Air to Water Heat Pump
Installation manual

Cascade Controller (MCM-D3E0N)
Control Kit (MIM-E03GN)

- Thank you for purchasing this Samsung Product.
- Before operating this unit, please read this manual carefully and retain it for future reference.

SAMSUNG

Contents

Correct Disposal of This Product
(Waste Electrical & Electronic Equipment)

(Applicable in countries with separate collection systems)

This marking on the product, accessories or literature indicates that the product and its electronic accessories (e.g. charger, headset, USB cable) should not be disposed of with other household waste at the end of their working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take these items for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

For information on Samsung's environmental commitments and product regulatory obligations, e.g. REACH, visit our sustainability page available via www.samsung.com

Safety precautions

Carefully follow the precautions listed as below because they are essential to guarantee the safety of Samsung product.

WARNING

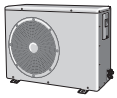
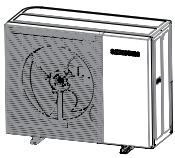
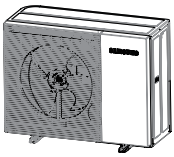
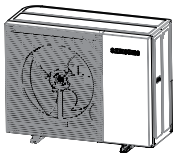
- Always disconnect a power supply of Air-Water Heat Pump before servicing it or accessing components inside the unit.
- Verify that installation and testing operations shall be performed by qualified personnel.
- To prevent serious damage on the system and injuries to users, precautions and other notices shall be observed.

Warning

- Carefully read the contents of this manual before installing the Cascade Controller & Control kit and store the manual in a safe place in order to be able to use it as reference after installation.
- For maximum safety, installers should always carefully read the following warnings.
- Store the manual in a safe location and remember to hand it over to the new owner if the kit is sold or transferred.
- The kit is compliant with the requirements of the Low Voltage Directive (72/23/EEC), the EMC Directive (89/336/EEC) and the Directive on pressurized equipment (97/23/EEC).
- The manufacturer shall not be responsible for damage originating from unauthorized changes or the improper connection of electric and hydraulic lines. Failure to comply with these instructions or to comply with the requirements set forth in the "Operating limits" table, included in the manual, shall immediately invalidate the warranty.
- Do not use the units if you see some damages on the units and recognize something bad such as loud noise, smell of burning.
- In order to prevent electric shocks, fires or injuries, always stop the unit, disable the protection switch and contact Samsung's technical support if the unit produces smoke, if the power cable is hot or damaged or if the unit is very noisy.
- Always remember to inspect the unit, electric connections, and protections regularly. These operations shall be performed by qualified personnel only.
- The unit contains various electrical components, which should be kept out of the reach of children.
- Do not attempt to repair, move, alter or reinstall the unit by unauthorized personnel, these operations may cause product damage, electric shocks and fires.
- Do not place containers with liquids or other objects on the unit.
- The packing materials must be disposed of in accordance with local regulations.
- Wear protective gloves to unpack, move, install, and service the unit to avoid your hands being injured by the edge of the parts.
- Do not touch the internal parts while running the units.
- Inspect the product shipped and check if damaged during transport. If the product has some damages, DO NOT INSTALL and immediately discuss the damages with the carrier or retailer (if the installer or the authorized technician has collected the material from the retailer.)
- Our units shall be installed in compliance with the spaces described in the installation manual, to ensure accessibility from both sides and allow repairs or maintenance operations to be carried out. If the units installed without complying with procedures described in manual, additional expenses can be asked because special harnesses, ladders, scaffolding or any other elevation system for repair service will NOT be considered part of the warranty and will be charged to the end customer.
- When service works required, make sure to disconnect the power supply at least 1 minute to prevent electric shocks.
  - Always check the voltage at the terminals of main PCB before trying to touch.
- Use electric wires which are specified in the manual. Connections between wires and terminals shall be assembled without any tension. If the assembly works is not implemented well, it can lead to product damages and fires.
- After wiring works, the terminal block cover shall be fixed firmly. Without cover, it can cause to have product damage and fire.
- Be sure not to perform power cable modification, midway wiring, and multiple wire connection.
  - It may cause electric shock or fire due to poor connection or insulation and current limit override.
  - When midway wiring is required due to power line damage, refer to "How to connect your extended power cables" in the installation manual.

Product specifications

Product compatibility

<table>
<tr><th colspan="5">Line-up</th></tr>
<tr><td rowspan="4">Heat pump units</td><td rowspan="2">Chassis</td><td colspan="2"></td><td>R32 Mono</td><td>R32 HTQ</td></tr>
<tr><td colspan="2">  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Model Name</td><td>Mono</td><td>AE050RXYD**</td><td>AE080RXYD**</td><td>AE120RXYD**
AE160RXYD**</td><td>AE080BXYD**
AE120BXYD**
AE140BXYD**</td></tr>
<tr><td rowspan="3">Chassis</td><td colspan="2"></td><td colspan="2">R290 Mono</td><td colspan="2">R290 Mono with Pump</td></tr>
<tr><td colspan="2"></td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
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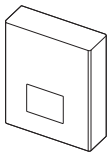
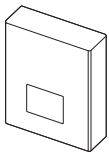
AE080CXYD**</td><td>AE120CXYD**
AE160CXYD**</td><td>AE050CXYB**
AE080CXYB**</td><td>AE120CXYB**
AE160CXYB**</td></tr>
<tr><td rowspan="2">Indoor units</td><td>Control Kit</td><td colspan="4">  </td></tr>
<tr><td>Model Name</td><td colspan="4">MIM-E03GN</td></tr>
<tr><td rowspan="2">Central controller</td><td>Cascade Controller</td><td colspan="4">  </td></tr>
<tr><td>Model Name</td><td colspan="4">MCM-D3E0N</td></tr>
</table>

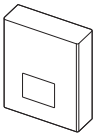
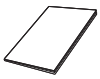
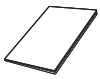
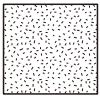
NOTE

- The maximum number of outdoor units that can be connected to a cascade controller is eight.
- The outdoor unit combination is possible only within the same product type.
  e.g., when applying Mono HTQ, only Mono HTQ products can be combined.
  Mono R32, Mono R290 and Mono R290 with pump cannot be applied with Mono HTQ.
- It is possible to combine different capacities of outdoor units within the same product type.
  e.g., Mono R290 8 kW and Mono R290 16 kW can be installed in combination.

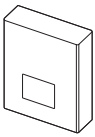
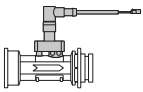
CAUTION

- The Control Kit (MIM-E03GN) is a model exclusively for outdoor units that connects to the Cascade.
- The Mono R290 with pump model operates independently without the Control kit (MIM-E03GN).

Accessories for Cascade controller (MCM-D3E0N)

		
Cascade Controller (MCM-D3E0N)	Installation manual	User manual
		
Temperature Sensor for Water In (Main) (Φ7, 15m, 3Pin, WHT, 1EA)	Temperature Sensor for Water Out (Main) (Φ7, 15m, 2Pin, BLU, 1EA)	Temperature Sensor for Water Tank (Heating) (Φ6, 15m, 2Pin, WHT, 1EA)
		
Temperature Sensor for Water Tank (DHW) (Φ6, 15m, 2Pin, YEL, 1EA)	Temperature Sensor for Heater Out (Φ7, 15m, 2Pin, BLK, 1EA)	Temperature Sensor for TW2 Zone1 In (Φ7, 15m, O-ring, 1EA)
		
Temperature Sensor for TW2 Zone2 In (Φ7, 15m, O-ring, 1EA)	Insulator (6EA)	Cable-Tie (6EA)

Accessories for Control kit (MIM-E03GN)

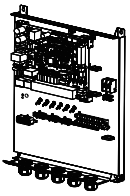
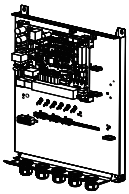
		
Control Kit (MIM-E03GN)	Flow Sensor (1EA, 1.5m)	ASSY TUBE CONNECTOR-RIGHT (OD28.0, 1EA)
		
ASSY TUBE CONNECTOR-LEFT (OD28.0, 1EA)	Fastener (2EA)	O-Ring (2EA)

NOTE

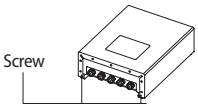
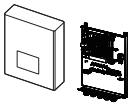
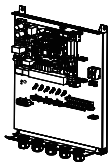
- The MIM-E03GN is a dedicated outdoor unit model that connects to the Cascade. Please note that other control kits are not compatible in cascade system.

Main components

(Unit : EA)

Model name	Parts	MCM-D3E0N	MIM-E03GN
Detail components	Shape		
	Main PBA	1	1
	Remote Controller	1	-
	Wi-Fi	Embedded in 7" Display	Single Wi-Fi kit
	Grounding screw	7	7
	Conduit	5	5
	Base plate	1	1
	Top cover plate	1	1
	Case screw	2	2
	Terminal Block (10p)	1	-
Weight (Net)		7.3 kg	6.7 kg
Size (W x H x D)		380 mm x 480 mm x 150 mm	380 mm x 480 mm x 150 mm

Mounting the unit

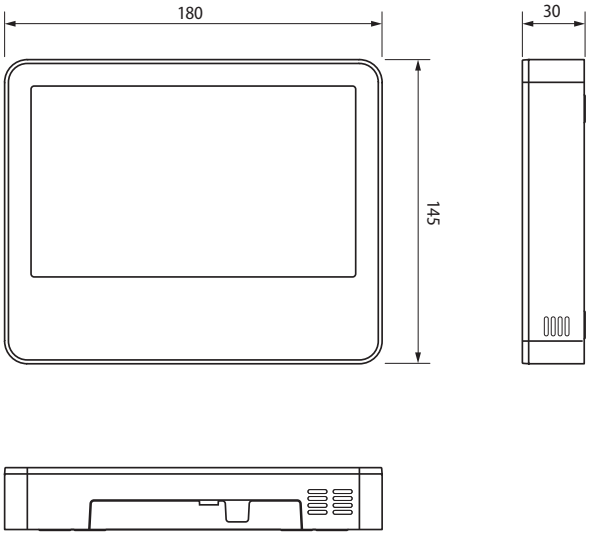
Procedure	Remark
1. Open the 2 screws located at the bottom of the unit.	
2. Open the top cover and fix the unit to the wall with 4 screws.	
3. Close the top cover and fasten 2 screws again into the unit.	

Installing the unit

Installing the AI Home

Dimension

(Unit : mm)



NOTE

- AI Home is applied to Cascade Controller (MCM-D3E0N) only.

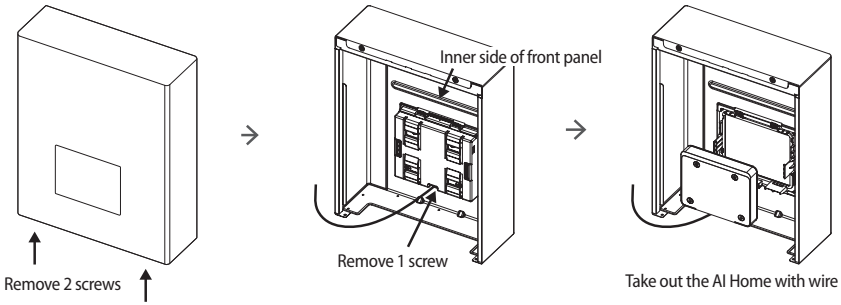
Installing the unit

Installation of AI Home at the separate room

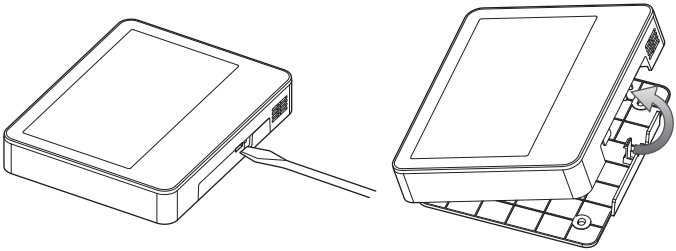
AI Home mounted to the Cascade Controller can be moved to the room.

NOTE
- In order to install AI Home in a separate room, please purchase Extension Wire Kit (MVW-EE300).
- AI Home is applied to Cascade Controller (MCM-D3E0N) only.

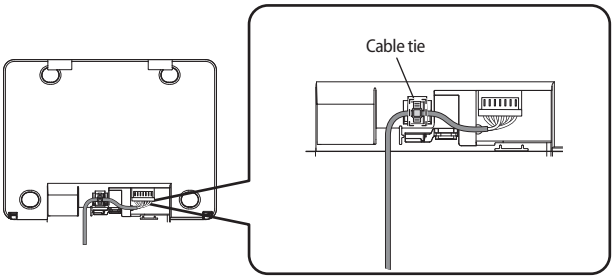
1. Remove the AI Home from Cascade Controller.



2. Remove the wire from the Cascade Controller and AI Home.

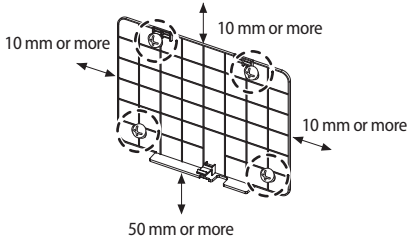


Insert the flat-head screwdriver into a square grooves at the bottom of the AI Home and slightly turn to lift the front from the rear cover.



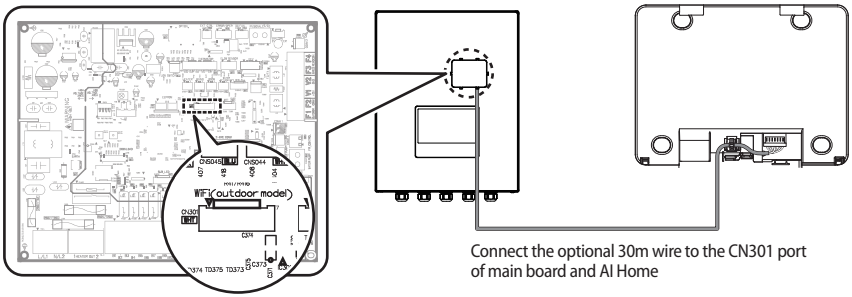
Remove cable tie and wire from the board

3. Installation of AI Home to the wall
   Using 4 screws, firmly affix the rear cover of the AI Home to the wall.



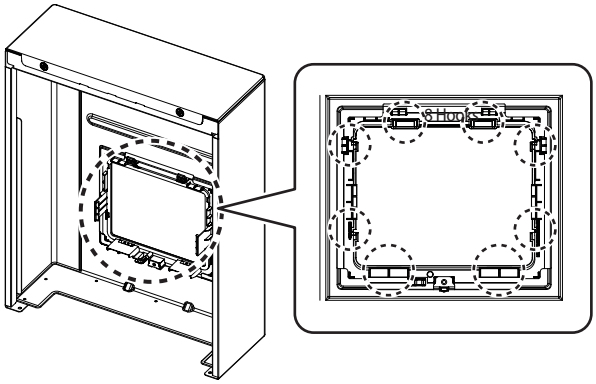
Before fixing the rear cover, secure at least 10 mm space of left, right, upper side, and 50 mm for bottom side

4. Connect extension wire (30m) to main board & AI Home.

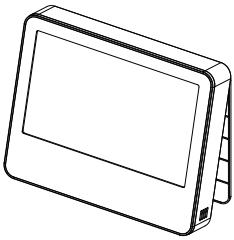


Connect the optional 30m wire to the CN301 port of main board and AI Home

5. Reassemble the Cascade Controller and AI Home.



Fix the front cover decoration panel to the front panel



Align the controller with the upper groove first, and then insert it by turning it downwards as shown in the figure. after assemble, check that no wires are stuck in the gap between the back and front cover

NOTE

- If you install the AI Home separately, the control kits and AI Home for each outdoor unit should be installed in a place sharing the same Wi-Fi access point.

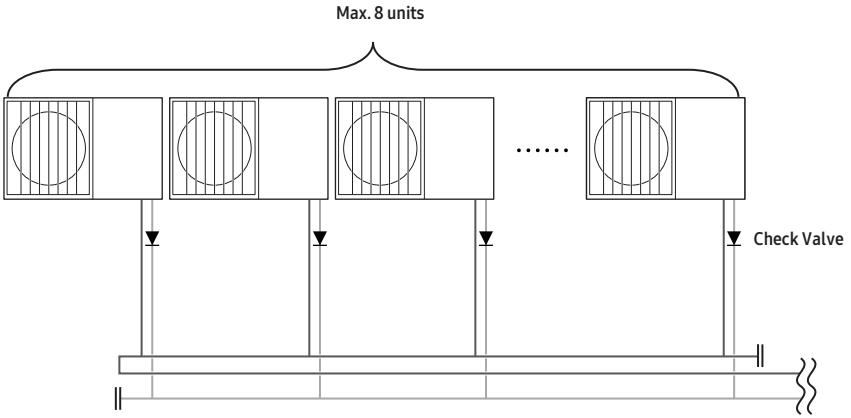
CAUTION

- The Cascade controller and each outdoor unit's Control Kit should be installed in an environment that shares the same SSID and password.
- The Mono R290 with pump model has an indoor unit PBA mounted inside the product, and a separate enclosed Single Wi-Fi kit must be installed in an environment that shares the same SSID and password.

