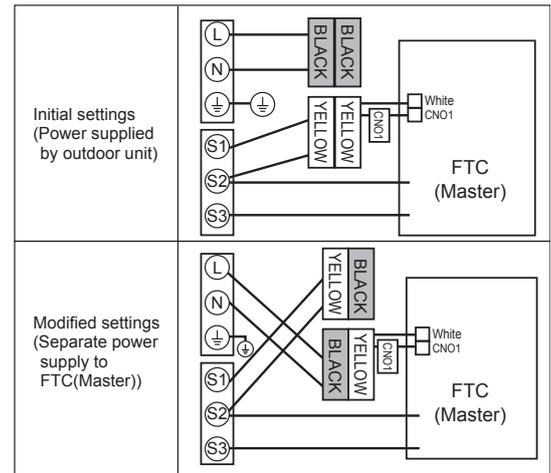
■ FTC (Master)

Outdoor unit must NOT be connected to FTC (Master) unit.

FTC (Master) unit electrical box connector connections changed (see Fig. 9.3.2.)



<Fig. 9.3.1>



<Fig. 9.3.2>

9.3.2 Slave unit

Connect each outdoor unit to a slave unit.

FTC (Slave) can be powered in two ways.

1. Power cable is run from the outdoor unit to a slave unit.
2. FTC (Slave) has independent power source.

■ FTC (Master) (PAC-IF061B-E) used as slave

• For wiring as a slave controller, refer to "4.1 Electrical connection". *1

*1 Do not connect the power cable to the booster heater because it does not work in slave controller setting.

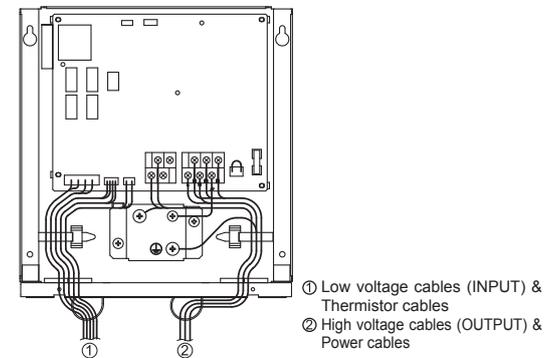
■ FTC (Slave) (PAC-SIF051B-E) <Fig. 9.3.3>

FTC (Slave) can be powered in two ways.

1. Power cable is run from the outdoor unit to FTC (Slave).
2. FTC (Slave) has independent power source

Note:

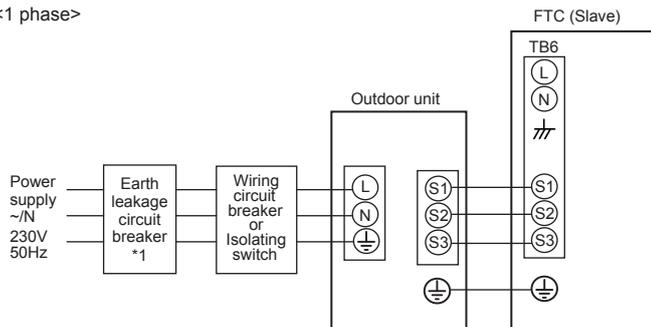
- Do not run the low voltage cables through a slot that the high voltage cables go through.
- Bundle cables by using clamps as shown in the figure to the right .



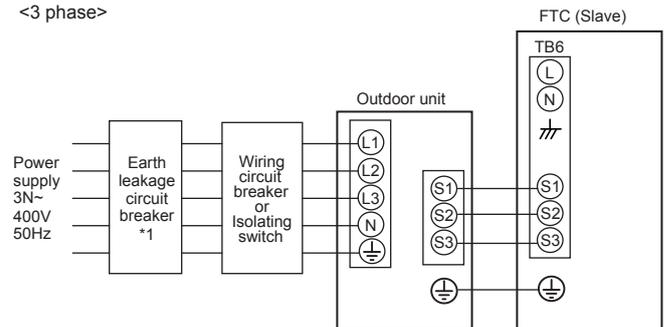
<Fig. 9.3.3>

Option 1: FTC (Slave) powered via outdoor unit

<1 phase>



<3 phase>



<Fig. 9.3.4>

*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.

Note: In accordance with IEE regulations the circuit breaker/isolating switch located on the outdoor unit should be installed with lockable devices (health and safety).

Wiring No. Wiring size (mm ²)	FTC (Slave) - Outdoor unit		3 × 1.5 (polar)
	FTC (Slave) - Outdoor unit earth	*2	
Circuit rating	FTC (Slave) - Outdoor unit S1 - S2	*3	230V AC
	FTC (Slave) - Outdoor unit S2 - S3	*3	24V DC

*1. 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.

*2. Max. 45 m

If 2.5 mm² used, Max. 50 m

If 2.5 mm² used and S3 separated, Max. 80 m

*3. The values given in the table above are not always measured against the ground value.

Notes: 1. Wiring size must comply with the applicable local and national codes.

