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MODEL TYPE	AHU-KIT-SP		
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1. Specifications

AHU-KIT-SP (AHU interface) is the controller dedicated to making the AHU system by using a split type outdoor unit.
AHU interface equips 0–10V and 4–20mA analog input as a basic capacity control method of the connected outdoor unit.
As an alternative control method, the setting temperature control can be used from the remote controller as well.
In addition, AHU interface can communicate over the Modbus protocol and it enables the capacity control (0–100%) or setting temperature control according to requirements.
For more details, please see the relevant sections.

Model	AHU-KIT-SP
Outdoor unit compatibility	See below (*1)
Usage environment	Temperature：-20～60 ℃ Relative humidity：less than 85% RH (without condensation)
Storage environment	Temperature：-20～70 ℃ Relative humidity：40%～90% RH (without condensation)
Power supply	Single phase 220–240V +10%, -15% 50Hz Single phase 220V +10%, -15% 60Hz
Power consumption	5W
Product dimensions (height×width×depth)	109.5 mm × 290 mm × 57 mm
Weight	0.55 kg
Installation	DIN rail TS 35 mm × 7.5 mm (separate DIN rail required)
Cascade connection	Max 16 outdoor units can be combined by cascade control (16 interfaces are required)
Power blackout compensation	This interface does not have a battery circuit for power blackout recovery. Operation can continue：The power blackout duration is 30 msec or less.
Accessories	Heat exchanger sensor (Thi-R1, Thi-R2, Thi-R3)×1 Return air sensor (Thi-A)×1 Reserve sensor×1
	Spring leaf for heat exchanger sensor ×3
	Ferrite core for functional ground wire ×1
	Installation manual
	Caution label

(* 1) Connectable outdoor unit

Model capacity	Outdoor unit	
	R410A	R32
40/50/60	SRC40/50/60ZSX-S, SA	SRC40/50/60ZSX-W1, W2, WA
71	FDC71VNX	FDC71VNX-W
100/125/140	FDC100/125/140VN(S)A	FDC100/125/140VN(S)A-W
	FDC100/125/140VN(S)X	FDC100/125/140VN(S)X-W
200/250	FDC200/250VSA	FDC200/250VSA-W
280		FDC280VSA-W