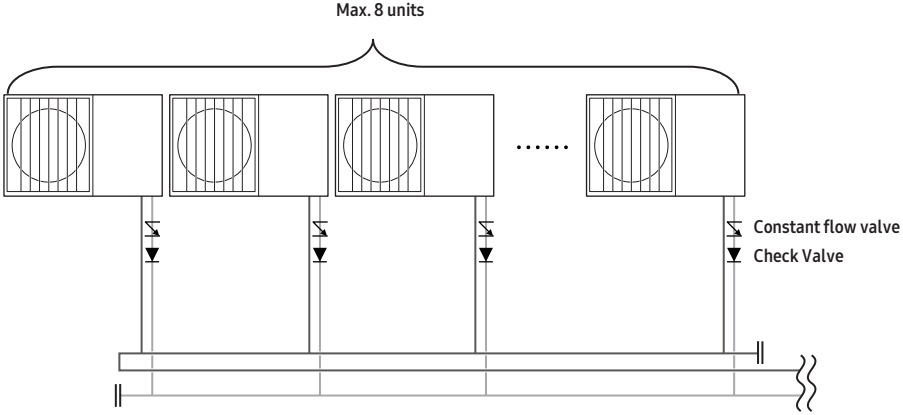
Installing the unit

Installation of outdoor units

▶ Installing outdoor units with the same capacity



▶ Installing outdoor units with the different capacity



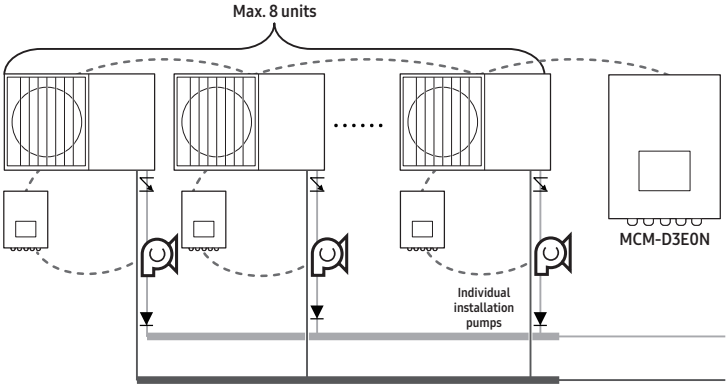
NOTE

- The maximum number of outdoor units that can be connected to a cascade controller is eight.
- The outdoor unit combination is possible only within the same product type.
  e.g., when applying Mono HTQ, only Mono HTQ products can be combined.
  Mono R32, Mono R290 and Mono R290 with pump cannot be applied with Mono HTQ.
- It is strongly recommended to configure the piping in a reverse return method to minimize flow rate deviation for each outdoor unit.

Installation of Water pump for Outdoor units

▶ Water pump for outdoor units

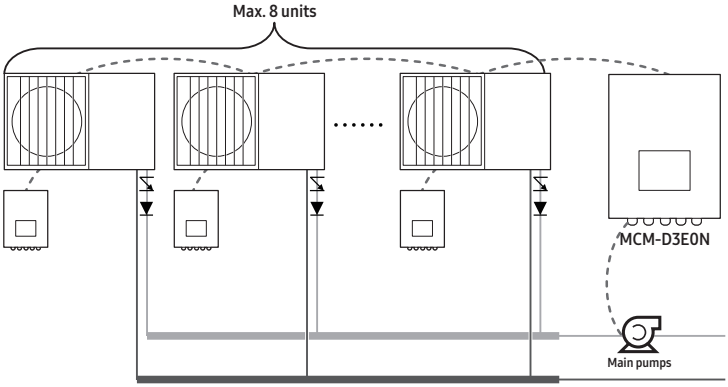
• Installing Water pumps for individual pump



CAUTION

• If the maximum output of the pump exceeds 1A, please connect it to a separate power source.

• Installing Water pumps for Integrated piping installation



• The Water pump can be installed for each outdoor unit or on the main pipe.
  - Individually Installed Water pump system: Each Water pump is controlled by a separate outdoor unit control kit.
  - Integrated main pipe Water pump system: The Water pump is connected to and controlled by a Cascade controller.

NOTE

• The Cascade controller does not provide inverter functionality for the Integrated Water pump. It can be applied only as a constant speed type.

CAUTION

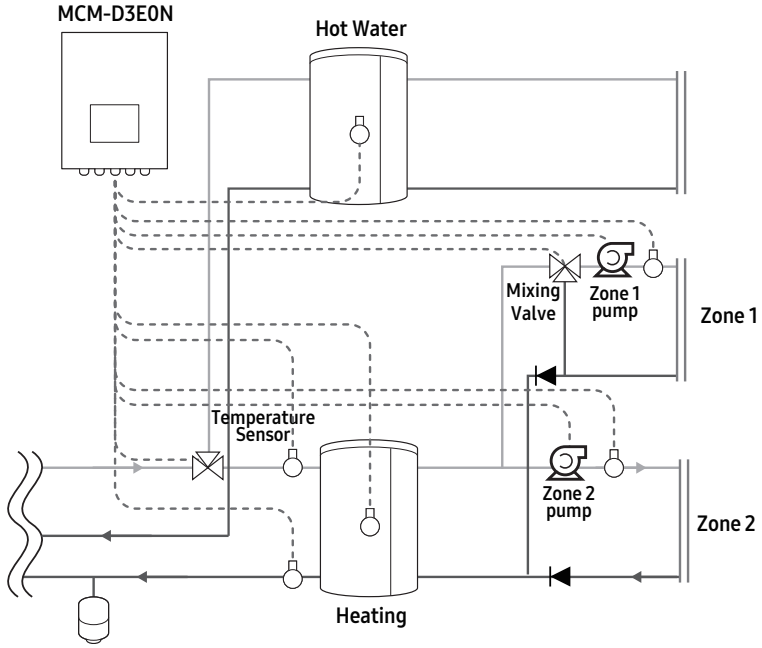
• The Cascade controller provides only on/off control signals for Common Main Pump. Please use a separate external relay to connect to each power source.

CAUTION

• The integrated DHW and heating pump should be installed on the supply pipe.

Installing the unit

Installation of Water pump for DHW and Zone



▶ Water pump for DHW and Zone

- The Water pump for hot water is not controlled by Cascade controller as it is installed and controlled on site.
- The Zone Water pump for heating can be controlled by Cascade controller. Additionally, the Zone water pump control by Cascade controller can be mixed with on-site control by using relays as needed.

NOTE

- When using L.L.H. or 2 Zone control, the Zone Water pumps for heating must be controlled by Cascade controller to synchronize the operation of the main and zone pumps.
  - For Buffer tank, it is optional
  - As needed, the Zone water pump control by Cascade controller can be mixed with on-site control by using relays.

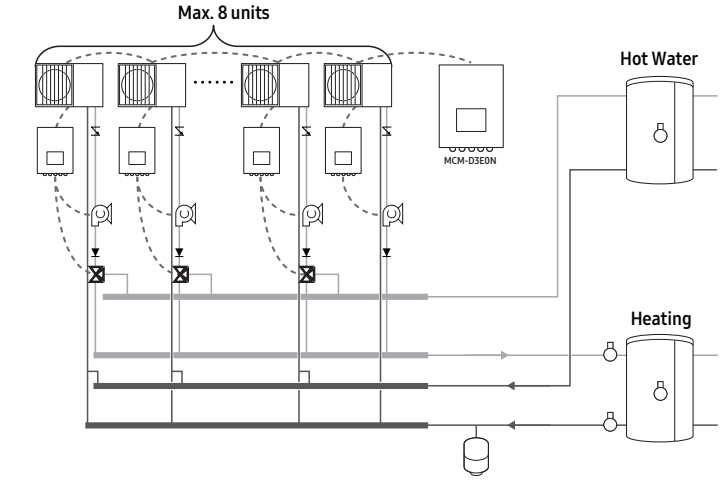
- The Zone Water pump for heating control provided by Cascade includes:
  - Synchronization with main pump
  - Continuous operation of Zone 1 and 2 pumps for preheating (3 options available: always on/always off/interval driving).
- Other requirements can be configured separately according to field needs.

CAUTION

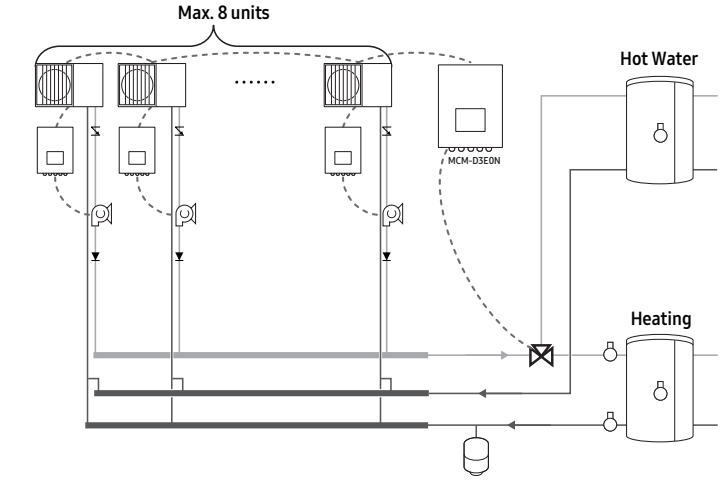
- The Cascade controller provides only on/off control signals for Water Pump for Zone. Please use a separate external relay to connect to each power source.

Installation of 3-way valve

▶ Individually Installed 3-way valve system



▶ Integrated main pipe 3-way valve system

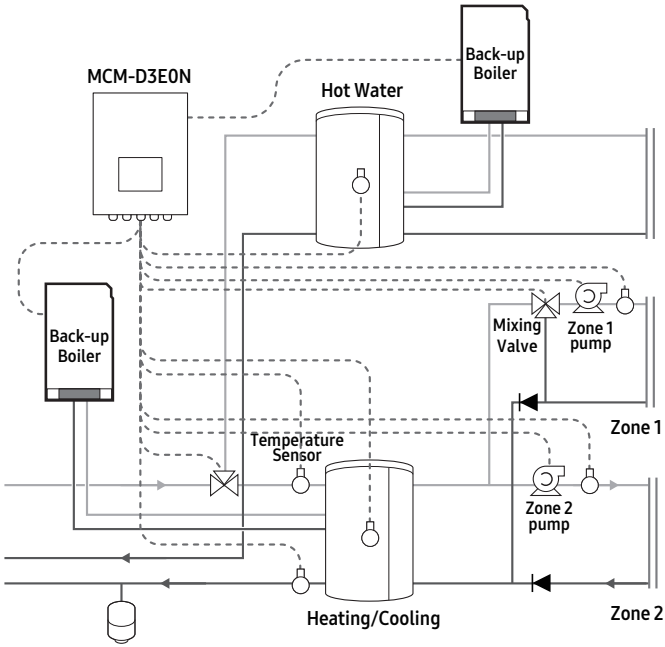


- The 3-way valve can be installed for each outdoor unit or on the main pipe.
  - Individually Installed 3-way valve system: Each 3-way valve is controlled by a separate outdoor unit control kit
  - Integrated main pipe 3-way valve system: The 3-way valve is connected to and controlled by a Cascade controller

CAUTION
- The Cascade controller support only one integrated main pipe 3-way valve.
- The Cascade system allows only one installation type of 3-way valve (individual or integrated type). Individual and integrated 3-way valves cannot be installed together in a system.

Installing the unit

Installation of Back-up boiler



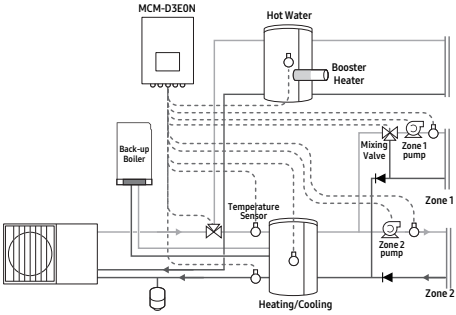
▶ Back-up boiler

• The Backup boiler can be applied as a substitute for the Back-up heater and Booster heater.

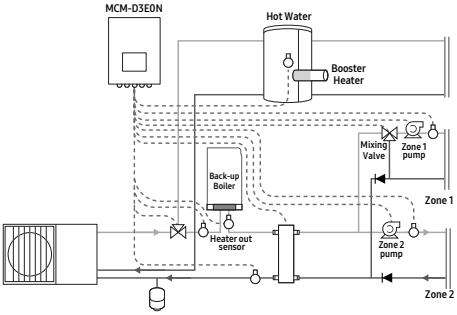
❋ Using a Back-up boiler instead of a Back-up heater

- Connect Back-up boiler to Backup heater contact point
- The Back-up boiler performs the function of the Back-up heater (heating assistance, emergency heating, defrosting protection control, etc.)
- To utilize it as a Back-up heater, set FSV4021 to 1(Back-up boiler is connected to Water tank directly) or 2(Back-up boiler is connected to water pipe line)

<FSV4021=1>



<FSV4021=2>



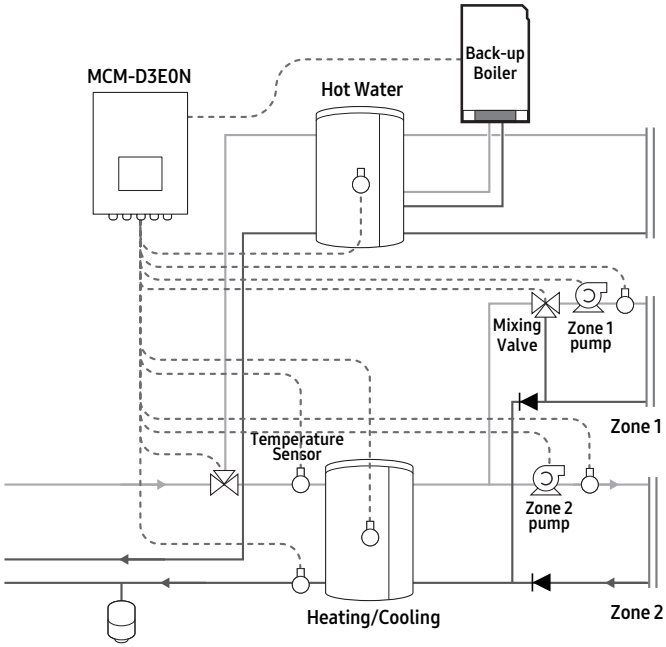
CAUTION

- If a buffer tank is installed, the backup boiler is controlled by the buffer tank temperature sensor. If L.L.H. is installed, the backup boiler should be installed before L.L.H., and a heater outlet temperature sensor must be installed in the backup boiler outlet line for backup boiler control. (Alarm will occur if the sensor is not installed.)

CAUTION

- It is not allowed to install both a back-up heater and a back-up boiler to back-up heater contact point.

❋ Using a Back-up boiler instead of a Booster heater
- Connect Back-up boiler to Booster heater contact point
- The Back-up boiler performs the function of the Back-up heater (hot water supply assistance, emergency hot water supply, disinfection operation, etc.)
- To utilize it as a Booster heater, set FSV3031 to 1

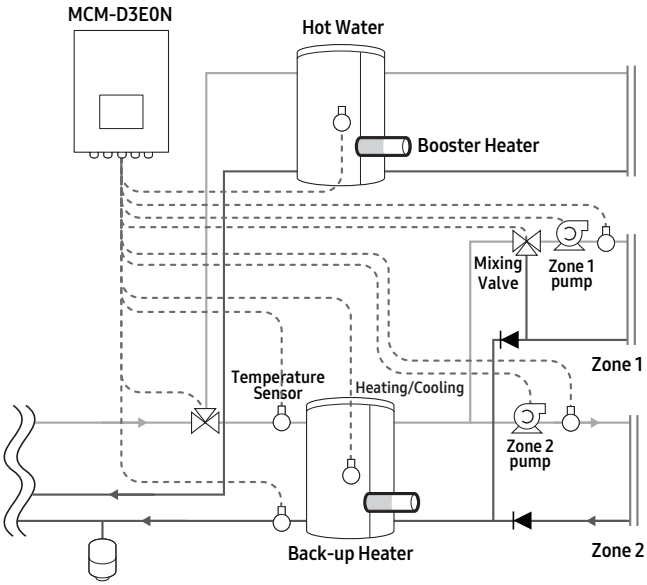


CAUTION

- If a Back-up boiler is connected to a Back-up heater or Booster heater contact point, FSV4031 should be set to 0.
- FSV4031 should be set to 1 only when the Back-up boiler is connected to the Back-up boiler contact point for its original function.

Installing the unit

Installation of heaters



NOTE

- The term "Booster heater" refers to an auxiliary heater for a hot water tank, and "Back-up heater" indicates an auxiliary heater for a heating tank.

CAUTION

- Back-up for Hot water tank can only be used with booster heater.
- Back-up for Heating/cooling tank can only be used with Back-up heater.
- Individual heaters for outdoor units are not allowed.

▶ Booster heater

- Booster heater can be used for Anti-Legionella operation for hot water tank.
  - To utilize the Booster Heater functionality, the FSV3031 must be configured as 1.
- When there's a performance degradation of the outdoor unit due to low ambient temperature, booster heater provide desired hot water temperature.