2. FTC (Slave)/outdoor unit connecting cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60245 IEC 57)

FTC (Slave) power supply cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60227 IEC 53)

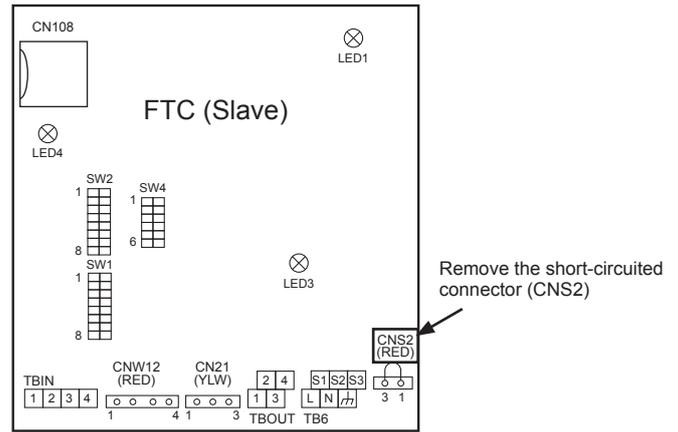
3. Install an earth longer than other cables.

9. Multiple outdoor units control

Option 2: FTC (Slave) powered by independent source

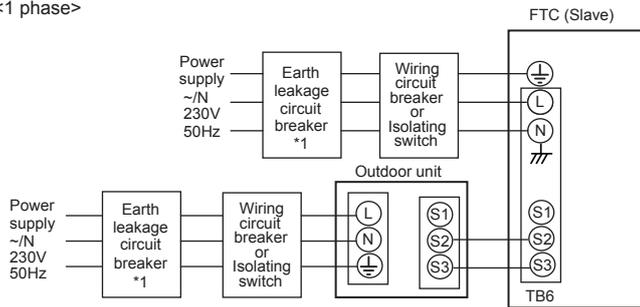
If FTC (Slave) and outdoor units have separate power supplies, the following requirements MUST be carried out:

- Remove the short-circuited connector (CNS2) on FTC (Slave). (see <Fig. 9.3.5>)
- Turn the outdoor unit DIP switch SW8-3 to ON.
- Turn on the outdoor unit BEFORE the FTC (Slave).

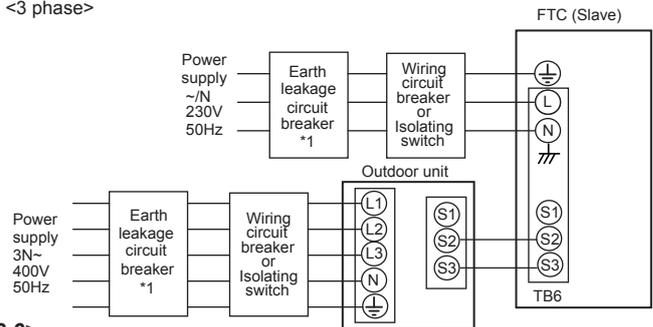


<Fig. 9.3.5>

<1 phase>



<3 phase>



<Fig. 9.3.6>

*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.

FTC (Slave) power supply		~N 230 V 50 Hz
FTC (Slave) input capacity		
Main switch (Breaker)	*1	16 A
Wiring No. Wiring size (mm ²) x size (mm ²)	FTC (Slave) power supply	2 × Min. 1.5
	FTC (Slave) power supply earth	1 × Min. 1.5
	FTC (Slave) - Outdoor unit	*2 2 × Min. 0.3
	FTC (Slave) - Outdoor unit earth	—
Circuit rating	FTC (Slave) L - N	*3 230V AC
	FTC (Slave) - Outdoor unit S1 - S2	*3 —
	FTC (Slave) - Outdoor unit S2 - S3	*3 24V DC

*1. 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.

*2. Max. 45 m
If 2.5 mm² used, Max. 50 m
If 2.5 mm² used and S3 separated, Max. 80 m

*3. The values given in the table above are not always measured against the ground value.

- Notes:**
1. Wiring size must comply with the applicable local and national codes.
 2. FTC (Slave)/outdoor unit connecting cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60245 IEC 57)
FTC (Slave) power supply cords shall not be lighter than polychloroprene sheathed flexible cord. (Design 60227 IEC 53)
 3. Install an earth longer than other cables.

Hydrobox

• For wiring as a slave controller (hydrobox), refer to "4.4 Electrical Connection" in Hydrobox installation manual. *1

*1 Do not connect the power cable to the booster heater because it doesn't work in slave controller setting.

*2 Do not connect the main controller cable.