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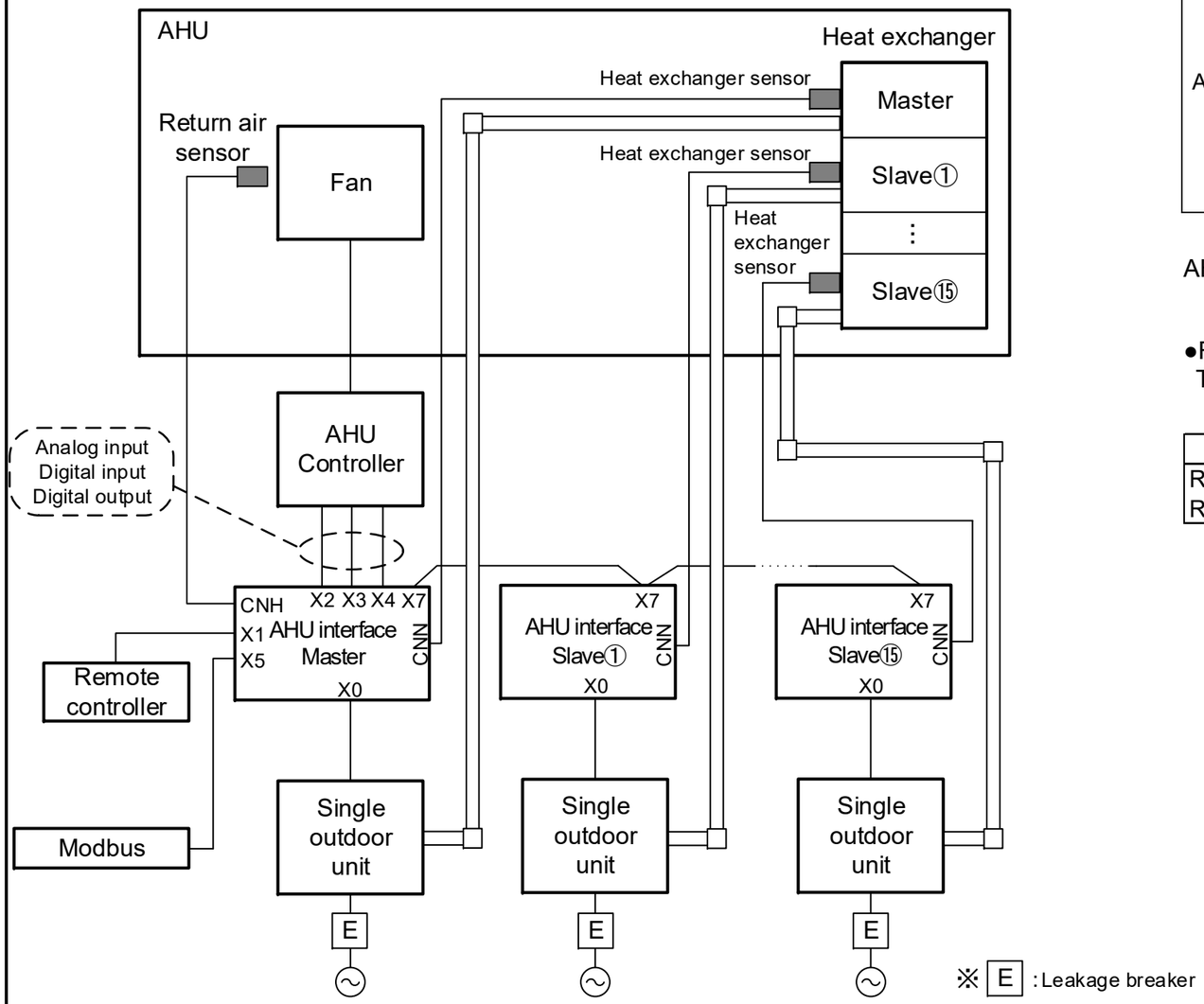
2. System configuration



●AHU interface configuration

Model	Contents	Applications
AHU-KIT-SP	Interface controller (master/slave)	Single refrigerant system. Multiple refrigerant system (cascade control).
	Heat exchanger sensor	Obtain the heat exchanger temperature information. Those sensors must be connected each interfaces.
	Return air sensor	Obtain the return air temperature information. This sensor must be connected with master interface.
	Reserve sensor	Reserve.

AHU equipment (heat exchanger, fan, total heat exchanger, etc.) be should be procured on site.

●Remote control
The remote controller shown in the table below can be connected.

Model	Contents	Applications
RC-EX3A RC-E5	Remote control	Connection is optional. Necessary when Temperature Control is used as a control method.

Note 1: Only one outdoor unit can be connected to the AHU interface.
However, it is possible to connect up to 15 slave interfaces to the master by setting the AHU interface to the master setting.
Up to 16 AHU interface × outdoor units can be connected in 1 system including the master.
Note 2: Remote control and Modbus communication are valid only for the master unit.
Note 3: Be sure to connect a leakage breaker in leakage category III.

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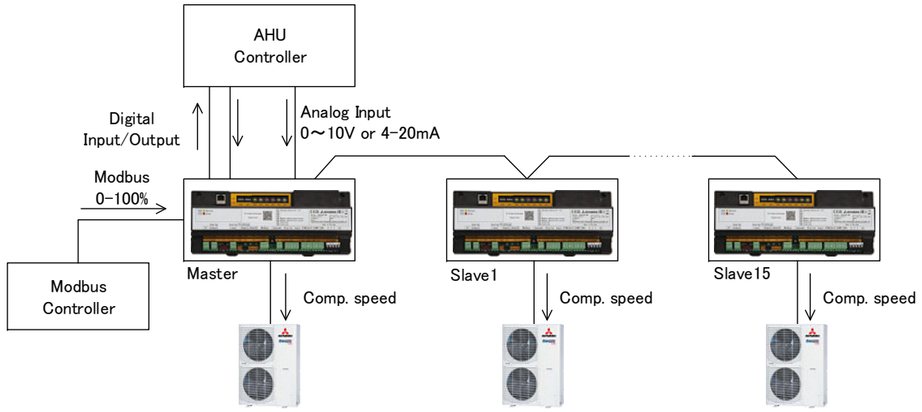
●Select control method and settings

The outdoor units can be controlled by one of two methods (Capacity Control or Temperature Control).
Select the suitable control combination (No.1-No.4) based on the equipment to be installed.
Correct Master/Slave settings are required when using cascading control.
Check each setting by referring to table 1-1, 1-2 in this section.