▶ Back-up heater

- The backup heater can be installed inside The buffer tank or in the main pipe.
  - If installing the backup heater inside the buffer tank: Set FSV4021 to 1.
    In this case, since the buffer tank sensor acts as a heater sensor, there is no need for a additional heater sensor.
  - If installing the backup heater in the main pipe: Set FSV4021 to 2.
    In this case, it is necessary to connect the heater sensor at the after of the backup heater.

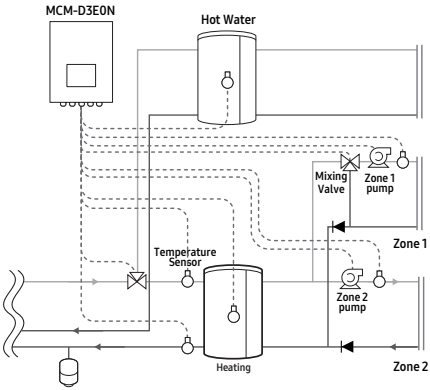
NOTE

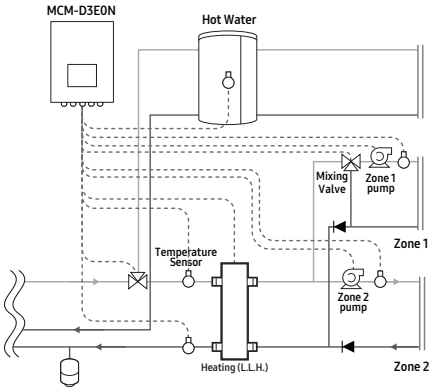
- The back-up heater cannot be used for the purpose of anti-legionella operation in a hot water tank.

CAUTION

- The Cascade controller provides only on/off control signals for both back-up heater and booster heater. Please use a separate external relay to connect to each power source.
- The third-party heater must be equipped with a product that has its own overheating protection function.

Installation of Buffter tank





▶ Buffer tank

- Hot water tanks and heating tanks can be installed separately, and a heating tank can be replaced with a Low-Loss Header (L.L.H.).
  - Buffer Tank: Heating/Cooling Thermo on/off through temperature sensor in Buffer tank
  - L.L.H. : Heating/Cooling Thermo on/off through outlet water sensor at rear end of separator

CAUTION

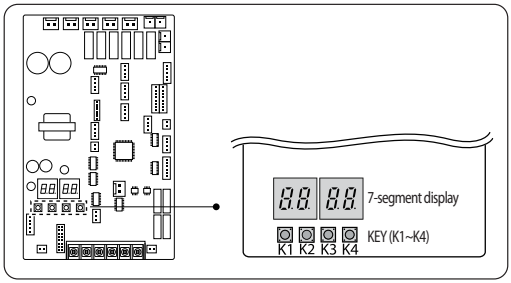
- The use of L.L.H. as a hot water tank is not permitted.
- It is essential to install either a Buffer tank or a L.L.H. in the heating line.
- In a system where L.L.H. is applied, and the zone control is not used, a temperature sensor of Zone 2 should be installed at the exit of L.L.H.

Installing the unit

Setting guide for outdoor unit address

The outdoor units connected to a cascade must be assigned addresses in order for them to be controlled by the cascade controller.

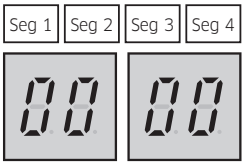
► Setting the outdoor unit adress via K-button tactile switches



NOTE

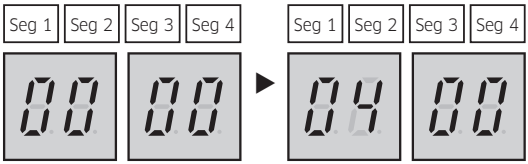
- Before setting up K-button tactile switches, power must be applied to the outdoor units.

- Press and hold K2 to enter the option setting. (Only available when the operation is stopped)
  When entering the option setting, the display will show the following:



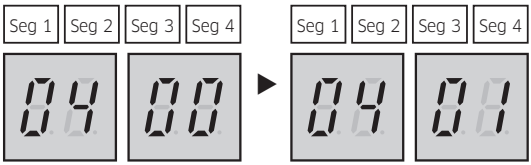
  - Seg 1 and Seg 2 will display the number for the selected option.
  - Seg 3 and Seg 4 will display the number for the set value of the selected option.

- After entering the option setting mode, shortly press the K1 switch to go to the desired option to change, indicated by Seg 1, Seg 2 and select the desired option.



  - The channel address setting is "04".
    Press the K1 button to set it as "04".

- After selecting Seg1 & 2, Press shortly the K2 switch to adjust the value of the option, as indicated by Seg 3 and Seg 4.



  - Please set each outdoor unit channel address from "01" to "08".
    Ex.) If five outdoor units have been installed, they should be set from "01" to "05".

- After selecting the function setting for the selected options, press and hold the K2 switch for 2 seconds to store the value. The changed value of the option will be saved when the entire segment display blinks and tracking mode begins.

CAUTION

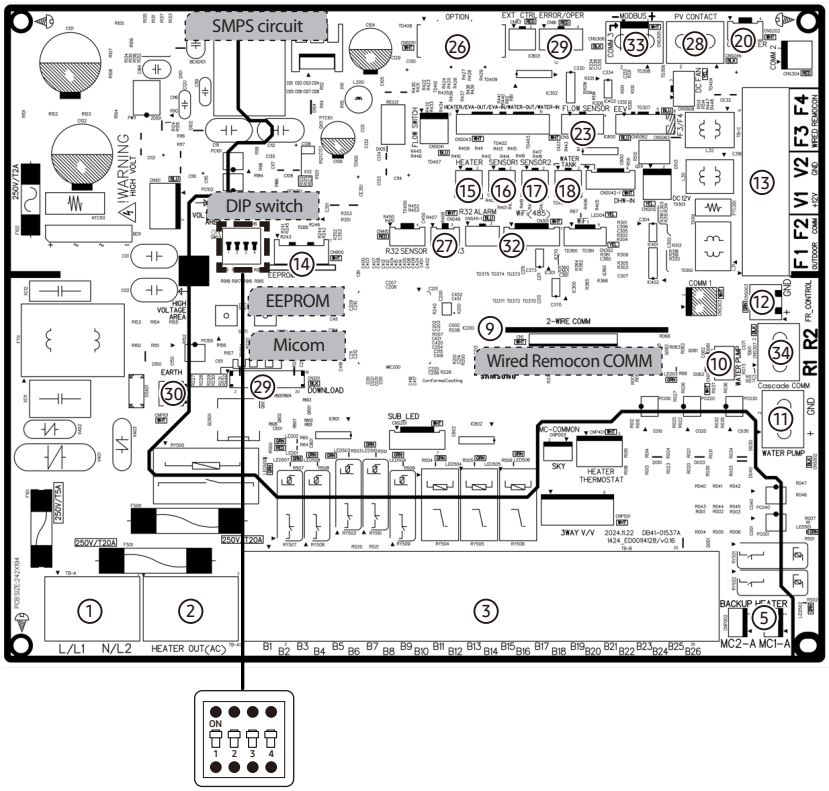
- Each outdoor unit must have its own channel address. (No duplicate input allowed)
- The number of outdoor units assigned channel addresses should match the number of outdoor units set in AI Home.

Wiring work

CAUTION

- Field-supplied electrical components such as power switch, circuit breakers, wires, terminal blocks, etc must be properly chosen with compliance with national legislation or regulation.
- Switch off the power supply before making any connections.
- All field wiring and components must be installed by a licensed electrician.
- Use a dedicated power supply.
- All power connections must be protected from dew condensation by thermal insulation.
- The system shall be earthed. Do not earth the unit to a utility pipe, surge absorber or telephone earth. Incomplete earth may cause electrical problems.

Layout of PCB



Wiring work

No.	Part code	Part name	Terminal	Terminal description
①	TB-A	AC POWER-IN	#1: L	AC INPUT
			#2: N	AC INPUT
②	TB-A1	BOOSTER HEATER	#1: BOOSTER HEATER SIGNAL(L)	AC OUTPUT
			#2: N	AC OUTPUT
③	TB-B	LOAD CONTROL	#1: N	AC OUTPUT
			#2: MIXING VALVE_CW (L)	AC OUTPUT
			#3: MIXING VALVE_CCW (L)	AC OUTPUT
			#4: BOILER (L)	AC OUTPUT
			#5: N	AC OUTPUT
			#6: L * CASCADE : WATER PUMP_DHW(HOT WATER) (L)	AC OUTPUT
			#7: N	AC OUTPUT
			#8: L * CASCADE : WATER PUMP_HEATING(L) * CONTROL KIT : WATER PUMP_ADD(L)	AC OUTPUT
			#9: -	
			#10: L * CASCADE : Zone1 Water Pump	AC OUTPUT
			#11: N	AC OUTPUT
			#12: L	AC OUTPUT
			#13: -	
			#14: L * CASCADE : Zone2 Water Pump	AC OUTPUT
			#15: N	AC OUTPUT
			#16: L	AC OUTPUT
			#17: 3WAY VALVE_NO (L)	AC OUTPUT
			#18: 3WAY VALVE_NC (L)	AC OUTPUT
			#19: N	AC OUTPUT
			#20: L	AC OUTPUT
			#21: -	
			#22: -	
			#23: -	
			#24: -	
			#25: SOLAR PUMP(N)	AC INPUT
			#26: SOLAR PUMP(L)	AC INPUT
⑤	CNP001	MC1-A	#1: BACK UP HEATER	AC OUTPUT
⑨	CN1	WIRED REMOCON COMM. SUB PBA		

No.	Part code	Part name	Terminal	Terminal description
⑩	CNS001	WATER PUMP	#1: WATER PUMP PWM SIGNAL	DC OUTPUT
			#2: -	
			#3: GND	DIGITAL GROUND
⑪	CNS002	WATER PUMP (Control kit only)	#1: WATER PUMP PWM SIGNAL	DC OUTPUT
			#2: GND	DIGITAL GROUND
⑫	CNS003	FR_CONTROL	#1: FR CONTROL DC INPUT	DC INPUT
			#2: GND	DIGITAL GROUND
⑬	TB-C	COMMUNICATION & DC 12V	#1: COM1 (F1)	RS485 - COMM.
			#2: COM1 (F2)	
			#3: V1 (DC 12V)	DC OUTPUT
			#4: V2 (GND)	DIGITAL GROUND
			#5: COM2 (F3)	WIRED REMOTE CONTROLLER
			#6: COM2 (F4)	
⑭	CN900	EEPROM	#1: GND	DIGITAL GROUND
			#2: -	
			#3: DC 5V	DC OUTPUT
			#4: EEPROM_SELECT	DC SIGNAL
			#5: EEPROM_SO	DC SIGNAL
			#6: EEPROM_SI	DC SIGNAL
			#7: EEPROM_CLK	DC SIGNAL
⑮	CNS047	HEATER SENSOR	#1: HEATER TEMP. (10kΩ @ 25 ℃)	DIGITAL INPUT
			#2: GND	DIGITAL GROUND
⑯	CNS045	WATER OUT SENSOR	#1: WATER OUT TEMP(10kΩ @25 ℃)	DIGITAL INPUT
			#2: GND	DIGITAL GROUND
⑰	CNS044	WATER TANK (HEATING) SENSOR	#1: WATER TANK(HEATING) TEMP(200kΩ @25 ℃)	DIGITAL INPUT
			#2: GND	DIGITAL GROUND
⑱	CNS042	WATER TANK (HOT WATER) SENSOR)	#1: WATER TANK(HOT WATER) TEMP(200kΩ @25 ℃)	DIGITAL INPUT
			#2: GND	DIGITAL GROUND
⑳	CNS202	EHS CONVERTER	#1: COM1 (F1)	RS485 - COMM.
			#2: COM1 (F2)	
			#3: GND	DIGITAL GROUND
			#4: DC 12V	DC OUTPUT
㉓	CNS057	FLOW SENSOR (Control kit only)	#1: DC 5V	DC OUTPUT
			#2: FLOW SENSOR DC INPUT	DC INPUT
			#3: GND	DIGITAL GROUND
			#4: -	

Wiring work

No.	Part code	Part name	Terminal	Terminal description
㉖	CNS051	OPTION CONNECT (DRY CONTACT, Thermistor)	#1: SG READY1 SIGNAL	DC INPUT
			#2: OPTION TEMP.(10kΩ @ 25 ℃)	DIGITAL INPUT
			#5: SG READY2 SIGNAL	DC INPUT
			#6: DRED (Cascade only)	DIGITAL INPUT
			#9: EMERGENCY_STOP	DC INPUT
			#10: ZONE1 FLOW TEMP. (10kΩ @ 25 ℃)	DIGITAL INPUT
			#13: DRY CONTACT_1	DC INPUT
			#14: ZONE2 FLOW TEMP. (10kΩ @ 25 ℃)	DIGITAL INPUT
			#17: DRY CONTACT_2	DC INPUT
			#21: DRY CONTACT_3	DC INPUT
			#3,4,7,8,11,12,15,16,19,23: GND	DIGITAL GROUND
			#18,20,22,24: -	
㉗	CN048	WATER IN SENSOR	#1: WATER IN TEMP(10kΩ @25℃)	DIGITAL INPUT
			#3: GND	DIGITAL GROUND
㉘	CNS046	PV/Peak power control SIGNAL	#1: PV(Photovoltaic) Control Signal / Peak power control Signal	DC INPUT
			#2: GND	DIGITAL GROUND
㉙	CN201	DOWNLOAD		
㉚	CNP101	EARTH	#1: EARTH	EARTH
㉜	CN302	AI Home	#1 : MICOM Rx Signal	UART
			#2 : MICOM Tx Signal	UART
			#3 : Wi-Fi Reset Signal	
			#4 : GND	DIGITAL OUTPUT
			#5 : DC12V	DC OUTPUT
㉝	CNS306	MODBUS Communication	#1 : MODBUS(+)	
			#2: MODBUS(-)	
㉞	CNS307	R1,R2 Communication	#1 : COMM_R1(+)	
			#1 : COMM_R2(-)	

No.	Part code	Part name	Terminal	Terminal description

③ Detail

Terminal No.	Function		Description	Input /output	Cascade Controller & Control kit
	Cascade Controller MCM-D3E0N	Control Kit MIM-E03GN			
B1/B6	WATER PUMP(HOT WATER)	-	B1: Neutral	AC 230V output	1 A
			B6: Water Pump(Live)		
B2/B3/B5	MIXING VALVE	-	B2: CW(Live)	AC 230V output	50 mA
			B3: CCW(Live)		
			B5: Neutral		
B4/B5	BACKUP BOILER	-	B4: Boiler Signal(Live)	AC 230V output	50 mA
			B5: Neutral		
B7/B8	WATER PUMP(HEATING)	WATER PUMP	B7: Neutral	AC 230V output	1 A
			B8: Water Pump(Live)		
B9/B10/ B11/B12	WATER PUMP (ZONE1)	-	-	AC 230V output	50 mA
			B10: Zone 1 Water Pump(Live)		
			B11: Neutral		
			B12: Live		
B13/B14/ B11/B12	WATER PUMP (ZONE2)	-	B11: Neutral	AC 230V output	50 mA
			B12: Live		
			-		
			B14: Zone 2 Water Pump(Live)		
B15/B16/ B17/B18	3WAY VALVE	3WAY VALVE	B15: Neutral	AC 230V output	50 mA
			B16: Live		
			B17: 3WAY_NO(Live)		
			B18: 3WAY_NC(Live)		
B19/B20	Power for Thermostat	-	B19: Neutral	AC 230V output	50 mA
			B20: Live		
B25/B26	SOLAR PUMP	-	B25: SOLAR PUMP_N	AC 230V Input	22 mA
			B26: SOLAR PUMP_L		

CAUTION

- If you use more than the current corresponding to each terminal, use a separate external relay to connect to each power source.

Wiring work

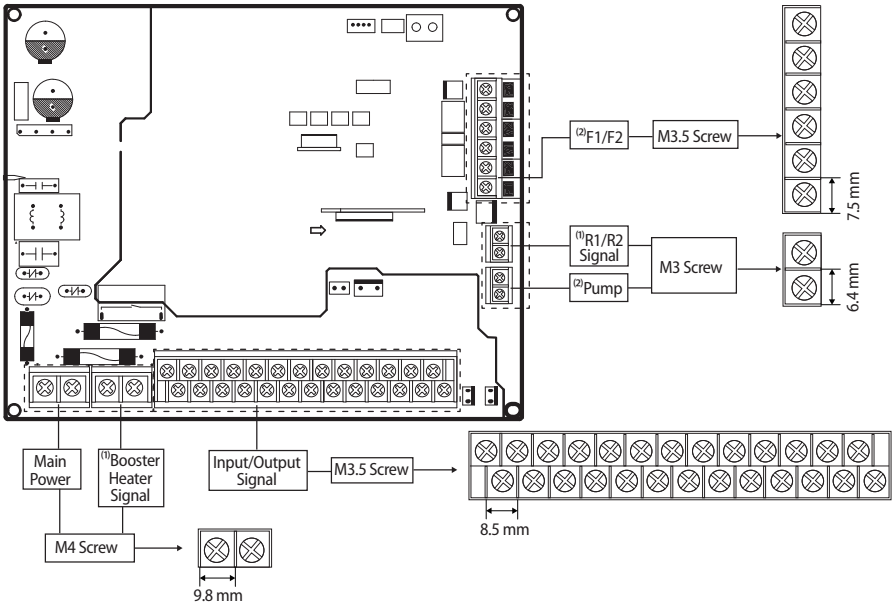
Wiring of Main power, Heater and Input/Output signal cables

- Connect the cables to the terminal board using the solderless ring terminal.
- Use certified and verified cables.
- The cable ties for securing the wires must be made from nonflammable materials, V0 or higher. Cable ties must be used to secure the power wire, and they come with the unit.
- Connect the cables with the torque chart and diagram as below.