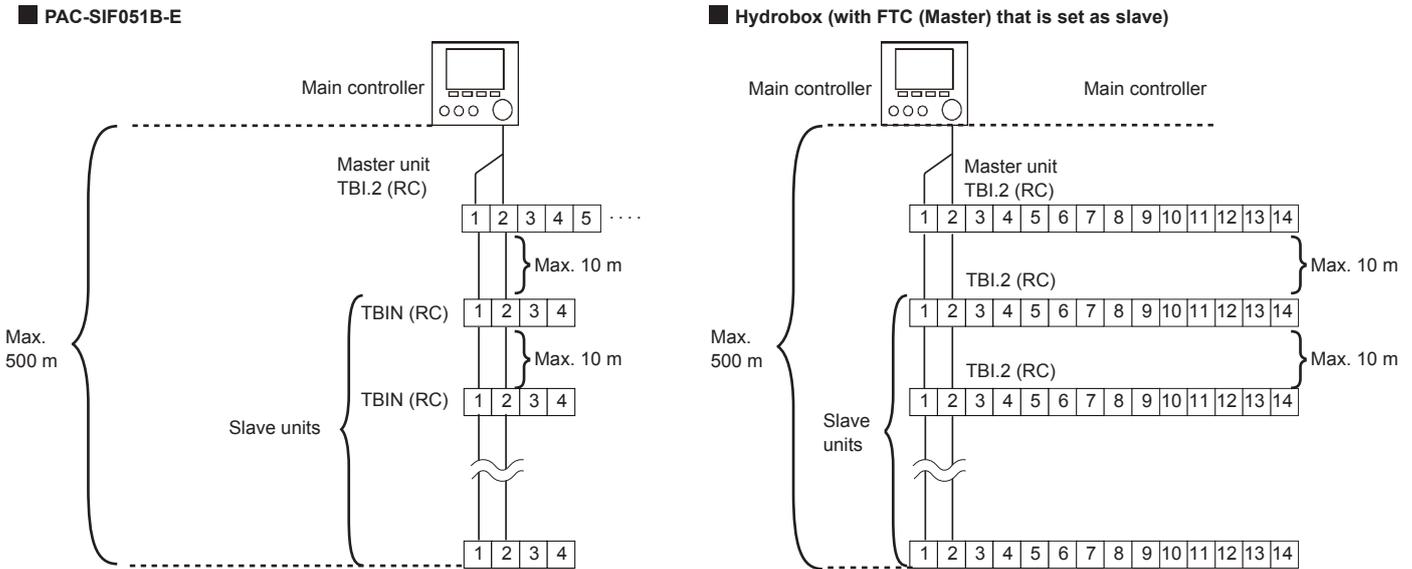
<Before system set up>

Insert the included SD memory card into the FTC control board. (Refer to section 4.10.)

9. Multiple outdoor units control

9.4 Main controller wiring

- (a) Wire the main controller to TBI.2 RC terminals on the master unit. The main controller must NOT be connected to a slave unit.
 (b) Use the daisy chain wiring method to wire the master unit and slave units by connecting TBI.2 RC terminals. *1
 *1 The maximum length between each units wiring is 10 m. The maximum length of total daisy-chain wiring is 500 m.



<Fig. 9.4.1>

Note: Wiring for main controller cable and daisy chain 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 controller cable and power source wiring in the same conduit.)

9.5. Connecting the thermistor cables

Connect the thermistor for the FTC (Slave) controller.

9.5.1. Connecting the refrigerant pipe temp. thermistor (TH2) cable

Connect the TH2 cable to the CN21 connector on FTC (Slave).

For split Outdoor unit : Connect TH2.

For packaged Outdoor unit : It is NOT necessary to connect TH2.

When the TH2 cable is too long, bundle the excess cable outside the FTC (Slave) unit.
 Do not bind the wires in the FTC (Slave) unit.

<Thermistor position>

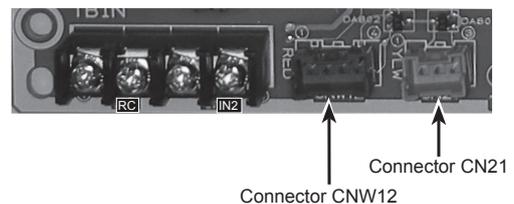
Place TH2 on **refrigerant** piping (**liquid** side).

It is recommended to protect the thermistor with heat insulating materials so as not to be affected by ambient temperature.

Note: Be sure to place TH2 where it correctly detects refrigerant piping temp. (liquid side).

Because;

- (1) TH2 is required to detect heating subcool correctly.
- (2) Refrigerant temperature of water-to-refrigerant heat exchanger also needs to be detected for protection purpose.



<Fig. 9.5.1>

9.5.2. Connecting the flow water temp. thermistor (THW1) cable and the return water temp. thermistor (THW2) cable

The THW1 and the THW2 cables share a connector, and the connector connects to CNW12 connector on FTC (Slave).

When the THW1 and THW2 cables are too long, bundle the excess cables outside the FTC (Slave) unit.
 Do not bind the wires in the FTC (Slave) unit.

<Thermistor position>

Place THW1 on **water** piping (water **outlet** side) after booster heater, and THW2 on the water inlet side.

It is recommended to protect the thermistor with heat insulating materials so as not to be affected by ambient temperature.

Note: Be sure to attach THW1 where it correctly detects Flow temp. (water outlet side). For more details, see Page 6.

⚠ Caution:

- Do not route the thermistor cables together with power cables.
- The sensor part of the thermistor should be installed where user can not access.