◇Capacity Control SW7-4：OFF (External input:0-10V / 4-20mA / 0-100%)

System diagram



The following control combinations are to be used for Capacity Control.

Table 1-1

No.	Analog input (0-10V/4-20mA)	Modbus (0-100%)	Remote Control (Include SL Adaptor)	AHU System How to Run/Stop
1	★	△(*1)	Monitoring only(*2)	Digital input or Modbus(*3)
2	×	★	Monitoring only(*2)	Digital input or Modbus(*3)

★：Main Controller for Capacity Control

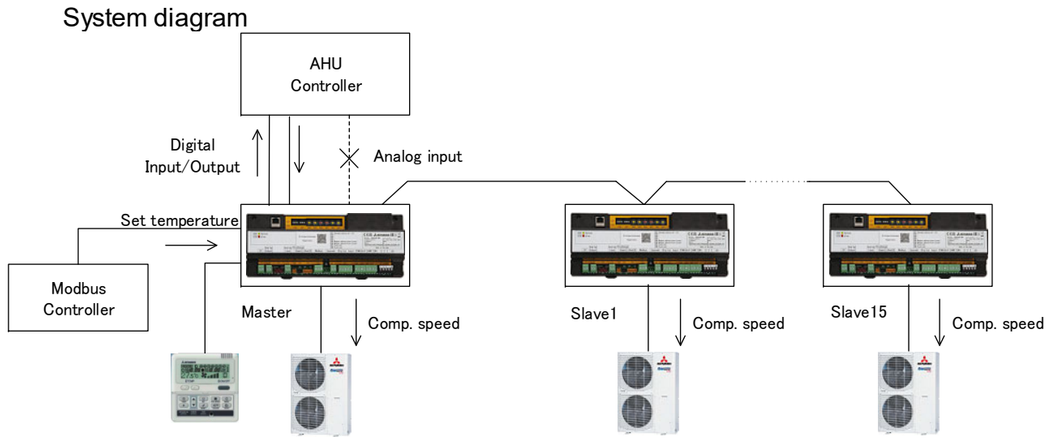
△：Optional Controller

×：Not available

(*1) Analog input will be invalidated once 0-100% command is sent from the Modbus controller.
Power reset is required to restore analog input function.
(*2) Monitoring purpose only. Operation from remote controller is not possible.
(*3) Select either of the following ways to Run/Stop the AHU system:
- Digital input (ON/OFF)
- Modbus command (Run/Stop)

◇Temperature Control SW7-4：ON (Set temp. control:18℃-30℃)

System diagram



The following control system can be used for Temperature Control.

Table 1-2

No.	Analog input (0-10V/4-20mA)	Modbus	Remote Control (Include SL Adaptor)	AHU System How to Run/Stop
3	×	★(*4)	○(*4)	Digital input, RC or Modbus(*5)
4	×	○(*4)	★(*4)	Digital input, RC or Modbus(*5)

★：Main Controller for Temperature Control

○：Optional Controller

×：Not available

(*4) Last received operation command has priority.
(*5) Select one of the following ways to Run/Stop the AHU system:
- Digital input (ON/OFF)
- Modbus command (Run/Stop)
- Remote controller command (Run/Stop)

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●Heat exchanger, minimum airflow and recommended circuits

・Be sure to select and set the capacity of the heat exchanger connected to each outdoor unit and the minimum air volume according to the following table.

・The table below is for both R 32 and R 410 A refrigerants.

・The range of use for air conditions conforms to the specifications of the outdoor unit.
Refer to the technical manual for the outdoor unit.