Tightening Torque (kgf • cm)	
M3	0.5 ~ 0.75
M3.5	8 ~ 12
M4	12 ~ 18
M5	20 ~ 30

WARNING
- If the terminal is loose, fire may occur caused by arc. Also If the terminal is connected too firmly, the terminal may be damaged.
- External force should not be applied to the terminal block and wires.

- Main PCB



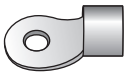
NOTE
- (1) : The content is related to Cascade controller only.
- (2) : The content is related to Control kit(MIM-E03GN) only.

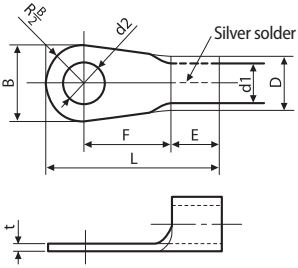
CAUTION
- Main and heater power must be configured through each RCBO or MCB+RCCB.
- Connect 'Protective Earth' line with 'Earth screw' In case.

CAUTION
- The heater connection terminal is used to receive the On/Off signal for the heater operation. Please make sure to install an external relay to provide separate power supply to the heater.

Selecting solderless ring terminal

- Select a solderless ring terminal of a connecting power cable based on a nominal dimensions for cable.
- Cover a solderless ring terminal and a connector part of the power cable and then connect it.





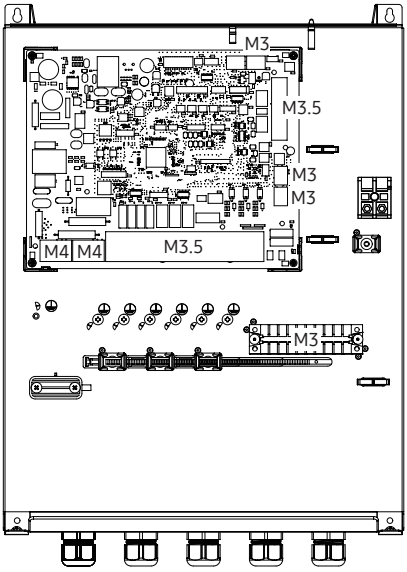
Nominal dimensions for cable (mm²)		1.5	2.5	4/6	
Nominal dimensions for screw (mm)		4	4	4	8
B	Standard dimension (mm)	8	9.5	9.5	12
	Allowance (mm)	±0.2	±0.2	±0.2	
D	Standard dimension (mm)	3.4	4.2	5.6	
	Allowance (mm)	+0.3 -0.2	+0.3 -0.2	+0.3 -0.2	
d1	Standard dimension (mm)	1.7	2.3	3.4	
	Allowance (mm)	±0.2	±0.2	±0.2	
E	Min.	4.1	4.1	6	
F	Min.	6	7	5	9
L	Max.	16	17.5	20	28.5
d2	Standard dimension (mm)	4.3	5.3	4.3	8.4
	Allowance (mm)	+ 0.2 0	+ 0.2 0	+ 0.2 0	+0.4 0
t	Min.	0.7	0.8	0.9	

Wiring work

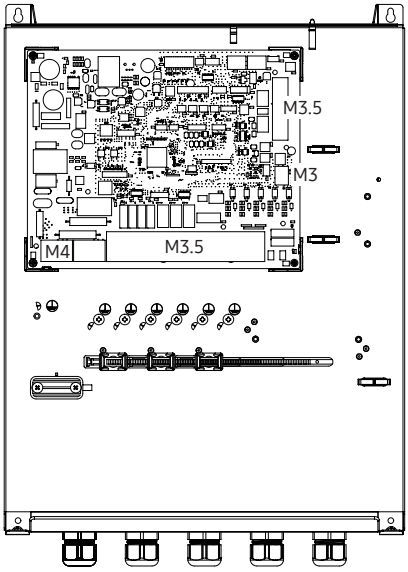
Torque requirements

CONTROL BOX & MAIN CONTROL PBA

MCM-D3E0N



MIM-E03GN



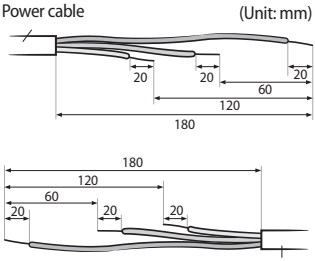
Screw size	Tightening torque (kfg·m)	Part	Terminal code	Remarks
M4	12~18	MAIN Control PBA 2P Terminal Block	TB-A (POWER)	MAIN POWER Input (AC 220V~240V)
		MAIN Control PBA 2P Terminal Block	TB-A1 (BOOSTER HEATER POWER)	BOOSTER HEATER OUTPUT (AC 220V~240V)
M3.5	8~12	MAIN Control PBA 6P Terminal Block	TB-C (F1,F2,V1,V2,F3,F4)	F1,F2,F3,F4 : Comm. Signal V1,V2 : DC12V Output
		MAIN PBA 26P Terminal Block	TB-B (B1~B26)	POWER Input/Output (AC 220V~240V)
M3	5~7.5	MAIN Control PBA 2P Terminal Block	CNS046 (PV/Peak Power Control Signal)	Dry Contact Input
		MAIN Control PBA 2P Terminal Block	CNS002 (WATER PUMP)	PWM Signal Input
		MAIN Control PBA 2P Terminal Block	CNS306 (R1, R2)	Comm. Signal
		C-BOX 10P Terminal Block	Zone Control Signal etc.	Dry Contact Input DC Input(Thermistor)

How to connect your extended power cables

1. Prepare the following tools.

Tools	Crimping pliers	Connection sleeve (mm)	Insulation tape	Contraction tube (mm)
Spec	MH-14	20xØ6.5(HxOD)	Width 19mm	70xØ8.0(LxOD)
Shape				

2. As shown in the figure, peel off the shields from the rubber and wire of the power cable.
   - Peel off 20 mm of cable shields from the pre-installed tube.



Pre-installed tube for the power cable

> **CAUTION**
> - For information about the power cable specifications for indoor and outdoor units, refer to the installation manual.
> - After peeling off cable wires from the pre-installed tube, insert a contraction tube.

3. Insert both sides of core wire of the power cable into the connection sleeve.

► **Method 1**

Push the core wire into the sleeve from both sides.


Connection sleeve

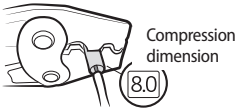
► **Method 2**

Twist the wire cores together and push it into the sleeve.


Connection sleeve

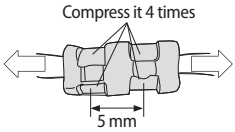
> **CAUTION**
> - If cable wires are connected without using connecting sleeves, their contact area becomes reduced, or corrosion develops on the outer surfaces of the wires (copper wires) over a long time. This may cause an increase of resistance (reduction of passing current) and consequently may result in a fire.

4. Using a crimping tool, compress the two points and flip it over and compress another two points in the same location.
   - The compression dimension should be 8.0 mm².

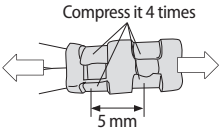


   - After compressing it, pull both sides of the wire to make sure it is firmly pressed.

► **Method 1**



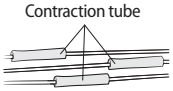
► **Method 2**



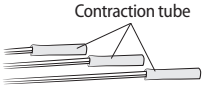
Wiring work

5. Apply heat to the contraction tube to contract it.

▶ **Method 1**

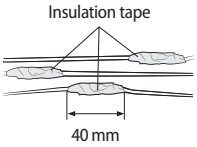


▶ **Method 2**

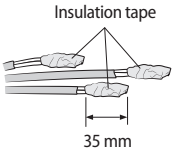


6. Wrap it with the insulation tape twice or more and position your contraction tube in the middle of the insulation tape.

▶ **Method 1**

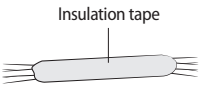


▶ **Method 2**

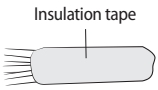


7. After tube contraction work is completed, wrap it with the insulation tape to finish.
   Three or more layers of insulation are required.

▶ **Method 1**



▶ **Method 2**

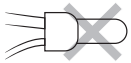


CAUTION

- Make sure that the connection parts are not exposed to outside.
- Be sure to use insulation tape and a contraction tube made of approved reinforced insulating materials that have the same level of withstand voltage with the power cable. (Comply with the local regulations on extensions.)

WARNING

- In case of extending the electric wire, please DO NOT use a round-shaped Pressing socket.
  - Incomplete wire connections can cause electric shock or a fire.



Grounding work

► Grounding must be done by a qualified installer for your safety.

Grounding the power cable

► The standard of grounding may vary according to the rated voltage and installation place of the heat pump.

► Ground the power cable according to the following.

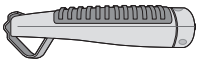
Power condition \ Installation place	High humidity	Average humidity	Low humidity
Electrical potential of lower than 150V		Perform the grounding work 3. Note 1)	Perform the grounding work 3 if possible for your safety. Note 1)
Electrical potential of higher than 150V	Must perform the grounding work 3. Note 1) (In case of installing circuit breaker)		

✻ **Note 1) Grounding work 3**

- Grounding must be done by your installation specialist.
- Check if the grounding resistance is lower than 100 Ω.

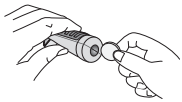
When installing a circuit breaker that can cut the electric circuit in case of a short circuit, the allowable grounding resistance can be 30~500 Ω.

✻ **Examples to use cable striper**



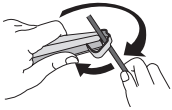
<Cable striper>

1. Adjust the blade position by coin(the controller is at the bottom side of the tool). Fix the blade position according to the outer sheath thickness of the power cable.

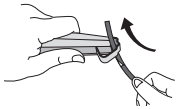


2. Fix the power cable and tool by using the hook at the top side of the tool.

3. Cut out the outer sheath of the power cable by revolving the tool in the direction of the arrow, two or three times.



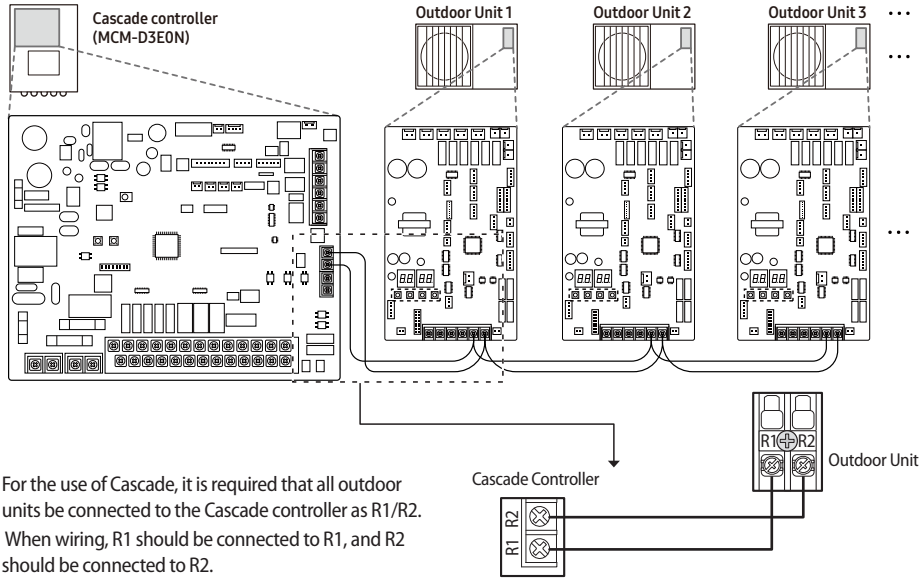
4. At this situation, cut out the outer sheath of the power cable by moving the tool toward the arrow direction expressed.



5. Slightly bend the wire and pull out the cut part of the outer sheath.

Wiring work

Wiring between Cascade controller (MCM-D3E0N) and Outdoor Unit

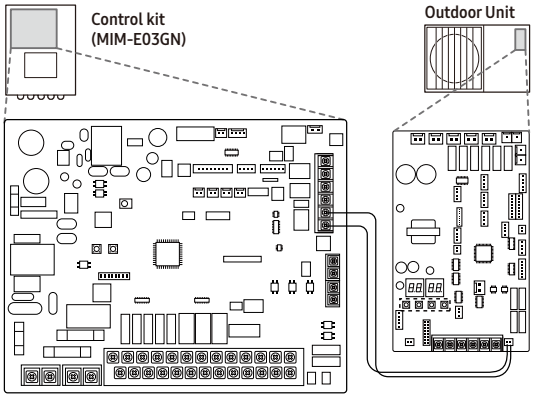


- For the use of Cascade, it is required that all outdoor units be connected to the Cascade controller as R1/R2.
- When wiring, R1 should be connected to R1, and R2 should be connected to R2.

NOTE
- It is highly recommended to wire in a bus wiring method in a cascade system.

CAUTION
- All outdoor units connected to Cascade controller must be connected as R1/R2.

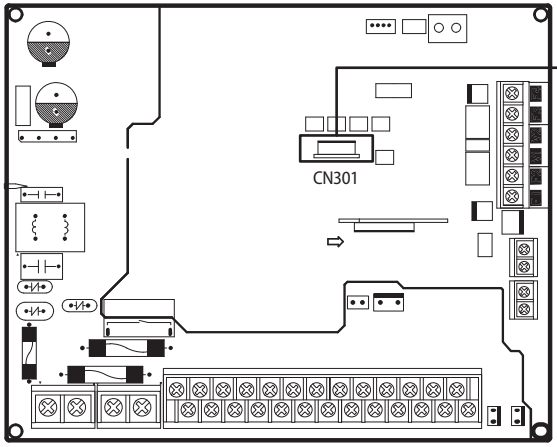
Wiring between Control Kit (MIM-E03GN) and Outdoor Unit



- Connect the outdoor unit to the control kit's F1/F2 ports for controlling the outdoor unit.
- When wiring, F1 should be connected to F1, and F2 should be connected to F2

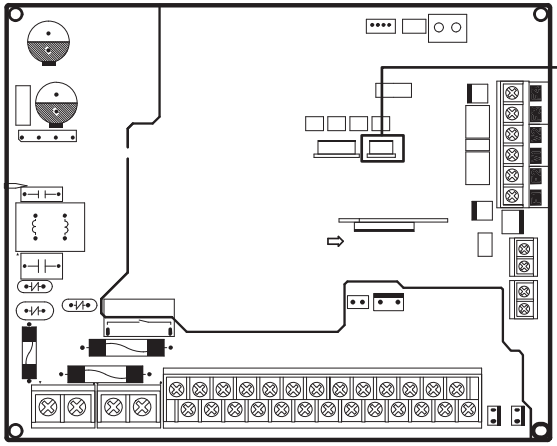
CAUTION
- The Mono R290 with pump model operates independently without the Control kit (MIM-E03GN).

Communication with a AI Home(Cascade controller only)



► The product is delivered with the AI Home connected to CN301 by default.

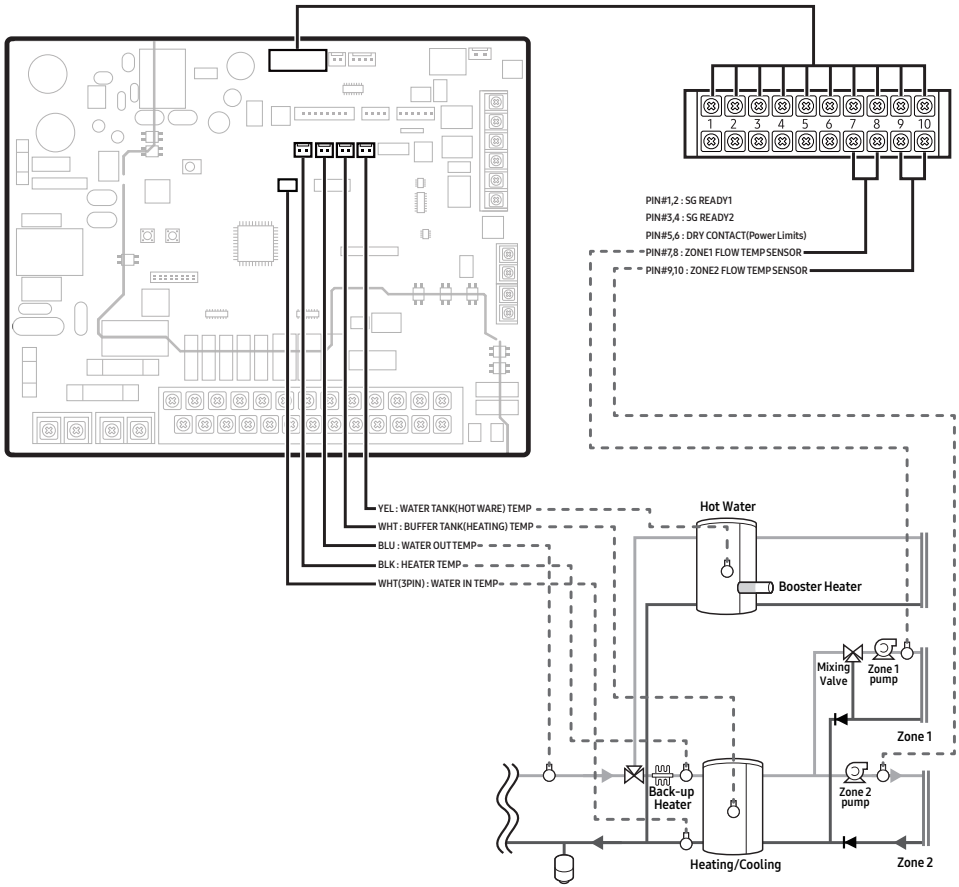
Communication with a Single Wi-Fi Module (Control kit only)



► The product is delivered with the Single Wi-Fi module connected to CN302 by default.