9. Multiple outdoor units control

9.6 Dip switch functions

<Outdoor unit>

- Set refrigerant address on each outdoor unit from 1 to 6.

Note: Do NOT use refrigerant address 0 as 0 is used for FTC (Master). The address range is from 1 to 6.

Split model (SW1-3 to SW1-6)

Dip switch	Refrigerant address number					
	Add. 1	Add. 2	Add. 3	Add. 4	Add. 5	Add. 6
SW1-1	—	—	—	—	—	—
SW1-2	—	—	—	—	—	—
SW1-3	ON	OFF	ON	OFF	ON	OFF
SW1-4	OFF	ON	ON	OFF	OFF	ON
SW1-5	OFF	OFF	OFF	ON	ON	ON
SW1-6	OFF	OFF	OFF	OFF	OFF	OFF

Packaged model (SW7-3 to SW7-6)

Dip switch	Refrigerant address number					
	Add. 1	Add. 2	Add. 3	Add. 4	Add. 5	Add. 6
SW7-1	—	—	—	—	—	—
SW7-2	—	—	—	—	—	—
SW7-3	ON	OFF	ON	OFF	ON	OFF
SW7-4	OFF	ON	ON	OFF	OFF	ON
SW7-5	OFF	OFF	OFF	ON	ON	ON
SW7-6	OFF	OFF	OFF	OFF	OFF	OFF

<FTC: Master>

- Set Dip SW4-1 and SW4-2 to ON.
- For more details refer to "5. Dip Switch setting."

<FTC: Slave>

- Set Dip SW4-1 to ON "Active :multiple outdoor unit control".
- Set Dip SW1-7 (Outdoor unit type) on each slave unit according to each connected outdoor unit type.
- Set only Dip-SW1-3 to ON on the slave unit that runs DHW operation.

Dip switch	Function	OFF	ON	Master	Slave (PAC-SIF051B-E)	Slave *1 (Hydrobox)
SW1	SW1-1	Bolier	WITHOUT Bolier	WITH Bolier	✓	—
	SW1-2	Heat pump maximum outlet water temperature	55°C	60°C	✓	✓
	SW1-3	DHW tank	WITHOUT DHW tank	WITH DHW tank	✓	✓
	SW1-4	Immersion heater	WITHOUT Immersion heater	WITH Immersion heater	✓	—
	SW1-5	Booster heater	WITHOUT Booster heater	WITH Booster heater	✓	—
	SW1-6	Booster heater function	For heating only	For heating and DHW	—	—
	SW1-7	Outdoor unit type	Split type	Packaged type	—	✓
	SW1-8	Wireless remote controller	WITHOUT Wireless remote controller	WITH Wireless remote controller	✓	—
SW2	SW2-1	Room thermostat1 input (IN1) logic change	Zone1 operation stop at short	Zone1 operation stop at open	✓	—
	SW2-2	Flow switch1 input (IN2) logic change	Failure detection at short	Failure detection at open	✓	✓
	SW2-3	Booster heater capacity restriction	Inactive	Active	✓	—
	SW2-4	Cooling mode function	Inactive	Active	✓	—
	SW2-5	"Automatic switch to backup heater only operation (When outdoor unit stops by error)"	Inactive	Active	✓	—
	SW2-6	Mixing tank	WITHOUT Mixing tank	WITH Mixing tank	✓*2	—
	SW2-7	2-zone temperature control	Inactive	Active	✓	—
	SW2-8	Flow sensor	WITHOUT Flow sensor	WITH Flow sensor	✓	—
SW3	SW3-1	Room thermostat2 input (IN6) logic change	Zone2 operation stop at short	Zone2 operation stop at open	✓	—
	SW3-2	Flow switch2 input (IN3) logic change	Failure detection at short	Abnormality detection at open	✓	—
	SW3-3	Flow switch3 input (IN7) logic change	Failure detection at short	Abnormality detection at open	✓	—
	SW3-4	—	—	—	—	—
	SW3-5	Heating mode function	Inactive	Active	✓	—
	SW3-6	2-zone valve ON/OFF control	Inactive	Active	✓	—
	SW3-7	—	—	—	—	—
	SW3-8	—	—	—	—	—
SW4	SW4-1	Multiple unit control	Inactive	Active	ON	ON
	SW4-2	Position of multiple outdoor units control	Slave	Master	ON	OFF
	SW4-3	—	—	—	—	—
	SW4-4	—	—	—	—	—
	SW4-5	Emergency mode (Heater only operation)	Normal	"Emergency mode (Heater only operation) (To be activated only when powered ON)"	✓	—
	SW4-6	Emergency mode (Bolier operation)	Normal	"Emergency mode (Bolier operation) (To be activated only when powered ON)"	✓	—
SW5	SW5-1	—	—	—	—	—
	SW5-2	—	—	—	—	—
	SW5-3	—	—	—	—	—
	SW5-4	—	—	—	—	—
	SW5-5	—	—	—	—	—
	SW5-6	—	—	—	—	—
	SW5-7	—	—	—	—	—
	SW5-8	—	—	—	—	—

*1 When FTC (Master) in Hydrobox is set as Slave.