Outdoor unit model capacity	Allowable heat exchanger volume L		Minimum air volume	
	Min	Max	m^3/h	m^3/min
SRC40	0.3	0.8	420	7
SRC50	0.3	0.9	420	7
SRC60	0.5	1.1	480	8
FDC71	0.7	1.6	600	10
FDC100	0.7	2.1	840	14
FDC125	1.0	2.2	960	16
FDC140	1.0	2.8	1080	18
FDC200	1.2	4.2	1680	28
FDC250	2.0	4.4	1920	32
FDC280	2.0	4.4	2160	36

・Recommended circuit number for D9.52 tube

Outdoor unit model capacity	40	50	60	71	100	125	140	200	250	280
Recommended circuit	2～4				4～6			6～10		

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3. Function

AHU interface outputs outdoor unit information to the outside. It also controls the compressor speed of the outdoor unit in response to external input.
Some settings can be changed by Modbus communication.

●Input/output list #1 of AHU interface

	Item	SW		Contents	Remarks
SW Settings	RotarySW	SW1	Yellow	Interface address	0-F
		SW2	Yellow	Reserve	Always 0
		SW3	Red	Reserve	Always 0
		SW4	Red	Reserve	Always 0
		SW5	Yellow	Modbus address (ones)	0–9
		SW6	Yellow	Modbus address (tens)	0–9
	DipSW	SW7	Black	-1 Analogue input switching	ON: 4–20mA OFF: 0–10V
				-2 Modbus baudrate (bps)	ON: 9600bps OFF: 19200bps
				-3 Modbus parity	ON: non parity + 2 stop bit OFF: even parity + 1 stop bit
				-4 Compressor control	ON: Temperature Control OFF: Capacity Control
		SW8	Black	-1 Digital output: X4d switching	ON: cooling/heating OFF: run/stop
				-2 Capacity step up control	ON: Valid OFF: Invalid
				-3 Reserve	Always OFF
				-4 Reserve	Always OFF
	ShortPIN	JX1		3P Modbus termination switching	1–2 short: not available 2–3 short: available 100Ω
		JX2		3P Analogue input switching	1–2 short: 0–10V 2–3 short: 4–20mA
		JX3		3P Reserve	Always 2–3: short

Note 1: Use the “Reserve” switch with OFF or 0 setting.

Note 2: The SW setting follows the setting at power-on.
Be sure to set SW at installation.
To change the SW setting after turning on the power, the power must be turned off once.

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●Input/output list #2 of AHU interface

	Item	Connector LED	Housing	Function	Color	Remarks
Connector/LED	Analog Input	CNH	2P	Return air temperature	Black	Thi-A
		CNF	2P	Reserve	Yellow	The CNF connector can not be used.
		CNN	6P	Heat exchanger (U-bend)	Yellow	Thi-R1
				Heat exchanger (capillary)		Thi-R2
				Heat exchanger (header)		Thi-R3
		X3	2P	Capacity control	Green	Depending on the JX2 setting, 0-10V/4-20mA can be switching.
	Digital Input	X2	5P	X2-1: run/stop	Green	Power supply: AC24-240V/DC20-130V 0.5A
				X2-2: cooling/heating		Power supply: AC24-240V/DC20-130V 0.5A
				X2-3: emergency stop		Power supply: AC24-240V/DC20-130V 0.5A
				X2-4: reserve		Power supply: AC24-240V/DC20-130V 0.5A
				X2-5: common		Common terminal
	Digital Output	X4a	2P	Outdoor unit, interface error	Green	Voltage free at contact output
		X4b	2P	Compressor ON		Voltage free at contact output
		X4c	2P	Defrost ON		Voltage free at contact output
		X4d	2P	Selection: ①Run/stop【initial】 ②Cooling/heating		Voltage free at contact output X4d is selectable by Modbus communication
		LED1		Normal	Green	
		LED2		Error	Red	
	Input/ Output	X1	2P	Remote control	Green	Remote control and SC-ADNA-E can be connected
		X5	3P	Modbus	Green	RS-485 communication circuit
		X7	2P	Cascade	Green	
			2P	Cascade reserve		
		X0	5P	X0-1: functional ground	Green	
				X0-2: empty port		X0-2 is an empty port due to reinforced insulation
				X0-3: power L phase		AC220–240V
				X0-4: power N phase		AC220–240V
				X0-5: communication terminal		