Wiring work

Temperature sensors for cascade system



Connecting a Water tank temperature sensor

1. Install the temperature sensor into the designated location in a heating & DHW tank.
2. Connect the temperature sensor connector for the heating tank to CNS044 (WHT, 2Pin), and connect the temperature sensor connector for the DHW tank to CNS042 (YEL, 2Pin).

Connecting a Back-up heater leaving water temperature

1. Install the temperature sensor into the designated location after backup heater.
   - The backup heater can be installed inside the buffer tank or in the main pipe.
     - If installing the backup heater inside the buffer tank: Set FSV4021 to 1.
       In this case, since the buffer tank sensor acts as a heater sensor, there is no need for a additional heater sensor.
     - If installing the backup heater in the main pipe: Set FSV4021 to 2.
       In this case, it is necessary to connect the heater sensor at the after of the backup heater.

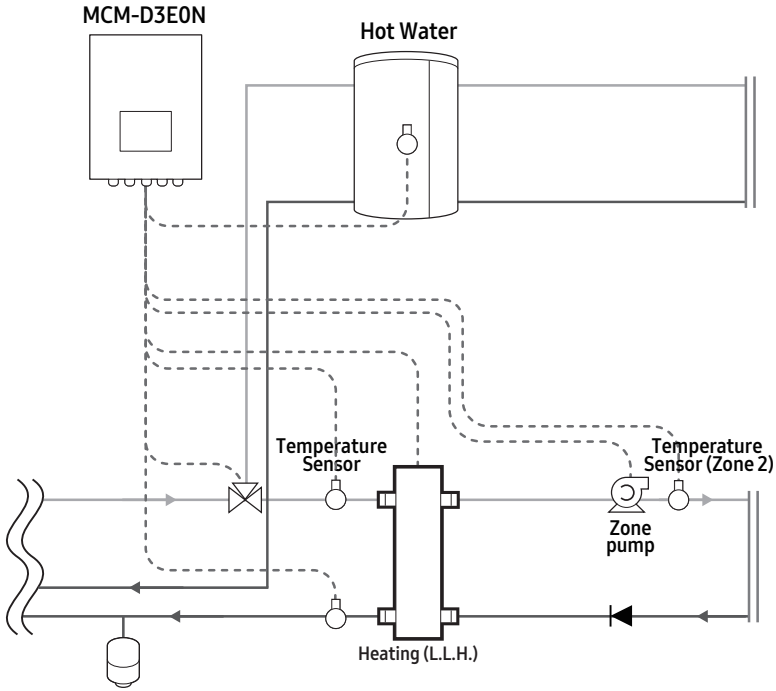
   please, refer to the "Installation of heaters"
2. Connect the temperature sensor connector to CNS047 (BLK, 2Pin).

Connecting a Main pipe entering and leaving water temperature sensor

1. Install the temperature sensor into the water in, out position respectively. If a heater is installed on the main pipe, the water out temperature sensor should be installed before the heater.
2. Connect the temperature sensor connector for water in to CN048 (WHT, 3Pin), and connect the temperature sensor connector for water out to CNS045 (BLU, 2Pin).

Connecting a entering water temperature for Zone 1, Zone 2

1. Install the temperature sensor into the Zone 1 & 2 inlet position respectively.
2. Connect the entering temperature sensor connector for the Zone 1 to Pin #7, 8 and connect the entering temperature sensor connector for the Zone 2 to Pin #9, 10.

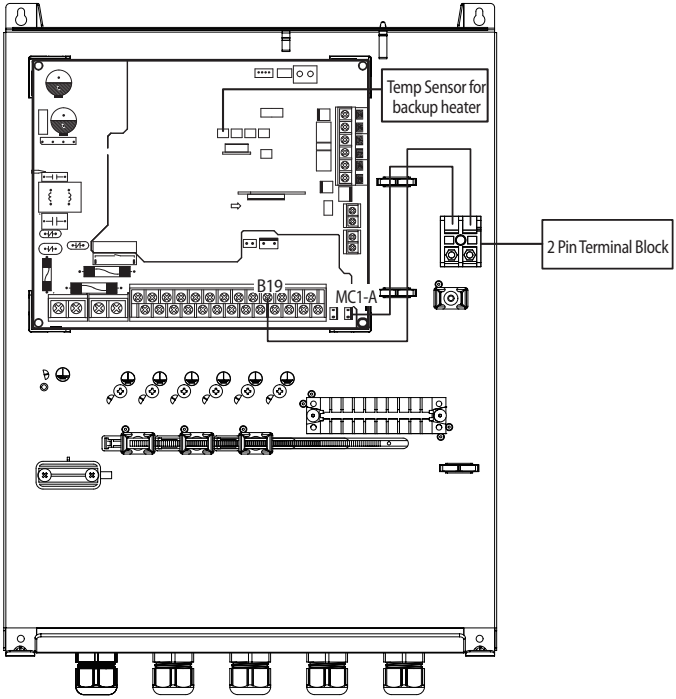


NOTE

- In a system where L.L.H is applied, and the zone control is not used, a temperature sensor of Zone 2 should be installed at the exit of L.L.H.

Wiring work

Wiring of Back-up heater signal for Cascade controller



Connecting a external backup heater signal

1. Connect the signal wire of the back-up heater to the 2 pin terminal block.
2. Connect a Temperature sensor to CNS047(BLK Connector)

NOTE

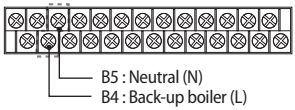
- The terminal for heater is used to transmit just the On/Off signal for the operation. Please make sure to install an external relay to provide separate power supply to the heater.
- The back-up heater cannot be used for the purpose of anti-legionella operation in a hot water tank.

CAUTION

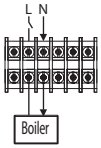
- The 3rd party back-up heater must be equipped with a product that has its own overheating protection function.

Wiring of Back-up boiler for Cascade controller

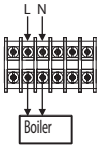
Description	No. of wires	Max. current	Thickness	Supply Scope
Back-up Boiler	2	50 mA	0.75mm² H05RN-F or H07RN-F	Field supply (220~240Vac, Output)



When it set back up boiler on the Cascade controller (relay off)



When it order to back up boiler operates (relay on)



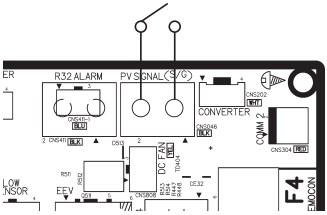
1. Before the installation, Cascade controller should be turned off.
2. Using the appropriate equipment to correct position of terminal block as shown on the diagram.

✻ Heat pump does not work when the Back-up boiler operates.

CAUTION
- If a back-up boiler is used, FSV4031 should be set to 1.
- If a back-up boiler is connected to a Back-up heater or Booster heater contact point for use, FSV4031 must be set to 0.

Connection of the Peak Power Control or PV control for Cascade controller

Description	No. of wires	Max. current	Thickness	Supply Scope
Peak Power Control or PV control (Photovoltaics control)	2	-	-	Field supply



✻ Function 1 (Peak Power Control)

► This is a function that allows you to disable the booster heater, backup heater, and compressor operation of the outdoor unit depending on the power input contact.

► If users make contracts with local electric power company for limiting the amount of power consumption when a surge in power usage, users can set FSV of "Forced off".

► To control the Power Peak , configure FSV #5041~ #5043. Please refer to the controller manual for this setting.

✻ Function 2 (PV[Photovoltaics] control)

► This is for energy saving by using the solar energy.

► To control PV, configure FSV #5081~ #5083. Please refer to the controller manual for this setting.

► Cooling/heating operation: Activated immediately with the set FSV value only for Away mode or Buffer tank installation case.

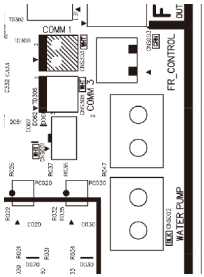
Hot water operation: Activated immediately with the set FSV value.

NOTE
- It operates according to the setting of FSV, and both functions can not be used at the same time. (PV Control / Peak power control)

Wiring work

Connection of the FR Control(Frequency ratio control) for Cascade controller

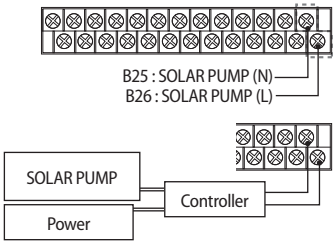
Description	No. of wires	Max. current	Thickness	Supply Scope
FR Control	2	-	-	Field supply



- ► The FR control function application is to limit the maximum frequency of the outdoor unit compressor. (if FSV #5051 = 1 "use")
- ► External DC signal Control uses a DC voltage of 0 ~ 10V (0v = 50%, ~ 10v = 150%)

Connection of the Solar Pump for Cascade controller

Description	No. of wires	Max. current	Thickness	Supply Scope
Solar pump	2	22mA	0.75mm² H05RN-F or H07RN-F	Field supply (220~240Vac, Input)



1. Before connecting the external controller, make sure it is turned off.
2. Using the appropriate equipment to correct position of terminal block as shown on the diagram.
3. The external controller must provide an output signal when Solar pump is operating.
4. It is the installers responsibility to connect the output of the Cascade controller to the Solar Pump input terminal (B25-26). In operating mode, signal shall be around 230VAC (N-L). In non-operating mode, signal shall be around 0VAC (N-L).

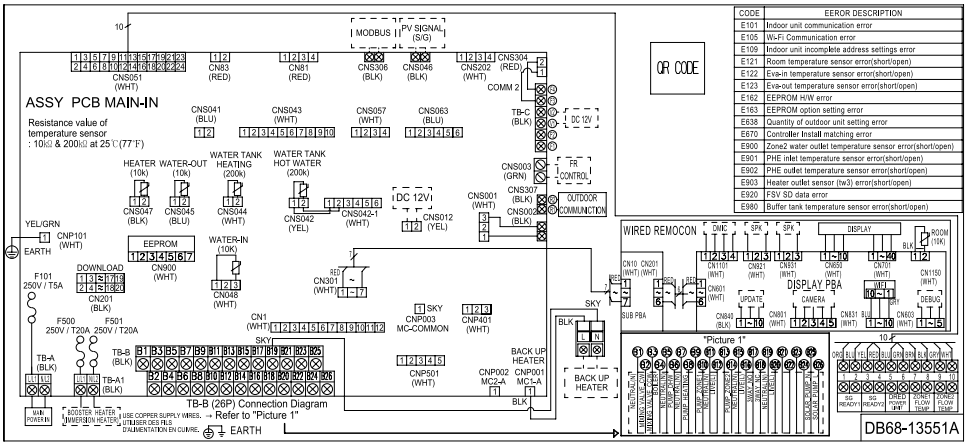
When solar pump signal is On, Cascade controller DHW mode will be turned off.

If a solar pump for DHW is used, the signal input line from the solar pump can be connected as shown above

- ► if a solar pump is used, FSV#3061 should be set to 1

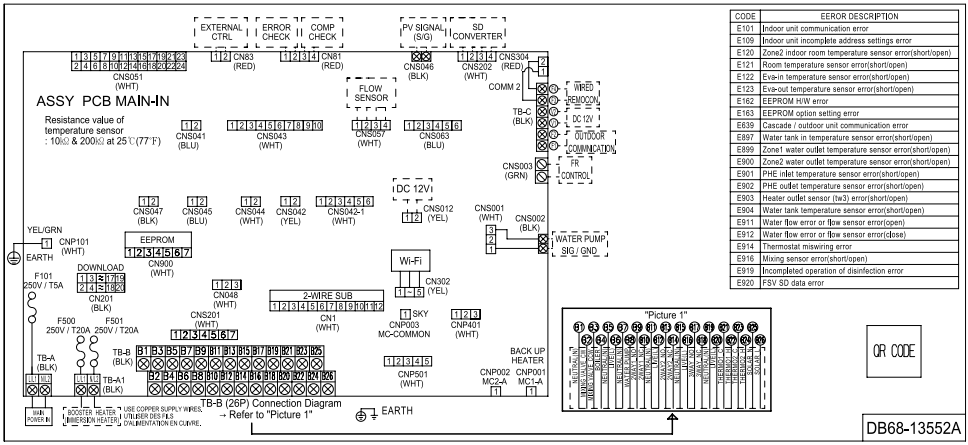
Wiring diagram

MCM-D3E0N



CODE	EERROR DESCRIPTION
E101	Indoor unit communication error
E105	Wi-Fi Communication error
E109	Indoor unit incomplete address settings error
E121	Room temperature sensor error(short/open)
E122	Eva-in temperature sensor error(short/open)
E123	Eva-out temperature sensor error(short/open)
E162	EEPROM H/W error
E163	EEPROM option setting error
E638	Quantity of outdoor unit setting error
E670	Controller Install matching error
E900	Zone2 water outlet temperature sensor error(short/open)
E901	PHE inlet temperature sensor error(short/open)
E902	PHE outlet temperature sensor error(short/open)
E903	Heater outlet sensor (tw3) error(short/open)
E920	FSV SD data error
E980	Buffer tank temperature sensor error(short/open)

MIM-E03GN



CODE	EERROR DESCRIPTION
E101	Indoor unit communication error
E109	Indoor unit incomplete address settings error
E120	Zone2 indoor room temperature sensor error(short/open)
E121	Room temperature sensor error(short/open)
E122	Eva-in temperature sensor error(short/open)
E123	Eva-out temperature sensor error(short/open)
E162	EEPROM H/W error
E163	EEPROM option setting error
E639	Cascade / outdoor unit communication error
E897	Water tank in temperature sensor error(short/open)
E899	Zone1 water outlet temperature sensor error(short/open)
E900	Zone2 water outlet temperature sensor error(short/open)
E901	PHE inlet temperature sensor error(short/open)
E902	PHE outlet temperature sensor error(short/open)
E903	Heater outlet sensor (tw3) error(short/open)
E904	Water tank temperature sensor error(short/open)
E911	Water flow error or flow sensor error(open)
E912	Water flow error or flow sensor error(close)
E914	Thermostat miswiring error
E916	Mixing sensor error(short/open)
E919	Incompleted operation of disinfection error
E920	FSV SD data error

Wiring work

Wiring of Water pump for Cascade system

Ensuring proper water flow is an important factor for performance and efficiency.
The Cascade System supports two methods:

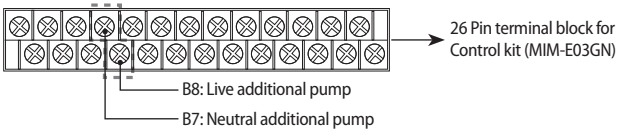
- Individual method of applying one pump per outdoor unit
- Integrated method of installing a pump in the main pipe to which all outdoor units are connected

The system should be configured to select and install a method suitable for the application site,
but the flow rate supplied to each outdoor unit can be operated within the minimum and maximum flow range.

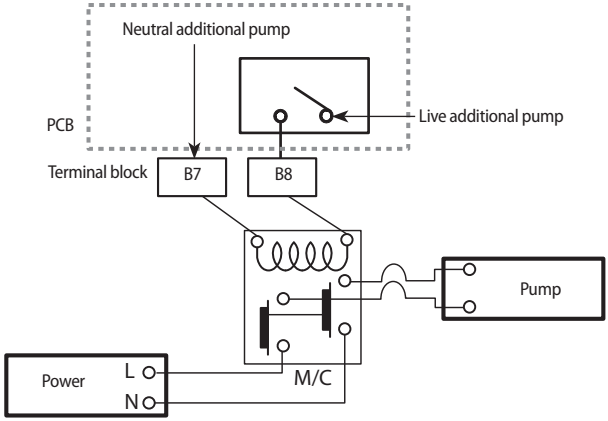
Wiring of individual water pump

If individual pumps are installed, each pump is controlled by a control kit (MIM-E03GN) connected to each outdoor unit.
In the case of R290 Mono with a built-in water pump, there is no need to install a separate individual pump.