*2 Set Dip SW2-6 to ON in "System 3 (2 zone)" and in "System 4 (with Boiler)" mentioned in "9.2 Pipe work."

✓ : Setting is required

— : NO setting (function is not available)

9. Multiple outdoor units control

9.7 Connecting inputs/outputs

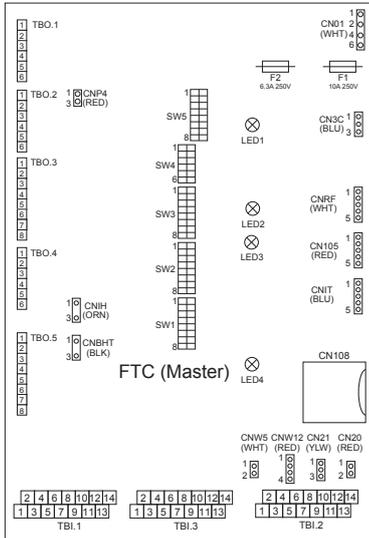
When the wires are wired to adjacent terminals use ring terminals and insulate the wires.

<Electrical connection for master controller>

- Refer to "4.5 Connecting inputs/outputs"

<Electrical connection for slave controller>

■ PAC-IF061B-E



<Fig. 9.7.1>

When the wires are wired to adjacent terminals use ring terminals and insulate the wires.

Signal inputs

Name	Terminal block	Connector	Item	OFF (Open)	OFF (Short)
RC	TBI.2 1-2	—	Communication cable between indoor units	—	—
IN2	TBI.1 11-12	—	Flow switch 1 input	Refer to SW2-2 in <9.6 Dip Switch Functions>.	

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. 10 m Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.13 mm ² to 1.25 mm ² Solid wire: ø0.4 mm to ø1.2 mm
	Switch	Non-voltage "a" contact signals Remote switch: minimum applicable load 12V DC, 1mA

Thermistor inputs

Name	Terminal block	Connector	Item	Optional part model
TH2	—	CN21	Thermistor (Ref. liquid temp.)	—
THW1	—	CNW12 1-2	Thermistor (Flow water temp.)	—
THW2	—	CNW12 3-4	Thermistor (Return water temp.)	—

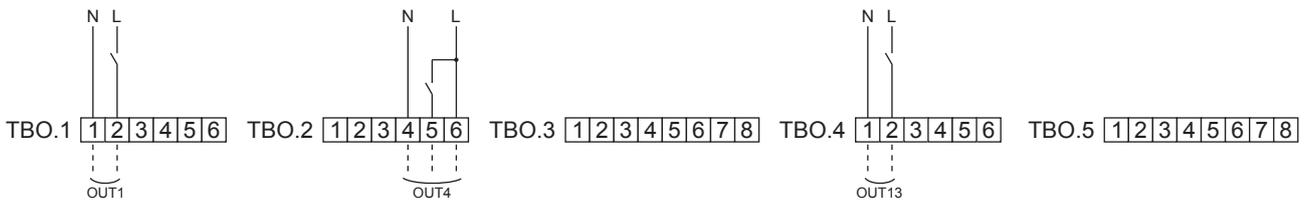
Note:

Do not splice the wiring to extend or shorten it, or this could affect correct monitoring of each temperature.

If the wiring is too long, bundle it with a strap to adjust the length.

Outputs

Name	Terminal block	Connector	Item	OFF	ON	Signal/Max current
OUT1	TBO.1 1-2	—	Water circulation pump 1 output	OFF	ON	230V AC 1.0 A Max
OUT4	TBO.2 4-6	—	3-way valve (2-way valve 1) output	Heating	DHW	230V AC 0.1 A Max
OUT13	TBO.4 1-2	—	2-way valve 2 output	DHW	Heating	230V AC 0.1 A Max

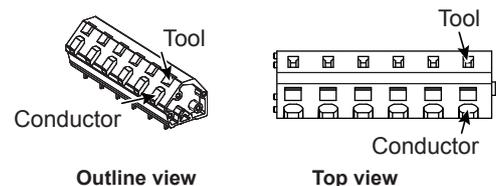


<Fig. 9.7.2>

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 mm ² to 1.5 mm ² Solid wire: 0.25 mm ² to 1.5 mm ²

How to use TBO.1 to 5



Connect them using either way as shown above.

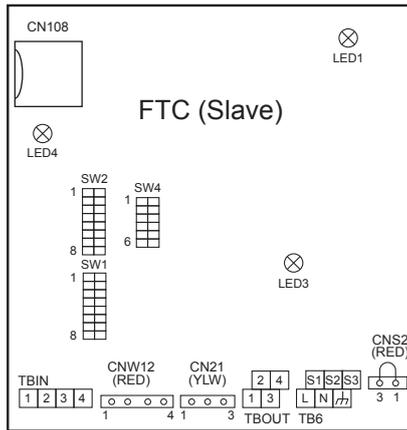
<Fig. 9.7.3>

Note:

1. Do not connect multiple water circulation pumps directly to each output (OUT1). In such a case, connect them via (a) relay(s).
2. Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).