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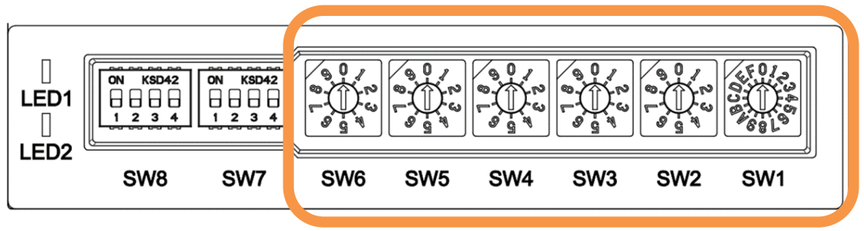
4. Rotary switch function

Item	SW		Contents	Remarks
RotarySW	SW1	Yellow	Interface address	0-F
	SW2	Yellow	Reserve	Always 0
	SW3	Red	Reserve	Always 0
	SW4	Red	Reserve	Always 0
	SW5	Yellow	Modbus address (ones)	0-9
	SW6	Yellow	Modbus address (tens)	0-9

RotarySW



・Set master and slave by SW1.
・For a single refrigerant system, always set the address of AHU interface to 0.
・For cascade control, set the master address to 0 and the slave address to a value other than 0 (1 to F).
・Rotary SW5 and SW6 are address settings for Modbus communication.
SW5 is Modbus address ones place and SW6 is Modbus address tens place.
In Modbus communication, AHU interface is a slave.
Set the Modbus address in 01 – 99 (Initial address setting: 01).
The Modbus address cannot be set to 0.

<Modbus address example>
Modbus address: 38
SW6: 3 SW5: 8

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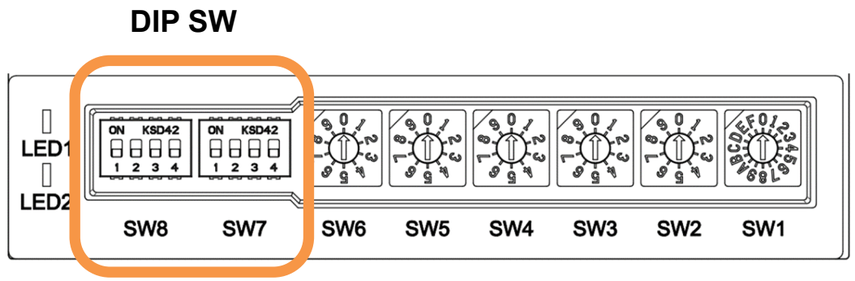
5. DIP switch function

Item	SW			Contents	Remarks
DipSW	SW7	Black	-1	Analogue input switching	ON: 4–20mA OFF: 0–10V
			-2	Modbus baudrate (bps)	ON: 9600bps OFF: 19200bps
			-3	Modbus parity	ON: non parity + 2 stop bits OFF: even parity + 1 stop bit
			-4	Compressor control	ON: Temperature Control OFF: Capacity Control
	SW8	Black	-1	Digital output: X4d switching	ON: cooling/heating OFF: run/stop
			-2	Capacity step up control	ON: Valid OFF: Invalid
			-3	Reserve	Always OFF
			-4	Reserve	Always OFF



・SW8-3, SW8-4 are reserve.
Be sure to set OFF.

【SW7-4】OFF: Capacity Control, ON: Temperature Control
・The compressor control can be selected in 2 patterns by SW7-4.

(1)SW7-4 OFF: Capacity Control

・When capacity control is set (default setting), the required capacity is directly commanded to the compressor.
・In the following way, 0% to 100% of the outdoor unit (compressor capacity) can be specified as the required capacity.
① Depending on the input voltage (0–10 V) or input current (4–20 mA) from the analog input, the corresponding required capacity is sent to the outdoor unit.
② With Modbus communication, the required capacity is commanded to the outdoor unit at 0–100%.
③ In analog input and Modbus communication above, directives from Modbus commnunication take precedence.
Once Modbus sends 0–100% command, the analog input will be disabled thereafter.