1. Power supply (Individual water pump)



2. Connect water pump to a separate power source.



NOTE

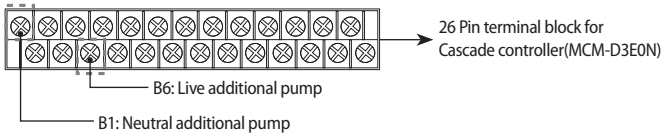
- In individual pump systems, if the maximum current of each pump is less than 1A, it can be directly connected to a terminal block.

Wiring of integrated water pump

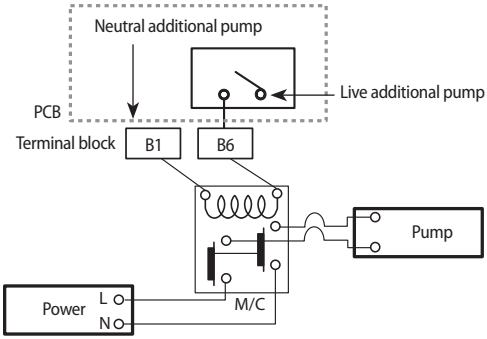
If integrated pump is installed, its control is performed by the Cascade controller (MCM-D3E0N).

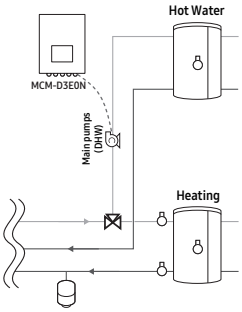
- Integrated Water pump for hot water pipe line

1. Power supply (Integrated water pump for DHW)



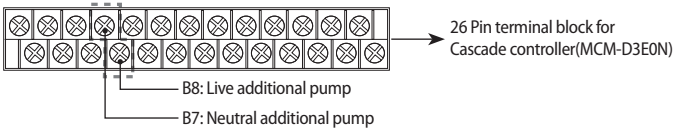
2. Connect water pump to a separate power source.



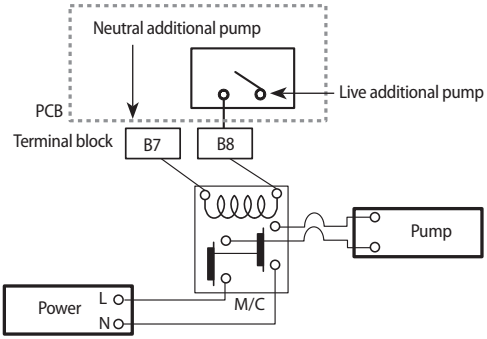


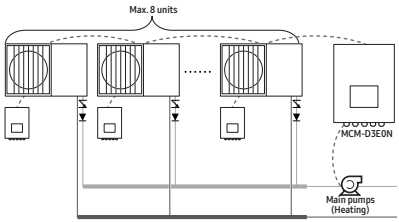
- Integrated Water pump for heating pipe line

1. Power supply (Integrated water pump for heating)



2. Connect water pump to a separate power source.





CAUTION

- The Cascade controller provides only on/off control signals for Water Pump for Zone. Please use a separate external relay to connect to each power source.

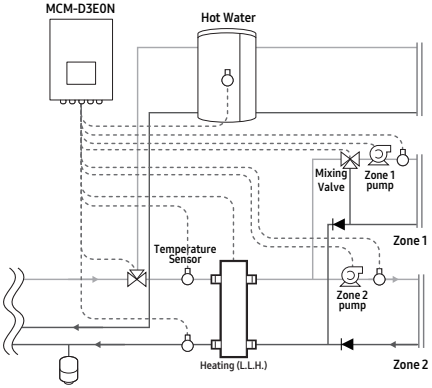
CAUTION

- The integrated DHW and heating pump should be installed on the supply pipe.

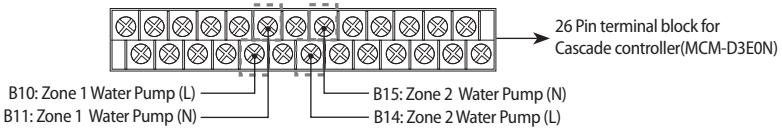
Wiring work

Wiring of integrated water pump for Zone

- The Cascade controller provides a signal contact for the Zone Water pump to control zones.

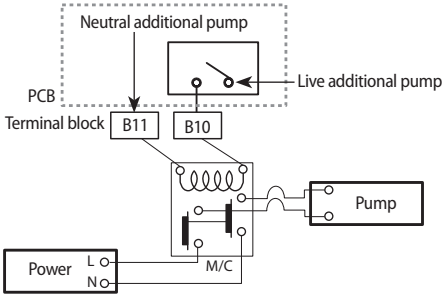


1. Power supply (Zone 1, 2 Water Pump)

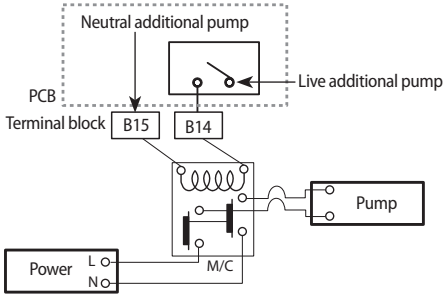


2. Connect water pump to a separate power source.

- Wiring of Zone 1 Water pump



- Wiring of Zone 2 Water pump



CAUTION

- The Cascade controller provides only on/off control signals for Water Pump for Zone. Please use a separate external relay to connect to each power source.

Connection of the 3-way valve

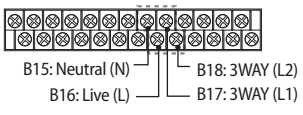
The 3-way valve can be installed for each outdoor unit or on the main pipe.

- Individually Installed 3-way valve system: Each 3-way valve is controlled by a separate outdoor unit control kit.
- Integrated main pipe 3-way valve system: The 3-way valve is connected to and controlled by a Cascade controller.

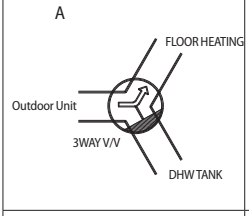
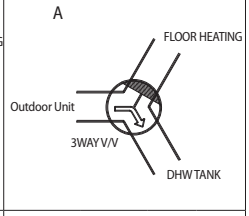
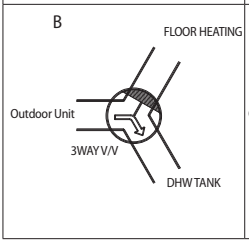
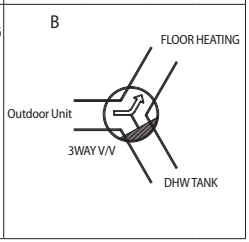
CAUTION

- Please note that for individual 3-way valves, it should be connected to the terminal block of the Control kit (MIM-E03GN), while for integrated 3-way valves, it should be connected to the terminal block of the Cascade controller (MCM-D3E0N).

Description	No. of wires	Max. current	Thickness	Supply Scope
Diverting type 3way valve	4	50mA	> 0.75 mm², H05RN-F or H07RN-F	Field supply (220~240Vac, Output)



Status	L1	L2
A (Initial)	OFF	ON
B	ON	OFF

Field Setting Valve (#3071) "0" Floor heating as default	Field Setting Valve (#3071) "1" DHW tank as default
	
	

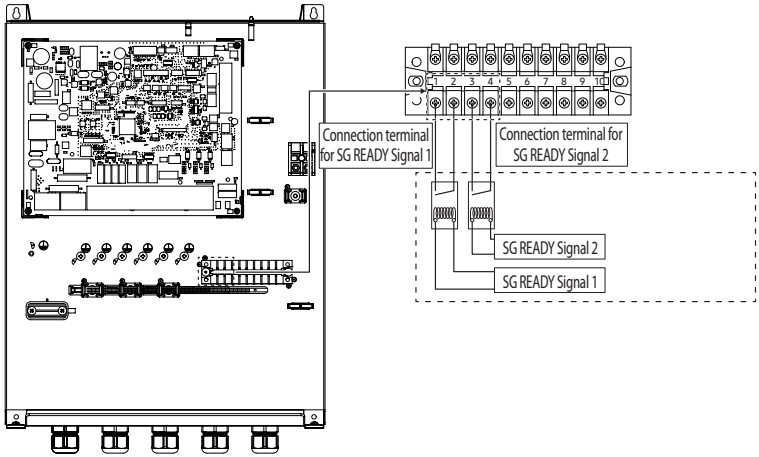
3-way diverting valve for water tank

- ► Diverting typecooling mode, UFH loops will be closed.
- ► 220 ~ 240 Vac

1. Before the installation, Control kit (or Cascade controller) should be turned off.
2. Using the appropriate equipment to correct position of terminal block as shown on the diagram.
3. Make sure what type of 3 way V/V you use.

Installation options and wiring work

Connecting for SG Ready(Smart Grid Ready) control for Cascade controller



SG READY Signal 1	SG READY Signal 2	Product operation
Short	Open	Forced thermo off operation
Open	Open	Normal operation
Open	Short	Heating / DHW setting temperature 1step-up operation
Short	Short	Heating / DHW setting temperature 2step-up operation

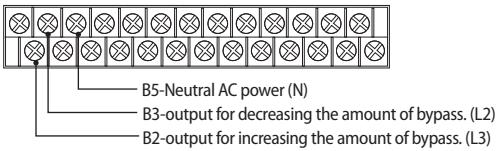
CAUTION
- These parts are optional and not included with the product.
- Turn off the RCBO first before connecting the SG Ready.

Connection of the mixing valve for Cascade controller

The Cascade controller provides a mixing valve control function for 2 Zone control.
In order to properly control the 2 Zone controls, it is necessary to connect the mixing valve.
The mixing valve controls the amount of bypass to provide low temperature water.

Description	No. of wires	Max. current	Thickness	Supply Scope
Mixing valve	3	50mA	> 0.75 mm^2, H05RN-F or H07RH-F	Field supply (220~240Vac, Output)

1. Before the installation, Cascade controller should be turned off.
2. Using the appropriate equipment to correct position of terminal block as shown on the diagram.

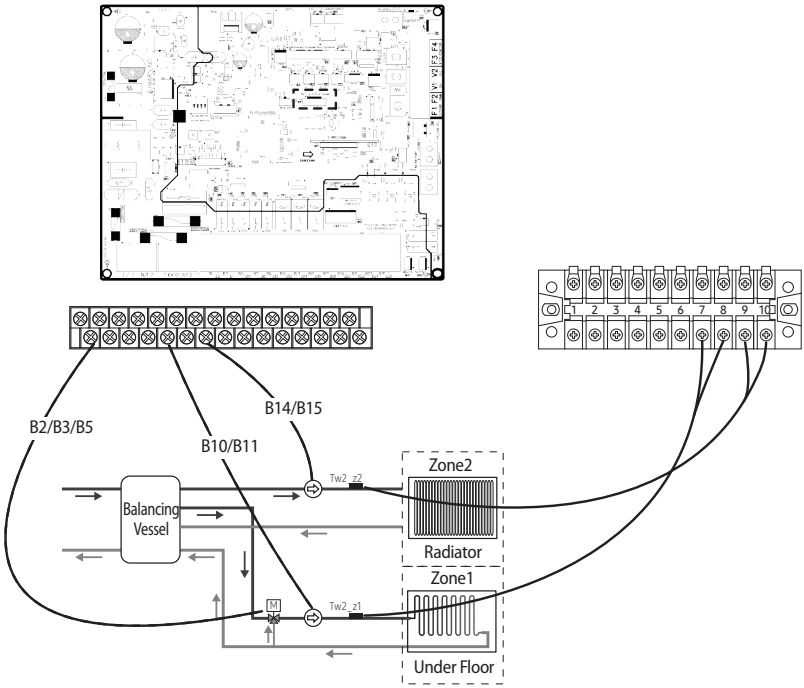


B2- output for increasing the amount of bypass : The amount of return water that is mixed with supply water through mixing valve is increased.

B3- output for decreasing the amount of bypass. : The amount of return water that is mixed with supply water through mixing valve is decreased.

CAUTION
- The mixing valve control function through individual Control kit (MIM-E03GN) is not provided.

2- Zone Control [FSV #4061 =1] Cascade controller



Cascade controller can support the 2-zone control using a mixing value, water-out temperature sensors.
When both zones are simultaneously Thermo on, the operation is performed based on Zone2. Therefore, set the zone that you want to have the higher set temperature to Zone2.
(The mixing valve must be installed in the zone that you want to have the lower set temperature.)

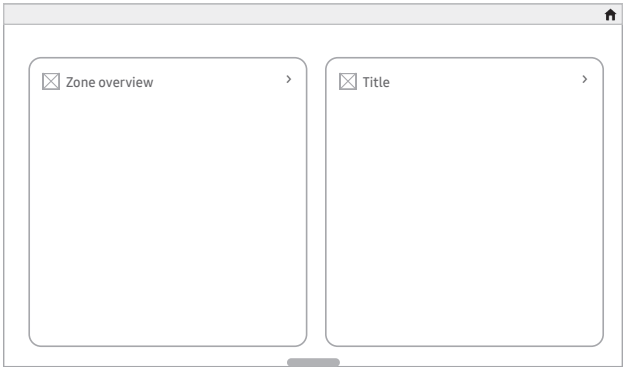
1. Install the mixing valve. (See "Installation of mixing valve.")
2. Install the water-out temperature sensors (Tw2_z1, Tw2_z2) for all zones.
3. Connect the water pump signal lines to the product.

► Zone1 water pump connection: B10 (L1) + B11 (N)
► Zone2 water pump connection: B14 (L1) + B15 (N)

4. FSV 4061 = 1: Enable the 2-zone control.

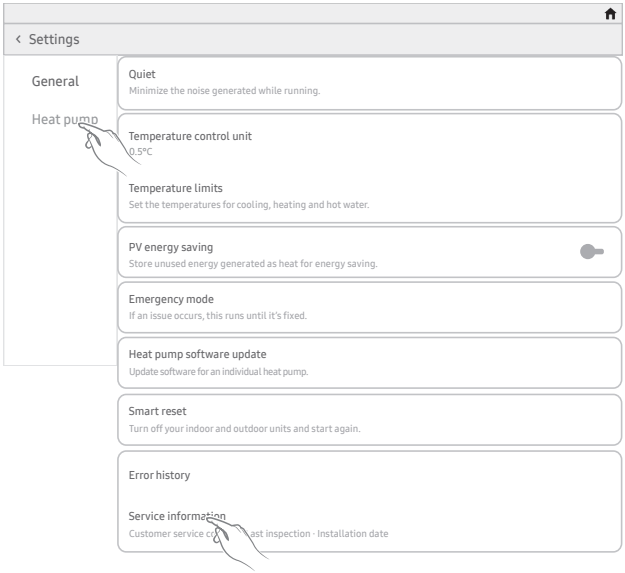
Self-test mode of AI Home

Use of self-test mode

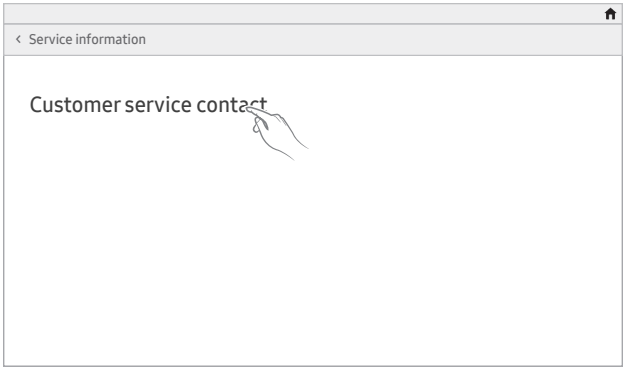


1. if you want to use the various additional functions for your AI Home, press .

► The setting screen appears.