9. Multiple outdoor units control

■ PAC-SIF051B-E



<Fig. 9.7.4>

Signal inputs

Name	Terminal block	Connector	Item	OFF (Open)	OFF (Short)
RC	TBIN 1-2	—	Communication cable between indoor units	—	—
IN2	TBIN 3-4	—	Flow switch input	Refer to SW2-2 in <9.6 Dip Switch Functions>.	

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. 10 m Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.5 mm ² to 1.25 mm ² Solid wire: ø0.65 mm to ø1.2 mm
	Switch	Non-voltage "a" contact signals Remote switch: minimum applicable load 12V DC, 1mA

Thermistor inputs

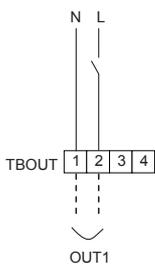
Name	Terminal block	Connector	Item	Optional part model
TH2	—	CN21	Thermistor (Ref. liquid temp.)	—
THW1	—	CNW12 1-2	Thermistor (Flow water temp.)	—
THW2	—	CNW12 3-4	Thermistor (Return water temp.)	—

Note:

Do not splice the wiring to extend or shorten it, or this could affect correct monitoring of each temperature.
If the wiring is too long, bundle it with a strap to adjust the length.

Output

Name	Terminal block	Connector	Item	OFF	ON	Signal/Max current
OUT1	TBOUT 1-2	—	Water circulation pump 1 output	OFF	ON	230V AC 1.0 A Max



<Fig. 9.7.5>

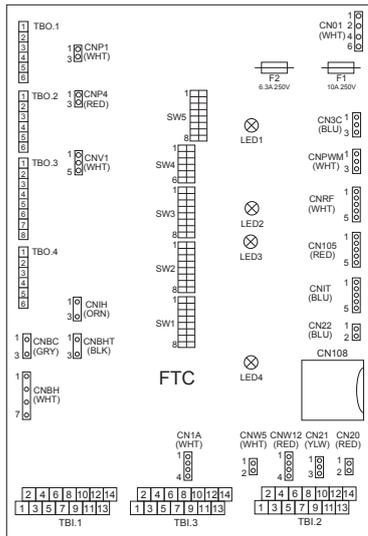
Wiring specification and local supply parts

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 0.5 mm ² to 1.25 mm ² Solid wire: ø0.65 mm to ø1.2 mm

Note: Do not connect multiple water circulation pumps directly to each output (OUT1). In such a case, connect them via (a) relay(s).

9. Multiple outdoor units control

Hydrobox



<Fig. 9.7.6>

When the wires are wired to adjacent terminals use ring terminals and insulate the wires.

Signal inputs

Name	Terminal block	Connector	Item	OFF (Open)	OFF (Short)
RC	TBI.2 1-2	CN22	Communication cable between indoor units	—	—
IN2	TBI.1 11-12	—	Flow switch input	Refer to SW2-2 in <9.6 Dip Switch Functions>.	

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. 10 m Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.5 mm ² to 1.25 mm ² Solid wire: ø0.65 mm to ø1.2 mm
	Switch	Non-voltage "a" contact signals Remote switch: minimum applicable load 12V DC, 1mA

Thermistor inputs

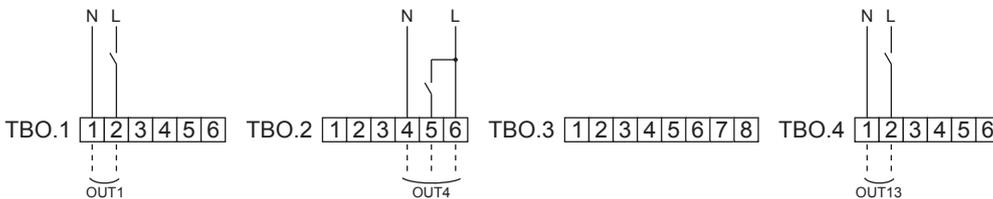
Name	Terminal block	Connector	Item	Optional part model
TH2	—	CN21	Thermistor (Ref. liquid temp.)	—
THW1	—	CNW12 1-2	Thermistor (Flow water temp.)	—
THW2	—	CNW12 3-4	Thermistor (Return water temp.)	—

Note:

Do not splice the wiring to extend or shorten it, or this could affect correct monitoring of each temperature.
If the wiring is too long, bundle it with a strap to adjust the length.