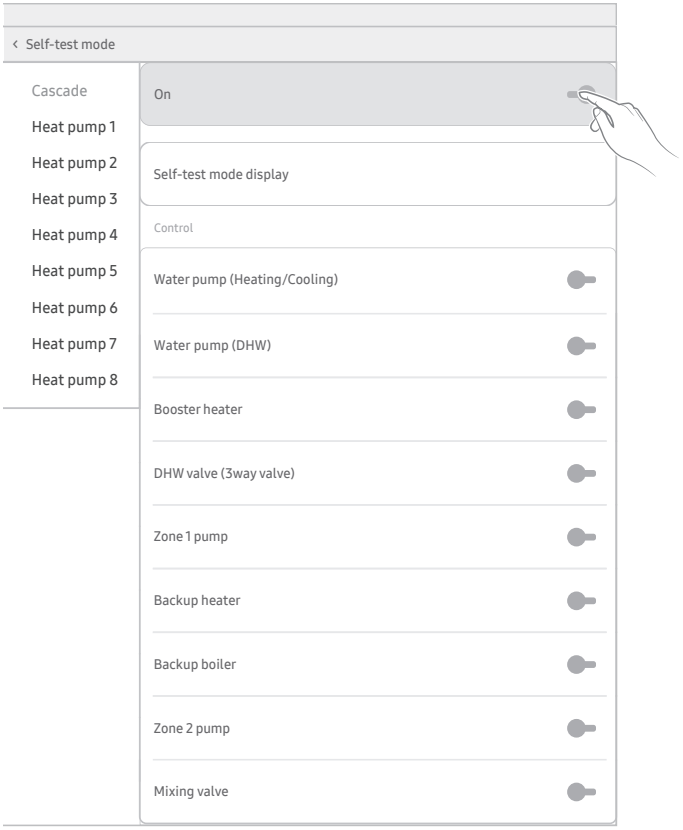


2. Press the "Heat pump" and you can see the service information at the end of screen.
3. Press the Service mode.



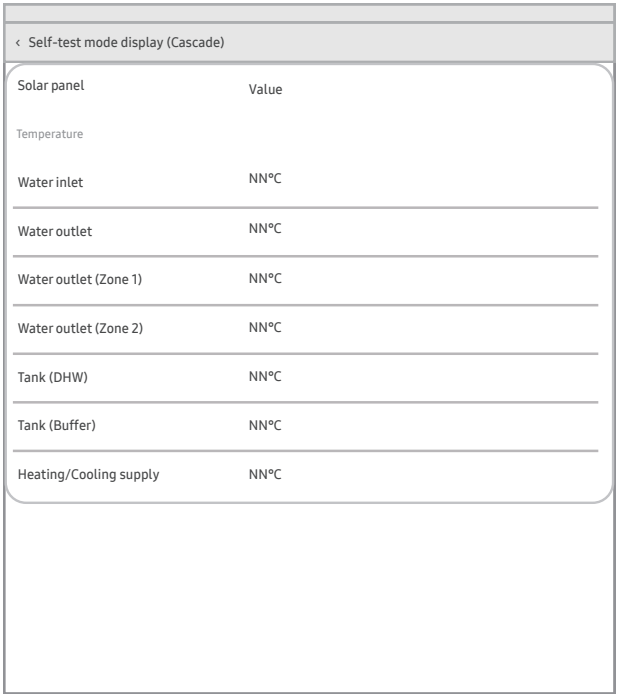
4. Press the "Customer service contact" more than 10 times in a row.

► Upon entering self-test mode, a list of cascade controllers and outdoor units connected to them will be displayed.

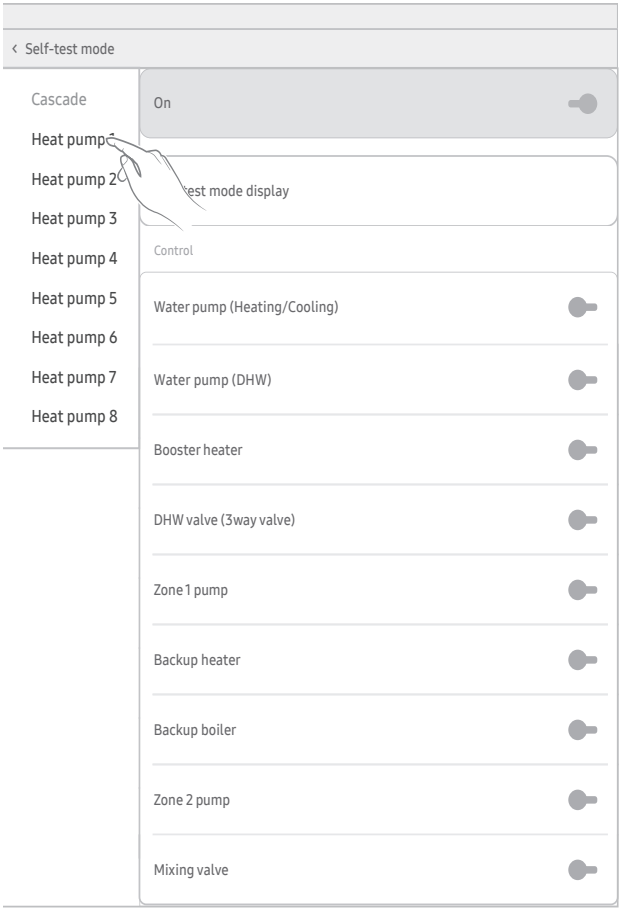


5. Press the "On" and select the item to test from the control menus that can turn each component on or off.

Self-test mode of AI Home

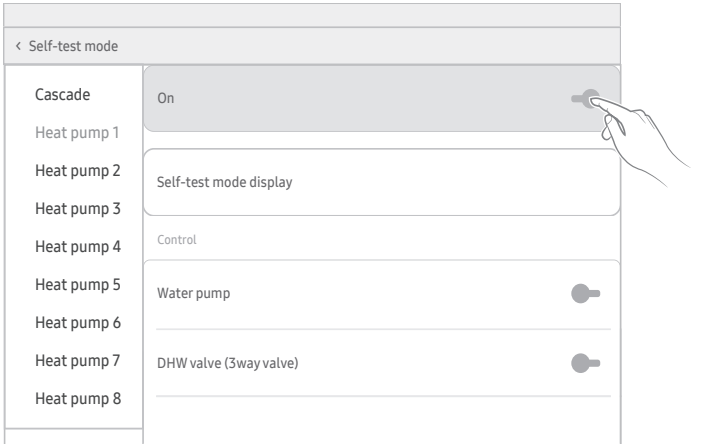


6. The operation status can be checked by pressing "Self-test mode display".

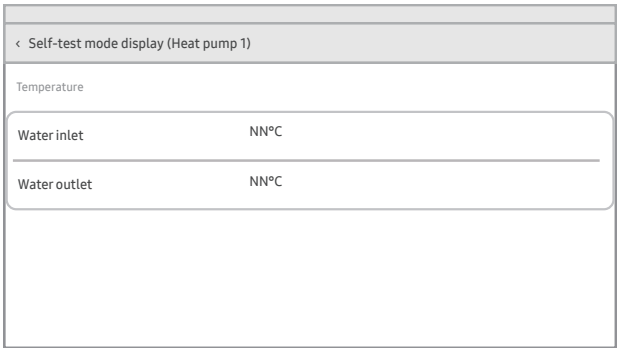


7. When clicking on a sub outdoor unit connected to the Cascade controller, it is possible to conduct a self-test of the components associated with each outdoor unit.

Self-test mode of AI Home



8. Press the "On" and select the item to test from the control menus that can turn each component on or off for the components of each outdoor unit.



9. The operation status of the components of outdoor unit also can be checked by pressing "Self-test mode display".

DHW tank

The Domestic Hot Water (DHW) tank should be provided by a third-party company.
Please select an appropriate water tank capacity based on expected hot water usage.

Safety information

Before installing the DHW Tank, please read this manual thoroughly for a safe and efficient installation.

WARNING • If you don't follow the safety precautions, you may get the risk of serious wound or death.

- The installation must be done by the manufacturer or its service agent or a qualified person in order to avoid a hazard.
  - Installation by an unqualified person may cause a water leakage, electric shock or fire and so on.
- The electric work must be done by service agent or qualified persons according to national wiring regulations and use only rated cable.
  - Use certified power cable in the market suggested here and do electric work according to installation manual otherwise, electric shock or fire may occur.
- Manufacturer is not responsible for accidents due to incorrect installation.
- Use certified parts in the market and supplied parts from the factory.
  - All wiring, components and materials to be procured on the site must comply with the applicable local and national codes. If you don't use the certified parts and tools, it can cause trouble to the Air to Water Heat pump and bring into injury.
- Install the DHW Tank on a hard and even place that can support its weight.
  - If the place cannot support its weight, the outdoor unit may fall down and it may cause injury.
- Secure power cable with a conduit, which is accessory part for DHW tank, not to be pulled out by external force.
  - If fixing is incomplete, it can cause trouble with a heat generation, electric shock or fire and so on.

GENERAL INFORMATION

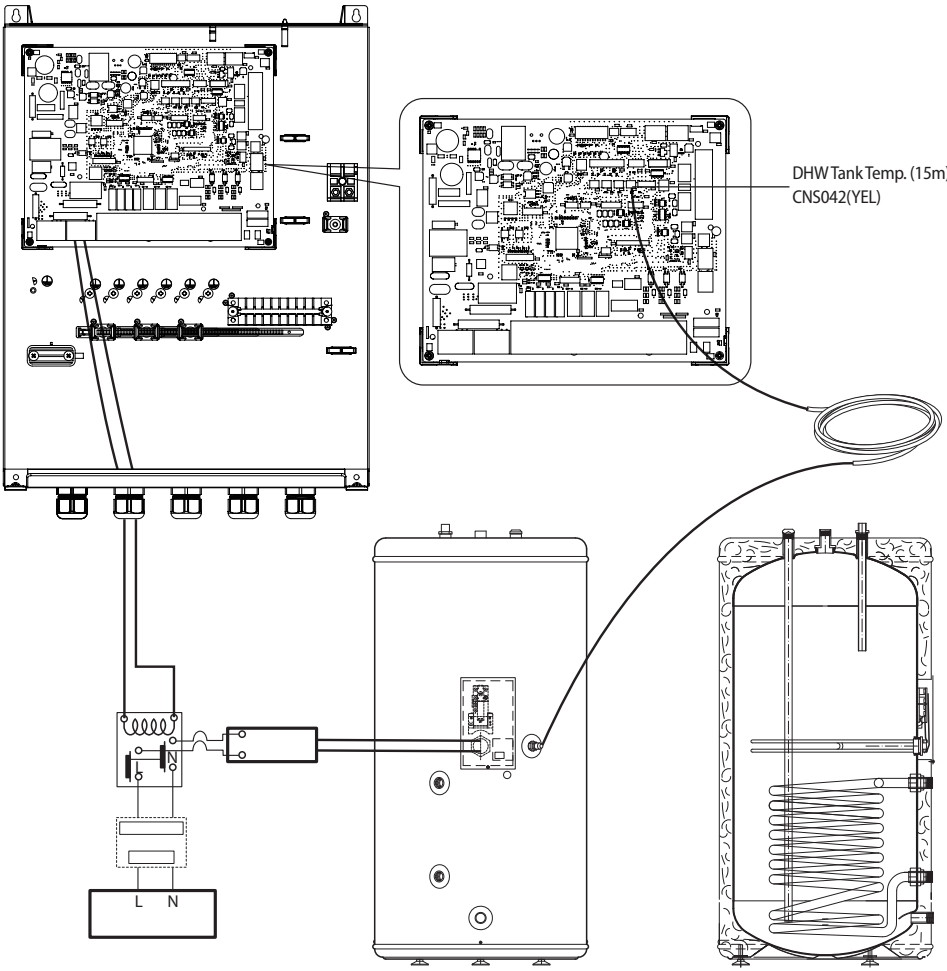
- The piping, valves and system configuration of DHW tank system should be followed a relevant local or national regulations.
- A pressure relief valve should be installed according to the use pressure of DHW Tank.
- The electrical box must be opened by a licensed electrician.
- Switch off the power supply before opening the electrical box lid.
- Make sure that the installation location of DHW tank system including piping and valves is frost free.
- The heat source supply and hot water use part must have completely independent structures .
  If not, it is necessary to install an intermediate heat exchanger to separate the heat source supply from the hot water use part.

CAUTION • DHW Tank shall be located and installed indoors area (garage, utility room, boiler room).

CAUTION • The third-party heater must be equipped with a product that has its own overheating protection function.

DHW tank

Booster heater



✻ Use a correct sensor pocket which is fit for the DHW tank sensor(OD Ø6).
If the gap between the supplied sensor and DHW tank sensor pocket is big, use thermal grease.

NOTE

- When you set the hot water supply temperature to 55℃ or less, do not use the booster heater.
  - The heatpump and the booster heater operate until the initial set temperature is reached. After that, only the booster heater may operate depending on the settings.

CAUTION

- The Cascade controller provides only on/off control signals for booster heater. Please use a separate external relay to connect to each power source.

Troubleshooting

CAUTION
- All maintenance or repair work must be executed by an approved installer.

Problem	Possible cause	Solution
Hot water is not coming out.	No power supply to the water heater	Check if there is any power on the power supply terminal on the thermostat.
	The thermostat may be set too high and cause the fuse or safety cut-off to operate.	Reduce thermostat setting by 5 °C and press the reset button.
Heating is not working	Heating element or internal electrical wiring is out of order.	Check if there is any power on the power supply on the connector of the heating element between black and yellow/ green wires. If this is OK, press the reset button on the fuse/safety cut-off.
Water is not warm enough	Thermostat is set too low.	Adjust the thermostat up using a standard screwdriver.
	Heating element or the internal electrical wiring is partially out of order.	Check the resistance of the heating element on the connector of the heater bundle, and the condition of the internal wiring.
	UX mixing valve(fitted on top) is incorrectly adjusted.	Adjust the UX mixing valve correctly to the preferred temperature.
Safety valve(SV) is dripping.	Water expands when heated. If there is no consumption of hot water over a period of time pressure builds up, causing the safety valve to open.	If drip from the SV is severe, it might need to be replaced. Some dripping is normal. Alternatively an expansion vessel can be fitted.
Leak warning outlet is dripping.	The heating element may not be properly tightened.	Check the heating element o-ring seal and all connections.
	There may be a leak.	
Other problems, or if none of the above solves the problem.	-	Contact the installer/supplier regarding any other failure.

WARNING
Incorrect handling of thermostat, safety valve or other valves may lead to tank rupture. When servicing the unit follow instructions carefully:
- Always turn off main power supply when water supply is being shut off.
- Test the free operation of the safety valve regularly by opening the valve ensuring the water flows freely.
- Electrical connection and all servicing of the electrical components should only be carried out by an authorized electrician.
- Fitting and all servicing of plumbing fixtures should only be carried out by an authorized installer.
- When replacing the thermostat, safety valve or any other valve or part supplied with this unit, use only approved parts of the same specification.

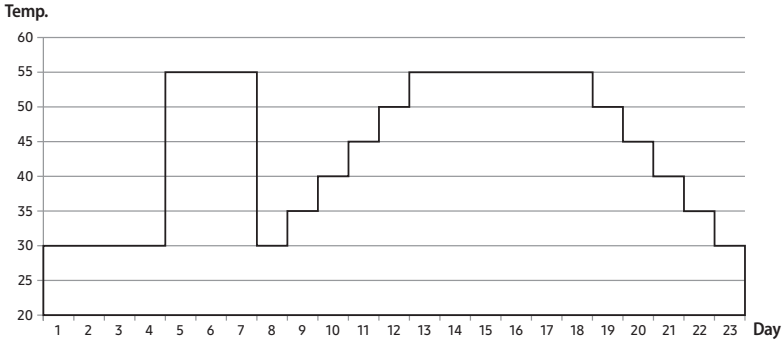
CAUTION
- Before resetting the safety cut-off or altering the thermostat setting, always remember to isolate the electrical supply to the unit. This must be done prior to removing the electrical box lid.
- If the electric element or thermostat is defective, contact authorized electrician.
- After adjustments are completed, ensure the lid to the electrical box is refitted correctly and that the retaining screw is properly fitted.

DIP switch functions for Cascade controller

When pipes of floor heating are installed, operation for reinforcing concrete curing is applied. (Period of operation: 23 days)

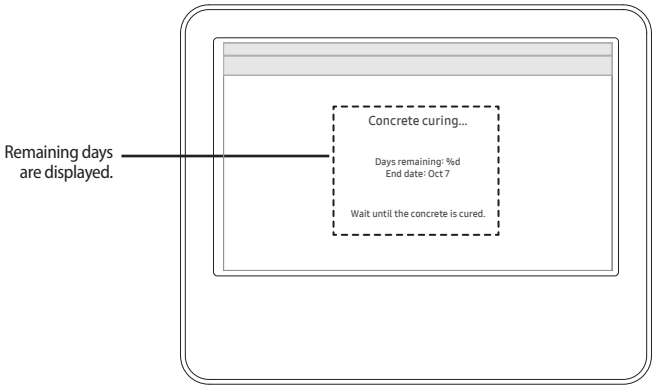
Entering procedure

1. After turning off the DIP switch K3 of Cascade controller (Default ON), power off and on the Cascade controller. The operation for concrete curing starts automatically. (If blackout occurs and communictation restarts later, operation will continue.)
2. Temperature of discharge water is controlled as time goes on like below.



Classification	Initial Heating		Step raise					Heating	Step down					Total (Hour)
Time	96	72	24	24	24	24	24	144	24	24	24	24	24	552
Temperature	30	55	30	35	40	45	50	55	50	45	40	35	30	-

3. Remaining days are displayed on the wired remote controller during operation but key operation is unavailable.

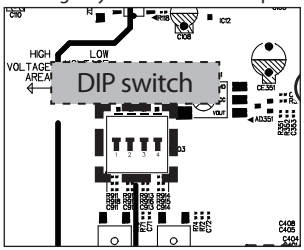


❋ If an error is displayed, concrete curing function does not work.

❋ Concrete curing can also be operated using "AI HOME".

Dip S/W	S/W #1	S/W #2	S/W #3	S/W #4
ON (default)	• None	• None	• None	• None
OFF	• Emergency heating	• Emergency hot water supply	• Concrete curing	• None
reference item	• Please refer to the user manual		• Please refer to the previous page	• None

• Emergency mode can also be operated using "AI HOME".