Outputs

Name	Terminal block	Connector	Item	OFF	ON	Signal/Max current
OUT1	TBO.1 1-2	CNP1	Water circulation pump 1 output	OFF	ON	230V AC 1.0 A Max
OUT4	TBO.2 4-6	CNV1	3-way valve (2-way valve 1) output	Heating	DHW	230V AC 0.1 A Max
OUT13	TBO.4 1-2	—	2-way valve 2 output	DHW	Heating	230V AC 0.1 A Max



<Fig. 9.7.7>

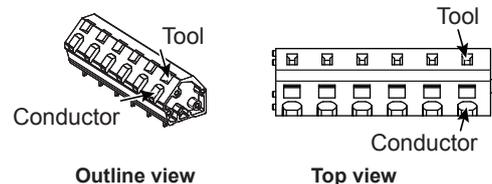
Wiring specification and local supply parts

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 mm ² to 1.5 mm ² Solid wire: 0.25 mm ² to 1.5 mm ²

Note:

- Do not connect multiple water circulation pumps directly to each output (OUT1). In such a case, connect them via (a) relay(s).
- Do not connect water circulation pumps to both TBO.1 1-2 and CNP1 at the same time.
- Stranded wire should be processed with insulation-covered bar terminal (DIN46228-4 standard compatible type).

How to use TBO.1 to 4



Connect them using either way as shown above.

<Fig. 9.7.8>

9. Multiple outdoor units control

■ Basic Troubleshooting for multiple outdoor units control

No.	Fault symptom	Possible cause	Explanation - Solution
1	Main controller display is blank.	<ol style="list-style-type: none"> There is no power supply to main controller. Power is supplied to the main controller, however, the display on the main controller does not appear. 	<ol style="list-style-type: none"> Check LED2 on the master controller. (See <Figure 5.4.1>.) <ol style="list-style-type: none"> When LED2 is lit. <ul style="list-style-type: none"> Check for damage or contact failure of the main controller wiring. When LED2 is blinking. <ul style="list-style-type: none"> Refer to No. 4 below. When LED2 is not lit. <ul style="list-style-type: none"> Refer to No. 3 below. Check the following: <ul style="list-style-type: none"> Disconnection between the main controller cable and the master controller. Failure of the main controller if "Please Wait" is not displayed. Refer to No. 2 below if "Please Wait" is displayed.
2	"Please Wait" remains displayed on the main controller.	<ol style="list-style-type: none"> "Please Wait" is displayed for up to 6 minutes. Communication failure between the main controller and master/slave controller. Communication failure between slave controller and outdoor unit. 	<ol style="list-style-type: none"> Normal operation. 3. Main controller start up checks/procedure. <ol style="list-style-type: none"> If "0%" or "50-99%" is displayed below "Please Wait" there is a communication error between the main controller and the master/slave controller. <ul style="list-style-type: none"> Check wiring connections on the main controller. Replace the main controller or master/slave controller. If "1-49%" is displayed there is a communication error between the outdoor unit's control board and slave controller. <ul style="list-style-type: none"> Check the wiring connections on the outdoor unit control board and the slave controller. (Ensure S1 and S2 are not cross-wired and S3 is securely wired with no damage. (See section 4.5.) Replace the outdoor unit's control board and/or the slave controller.
3	LED2 on master controller is off. (See <Figure 5.4.1>.)	<p>When LED1 on master controller is also off. (See <Figure 5.4.1>.)</p> <ol style="list-style-type: none"> Master controller is not supplied with 220 to 240V AC. There are problems in the method of connecting the connectors. Master controller failure. 	<ol style="list-style-type: none"> Check the voltage across the L and N terminals on the indoor power supply terminal block. (See section 4.5.) <ul style="list-style-type: none"> When the voltage is not 220 to 240V AC, check for faulty wiring to power supply. When the voltage is 220 to 240V AC, go to 2. below. Check for faulty wiring between the connectors. <ul style="list-style-type: none"> When the connectors are wired incorrectly re-wire them correctly referring to below. (See section 4.5 and a wiring diagram on the control and electrical box cover.) <div style="text-align: center;"> </div> <ol style="list-style-type: none"> If no problem found with the wiring, go to 3. below. Check the master controller. <ul style="list-style-type: none"> Check the fuse on the master controller. Check for faulty wiring. Check Dip SW4-2 is ON. If no problem found with the wiring, the master controller is faulty.
4	LED2 on FTC is blinking. (See Figure <5.4.1>.)	<p>When LED1 is also blinking on master controller.</p> <p>When LED1 on master controller is lit.</p> <ol style="list-style-type: none"> Faulty wiring in main controller Multiple indoor units have been wired to a single outdoor unit. Short-circuited wiring in main controller Main controller failure Dip SW setting failure 	<p>Check for faulty wiring between master controllers.</p> <ol style="list-style-type: none"> Check for faulty wiring in main controller. The number of indoor units that can be wired to a single outdoor unit is one. Additional indoor units must be wired individually to a single outdoor unit. ,3. Remove main controller wires and check LED2 on master controller. (See Figure 5.4.1.) <ul style="list-style-type: none"> If LED2 is blinking check for short circuits in the main controller wiring . If LED2 is lit, wire the main controller again and: <ul style="list-style-type: none"> - if LED2 is blinking, the main controller is faulty; - if LED2 is lit, faulty wiring of the main controller has been corrected. Check Dip SW 4-2 on the slave controller is OFF.

For other details, refer to "8. Troubleshooting".

10. Supplementary information

10.1 Refrigerant collecting (pumpdown) for split model systems only

Refer to "Refrigerant collection" in the outdoor unit installation manual or service manual.

10.2 Back-up operation of boiler

Heating operation is backed up by boiler.

For more details, refer to the installation manual of PAC-TH011HT-E.

<Installation & System set up>

1. Set Dip-SW 1-1 to ON "With boiler" and SW2-6 to ON "With Mixing tank".
2. Install the thermistors THWB1 (Flow temp.) and THWB2 (return temp.) *1 on the boiler circuit.
3. Connect the output wire (OUT10: Boiler operation) to the signal input (room thermostat input) on the boiler. *2
4. Install one of the following room temp. thermostats. *3

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

*1 The boiler temp. thermistor is an optional part.

*2 OUT10 has no voltage across it.

*3 Boiler heating is controlled on/off by the room temp. thermostat.

<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.

Local application factors

- * This FTC is designed to connect Mr.Slim/Ecodan inverter outdoor unit of MITSUBISHI ELECTRIC to local systems. Please check the following when designing the local system.
- * MITSUBISHI ELECTRIC does not take any responsibility for the local system design.

Heat exchanger

(1) Withstanding pressure

Designed pressure of outdoor unit is 4.15 MPa. Following must be satisfied for burst pressure of connecting application.
Burst pressure: More than 12.45 MPa (3 times more than designed pressure)

(2) Performance

Secure the heat exchanger capacity which meets the following conditions. If the conditions are not met, it may result in malfunction caused by the protection operation or the outdoor unit may be turned off due to the operation of protection system.

- In case of hot water supply, condense temperature is less than 58 °C in max. frequency operation with the outside temperature 7 °C D.B./6 °C W.B.

(3) Heat exchanger internal capacity

Heat exchanger internal capacity must be within the capacity range shown below. If the heat exchanger below the minimum capacity is connected, it may result in the back flow of liquid or the failure of the compressor.

If the heat exchanger above the maximum capacity is connected, it may result in the deficiency in performance due to lack of refrigerant or overheating of the compressor.

Outdoor unit	PUHZ-SW	40	50	75	100	—	120	160	200
	SUHZ-SW	—	45	—	—	—	—	—	—
	PUHZ-SHW	—	—	80	112	140	—	230	—
Maximum capacity [cm ³]	1050	1500	2130	3000	3750	4200	6000	7500	
Minimum capacity [cm ³]	350	500	710	1000	1250	1400	2000	2500	

(4) Contamination maintenance

1. Wash the inside of heat exchanger to keep it clean. Be sure to RINSE not to leave flux. Do not use chlorine detergent when washing.
2. Be sure that the amount of contamination per unit cubic content of heat transfer pipe is less than the following amount.

Example) In case of ϕ 9.52 mm

Residual water: 0.6 mg/m, Residual oil: 0.5 mg/m, Solid foreign object: 1.8 mg/m

Thermistor position

Refer to 4.4.

Notes

- Install the hydraulic filter at the water inlet pipework.
- Inlet water temperature of heat exchanger should be within the range 5 °C - 55 °C.
- Water quality should be to European Directive 98/83 EC standards
 - pH value of 6.5 - 8
 - Calcium \leq 100 mg/L
 - Chlorine \leq 100 mg/L
 - Iron/Manganese \leq 0.5 mg/L
- Refrigerant pipe diameter from outdoor unit to refrigerant-water HEX (Only for SPLIT type)
Use the pipe with same diameter size as the refrigerant pipe connection diameter of outdoor unit. (Refer to outdoor unit installation manual.)
- Ensure that there is sufficient anti-freeze chemical in the water circuit. It is recommended to use 7 : 4 anti-freeze to water ratio.
- The water velocity in pipes should be kept within certain limits of material to avoid erosion, corrosion and excessive noise generation.
Be aware, and take care of , that local velocities in small pipes, bends and similar obstructions can exceed the values above.
e.g.) Copper: 1.5 m/s

⚠ Warning:

- **Always use water that meets the above quality requirements. Using water that does not meet these standards may result in damage to the system pipework and heating components.**
- **Never use anything other than water as a medium. It may cause a fire or an explosion.**
- **Do not use heated water that is produced by the air to water heat pump directly for drinking or cooking. There is a risk to damage your health. There is also a risk that installing the water heat exchanger may corrode if the necessary water quality for air to water heat pump system cannot be maintained. If you wish to use the heated water from the heated pump for these purposes, take measure such as to the second heat exchanger within the water piping system.**

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erklært hiermit auf seine alleinige Verantwortung, dass die unten beschriebenen Zubehörteile für das Heizungs- / Kühlungs-System zur Benutzung im häuslichen, kommerziellen und leicht-industriellen Umfeld:
déclare par la présente et sous son entière responsabilité que les composants du système de chauffage/refroidissement décrits ci-dessous pour l'utilisation dans des environnements résidentiels, commerciaux et d'industrie légère :
verklaart hierbij als enige verantwoordelijke dat de componenten van het verwarmings-/koelsysteem die hieronder worden beschreven, bedoeld zijn voor gebruik in woonomgevingen en in commerciële en licht industriële omgevingen:
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Yoji SAITO
Product Marketing Director

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