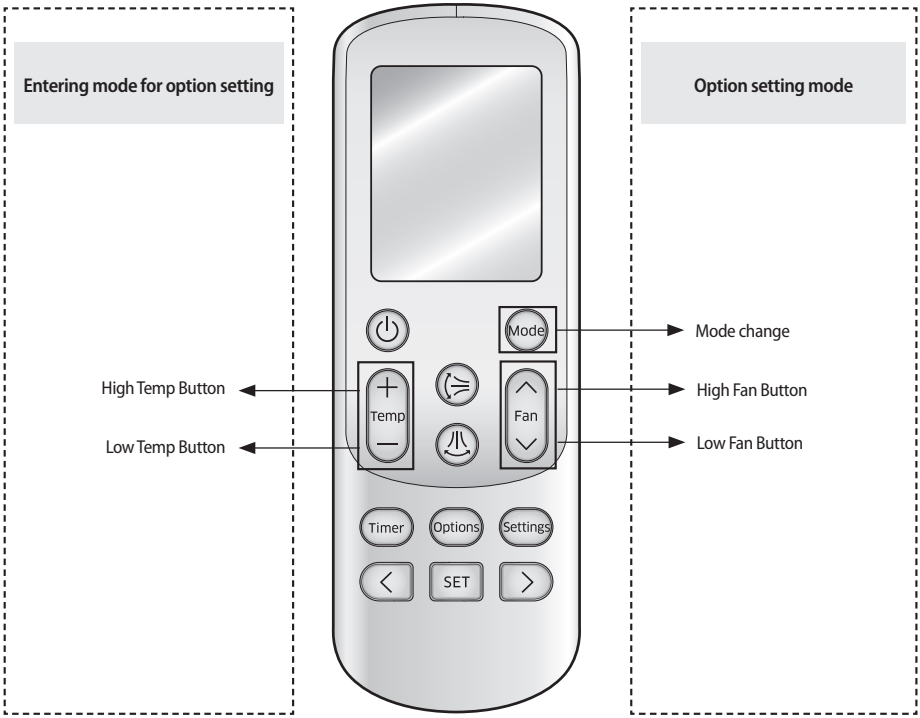


• When outdoor unit only power supply change by local condition, it is an option to auto restart system.

Installation option setting

► Set the control kit installation option with remote controller option.

The procedure of option setting



Entering mode to set option

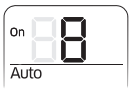
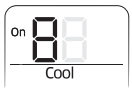
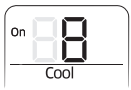
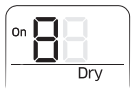
1. Remove batteries from the remote controller.
2. Insert batteries and enter the option setting mode while pressing High Temp button and Low Temp button. 

3. 

Check if you have entered the option setting status.

Changing a particular option

You can change each digit of set option.

Option	SEG1		SEG2		SEG3		SEG4		SEG5		SEG6	
Explanation	PAGE		MODE		The option mode you want to change		The tens' digit of an option SEG you will change		The unit digit of an option SEG you will change		The changed value	
Remote Controller Display												
Indication and Details	Indication	Details	Indication	Details	Indication	Details	Indication	Details	Indication	Details	Indication	Details
	0		D		Option mode	1~6	Tens' digit of SEG	0~9	Unit digit of SEG	0~9	The changed value	0~F

NOTE

- When changing a digit of an control kit address setting option, set the SEG3 as 'A'.
- When changing a digit of control kit installation option, set the SEG3 as '2'.

  Ex) When setting the 'central controller' into disuse status.

Option	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6
Explanation	PAGE	MODE	The option mode you want to change	The tens' digit of an option SEG you will change	The unit digit of an option SEG you will change	The changed value
Indication	0	D	2	0	5	0

✻ 02 Series installation option

Classification	SEG1~24
Use central controller (Default)	020010 100000 200000 300000
Disuse central controller	020000 100000 200000 300000

✻ 01 Series Production Option (Factory default)

Mode 1	SEG1~24
Cascade Controller (MCM-D3E0N)	012300 100000 200000 300000
Control Kit (MIM-E03GN)	012300 100000 200000 300000

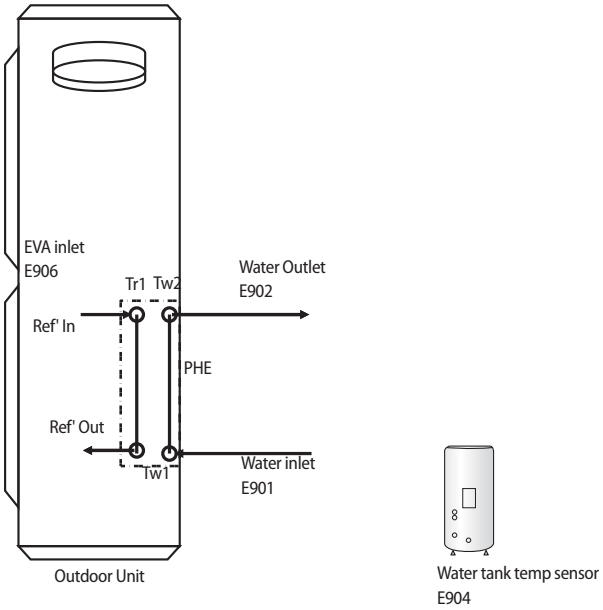
Troubleshooting

If the unit has some problem to work properly, some error codes will be displayed on the controller.
The following table described the explanation of error codes on the LCD display.

Thermistor

- Check its resistance. 10kohm@25 °C (Control kit), 200kohm@25 °C (DHW Tank, Solar)
- Check its location as shown at the diagram.
- Check its contact status with pipe.
- Final solution is to change parts

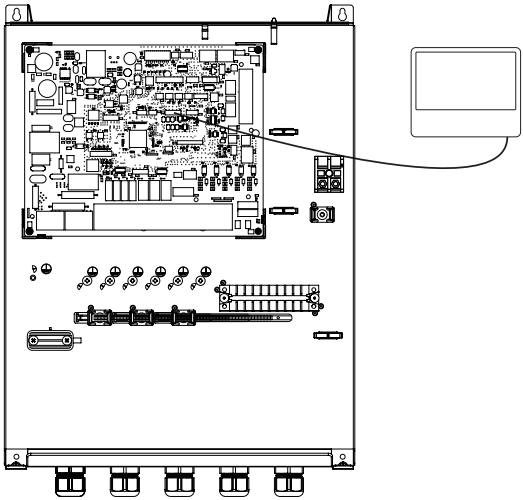
Display	Explanation
120	Short- or open-circuit error of the room temperature sensor of the Zone 2 indoor unit (detected only when the room thermostat is used)
121	Short- or open-circuit error of the room temperature sensor of the Zone 1 indoor unit (detected only when the room thermostat is used)
899	Zone1 Water Outlet Thermistor SHORT or OPEN
900	Zone2 Water Outlet Thermistor SHORT or OPEN
901	Water Inlet thermistor SHORT or OPEN
902	Water Outlet thermistor SHORT or OPEN
903	Water outlet (Back up Heater) temp sensor SHORT or OPEN (The Backup heater for using)
904	Water TANK (DHW) thermistor SHORT or OPEN
906	Outdoor Eva Inlet Temp Sensor SHORT or OPEN
916	Mixing Valve thermistor SHORT or OPEN
980	Buffer tank thermistor SHORT or OPEN



Communication

Display	Explanation
105	Wi-Fi communication error
601	Communication error between remote controller and the Cascade controller
604	Tracking error between remote controller and the Cascade controller
639	Communication error between Control kit and Cascade controller (3 min)
654	Memory(EEPROM) Read/Write Error(Wired remote Controller data error)
670	Controller combination error

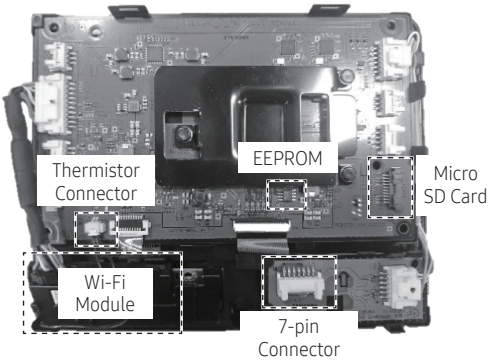
E601, E604



Error codes

E654

MEMORY(EEPROM) Read/Write Error (AI Home data error)

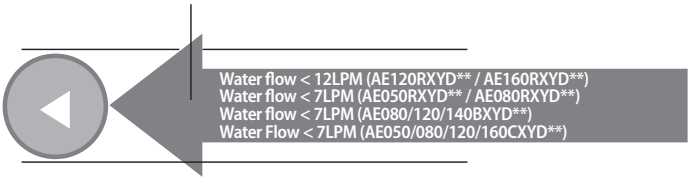


Water pump & Flow Sensor

Display	Explanation
911	Low flow rate error • in case of low flow rate in 60 sec during water pump signals is ON(Starting) • in case of low flow rate in 30 sec during water pump signals is ON(After starting)

E911

► Water pump ON (Low flow rate) : NOT enough water flow



Water flow range

	Water flow rates (LPM)	
	Min	Max
AE050RXYD** / AE080RXYD**	7	48
AE120RXYD** / AE160RXYD**	12	58
AE080BXYD** / AE050CXYD** / AE080CXYD**	7	48
AE120BXYD** / AE140BXYD** / AE120CXYD** / AE160CXYD**	7	58

If the unit has some problems and does not work normally, error code is shown on the OUTDOOR UNIT main PBA or LCD of the wired remote controller.

Display	Explanation	Error Source
101	CONTROL KIT / OUTDOOR UNIT wire connection error	CONTROL KIT, OUTDOOR UNIT
105	Wi-Fi communication error	CASCADE CONTROLLER
108	Duplication of setting address of indoor units and outdoor units	CASCADE CONTROLLER, OUTDOOR UNIT
109	Address incomplete communication error	CASCADE CONTROLLER, CONROL KIT
120	Short- or open-circuit error of the room temperature sensor of the Zone 2 indoor unit (detected only when the room thermostat is used)	CASCADE CONTROLLER
121	Short- or open-circuit error of the room temperature sensor of the Zone 1 indoor unit (detected only when the room thermostat is used)	CASCADE CONTROLLER
162	EEPROM Error	CONTROL KIT, CASCADE CONTROLLER
163	EEPROM OPTION SETTING Error	OUTDOOR UNIT, CASCADE CONTROLLER
177	In hydro box, take place emerency signal Error	CONTROL KIT
198	Error of Terminal Block's Thermal Fuse(Open)	CONTROL KIT, CASCADE CONTROLLER
201	CONTROL KIT/OUTDOOR UNIT communication error (Matching error)	CONTROL KIT, OUTDOOR UNIT
202	CONTROL KIT/OUTDOOR UNIT communication error (3 min)	CONTROL KIT, OUTDOOR UNIT
203	Communication error between INVERTER and MAIN MICOM (6 min)	OUTDOOR UNIT
205	Communication Error Between Outdoor Unit Inv Micom - Fan Motor Micom	OUTDOOR UNIT
221	OUTDOOR UNIT temperature sensor error	OUTDOOR UNIT
231	Condenser temperature sensor error	OUTDOOR UNIT
241	COND OUT Sensor of Outdoor Unit breakaway Error	OUTDOOR UNIT
251	Discharge temperature sensor error	OUTDOOR UNIT
262	Discharge Sensor breakaway Error	OUTDOOR UNIT
266	Comp Top Sensor breakaway Error	OUTDOOR UNIT
269	SUCTION Sensor breakaway Error	OUTDOOR UNIT
276	Compressor Top Temperature Sensor Error (open/short)	OUTDOOR UNIT
291	High Pressure Sensor Error (open/short)	OUTDOOR UNIT
296	Low Pressure Sensor Error (open/short)	OUTDOOR UNIT
308	Suction Sensor Error (open/short)	OUTDOOR UNIT
320	OLP sensor error	OUTDOOR UNIT
321	EVI Inlet Sensor Error (open/short)	OUTDOOR UNIT
322	EVI Outlet Sensor Error (open/short)	OUTDOOR UNIT
381	Inverter1 PCB overheat error	OUTDOOR UNIT
403	Plate heat exchanger freeze detection (During cooling operation)	OUTDOOR UNIT

Error codes

Display	Explanation	Error Source
404	Protection of OUTDOOR UNIT when it is overload (during Safety Start, Normal operation state)	OUTDOOR UNIT
407	Comp down due to high pressure sensor	OUTDOOR UNIT
410	COMP down due to Low PressureSensor Protection Control	OUTDOOR UNIT
416	Discharge of a compressor is overheated	OUTDOOR UNIT
425	Power source line missing error (only for 3-phase model)	OUTDOOR UNIT
428	COMP down by Compression Ratio control Error	OUTDOOR UNIT
436	Plate heat exchanger freeze detection (During heating operation)	OUTDOOR UNIT
438	EVI EEV Opening Error	OUTDOOR UNIT
439	Refrigerant Leakage Error (Detect when the system is not operated)	OUTDOOR UNIT
440	Heating operation blocked (outdoor temperature over 35°C)	OUTDOOR UNIT
441	Cooling operation blocked (outdoor temperature under 9°C)	OUTDOOR UNIT
443	No startup due to Low pressure	OUTDOOR UNIT
450	Error due to high cond temperature	OUTDOOR UNIT
458	OUTDOOR UNIT fan1 error	OUTDOOR UNIT
461	[Inverter] Compressor startup error	OUTDOOR UNIT
462	[Inverter] Total current error/PFC over current error	OUTDOOR UNIT
463	OLP is overheated	OUTDOOR UNIT
464	[Inverter] IPM over current error	OUTDOOR UNIT
465	Compressor V limit error	OUTDOOR UNIT
466	DC LINK over/low voltage error	OUTDOOR UNIT
467	[Inverter] Compressor rotation error	OUTDOOR UNIT
468	[Inverter] Current sensor error	OUTDOOR UNIT
469	[Inverter] DC LINK voltage sensor error	OUTDOOR UNIT
470	Outdoor unit EEPROM Read/Write Error	OUTDOOR UNIT
471	Outdoor unit EEPROM Read/Write Error(OTP error)	OUTDOOR UNIT
474	IPM(IGBT Module) or PFCM temperature sensor Error	OUTDOOR UNIT
475	OUTDOOR UNIT fan2 error	OUTDOOR UNIT
483	H/W DC_link over voltage Error	OUTDOOR UNIT
484	PFC Overload Error	OUTDOOR UNIT
485	Input current sensor error	OUTDOOR UNIT
488	AC Input Voltage Sensor Error	OUTDOOR UNIT
500	IPM is overheated	OUTDOOR UNIT
507	Comp down due to high pressure switch	OUTDOOR UNIT
536	PHE refrigerant leak error	OUTDOOR UNIT
554	Gas leak error	OUTDOOR UNIT

Display	Explanation	Error Source
563	INDOOR UNIT Mixed Install Error	OUTDOOR UNIT
590	[Inverter] Data flash Error	OUTDOOR UNIT
601	Communication error between the CASCADE CONTROLLER and wired remote controller	Wired Remote Controller
602	Wired remote controller Main/Sub setting error	Wired Remote Controller
604	Communication tracking error between the CASCADE CONTROLLER and wired remote controller	CASCADE CONTROLLER, Wired Remote Controller
607	Communication error between the Main and Sub wired remote controllers	Wired Remote Controller
638	EHS unit quantity setting error (different set and connected number)	CASCADE CONTROLLER
639	Communication error between Control kit and Cascade controller (3 min)	CONTROL KIT
653	Short- or open-circuit error of the thermistor for AI Home	CASCADE CONTROLLER
654	Memory(EEPROM) Read/Write Error(Wired remote Controller data error)	CASCADE CONTROLLER
670	Controller combination error	CASCADE CONTROLLER
899	Short- or open-circuit error of the Zone 1 water-out temperature sensor	CASCADE CONTROLLER
900	Short- or open-circuit error of the Zone 2 water-out temperature sensor	CASCADE CONTROLLER
901	Water inlet (PHE) temperature sensor error(open/short)	OUTDOOR UNIT, CASCADE CONTROLLER
902	Water outlet (PHE) temperature sensor error(open/short)	OUTDOOR UNIT, CASCADE CONTROLLER
903	Water outlet (backup heater) temperature sensor error.	CASCADE CONTROLLER
904	DHW tank temperature sensor error	CONTROL KIT, CASCADE CONTROLLER
906	Outdoor evaporator inlet temperature sensor (open/short)	OUTDOOR UNIT
907	Error due to pipe rupture protection	CONTROL KIT
908	Error due to freeze prevention(Re-Operation is possible)	CONTROL KIT
909	Error due to freeze prevention(Re-Operation is impossible)	CONTROL KIT
910	Water Temperature Sensor on water Outlet pipe is datached	CONTROL KIT
911	Low flow rate error • in case of low flow rate in 60 sec during water pump signals is ON(Starting) • in case of low flow rate in 30 sec during water pump signals is ON(After starting)	CONTROL KIT
913	Six times detection for FLow Switch Error(Re-Operation is not possible)	CONTROL KIT
914	Error due to Incorrect Themostat Connection	CONTROL KIT
915	Error on DC fan(Non-operating)	CONTROL KIT
916	Mixing valve temperature sensor (open/short)	CASCADE CONTROLLER
919	Error that the set temperature for disinfection operation is not reached, or, after reaching, the temperature fails to continue for the requested time	CASCADE CONTROLLER
920	FSV SD Card Read Error	CONTROL KIT
973	Water pressure error (Short/Open)	OUTDOOR UNIT
980	Buffer tank thermistor SHORT or OPEN	CASCADE CONTROLLER

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