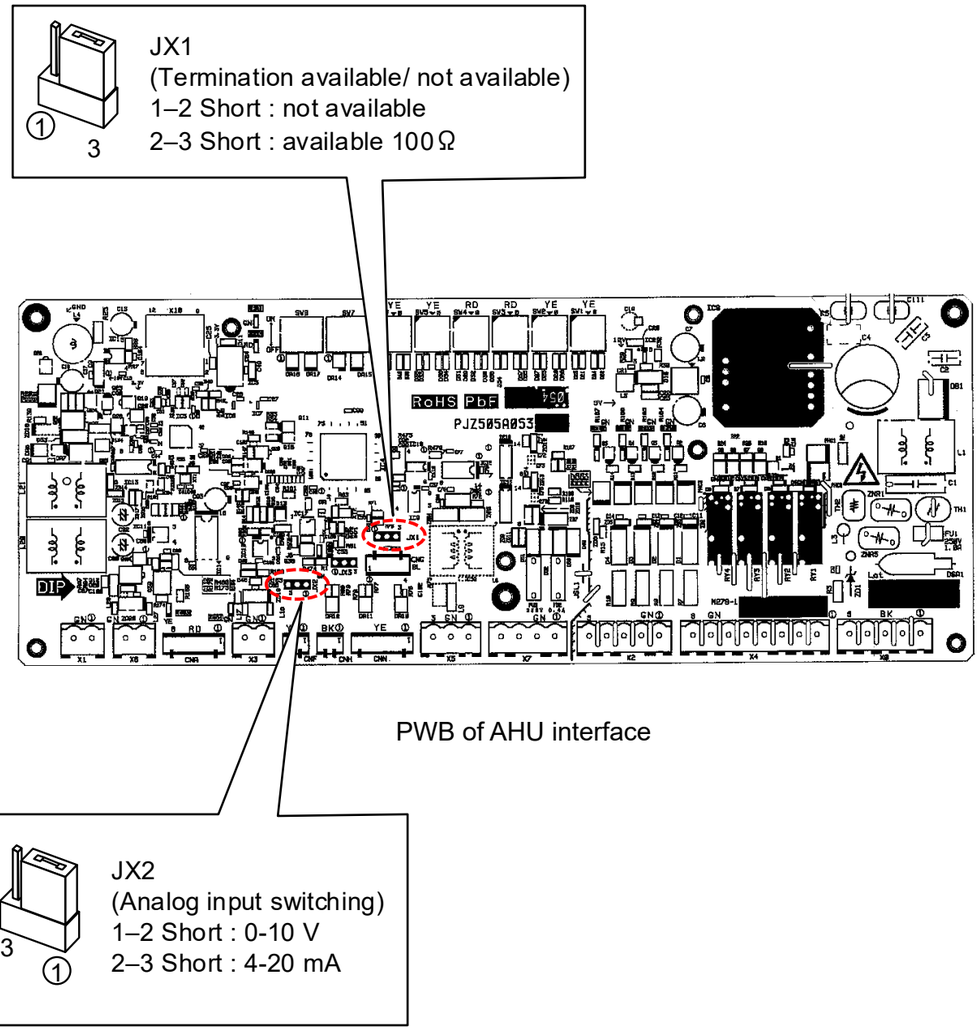
(2)SW7-4 ON: Temperature Control

・When temperature control is set, the compressor is controlled by the difference between the return air sensor value of the AHU interface and the set temperature.
・Controls the outdoor unit so that the return air sensor value approaches the set temperature.

6. Short PIN function

Item	SW		Contents	Remarks
ShortPIN	JX1	3P	Modbus termination switching	1–2 short: not available 2–3 short: available 100Ω
	JX2	3P	Analog input switching	1–2 short: 0–10V 2–3 short: 4–20mA
	JX3	3P	Reserve	Always 2–3 short

・By switching the short PIN on the interface, the function on the circuit can be switched.
・JX1: switches the terminal resistor of the Modbus communication circuit.
・JX2: switches the function of the analog input circuit.
・The JX3 is a reserve. Do not change from initial setting (2–3 short).



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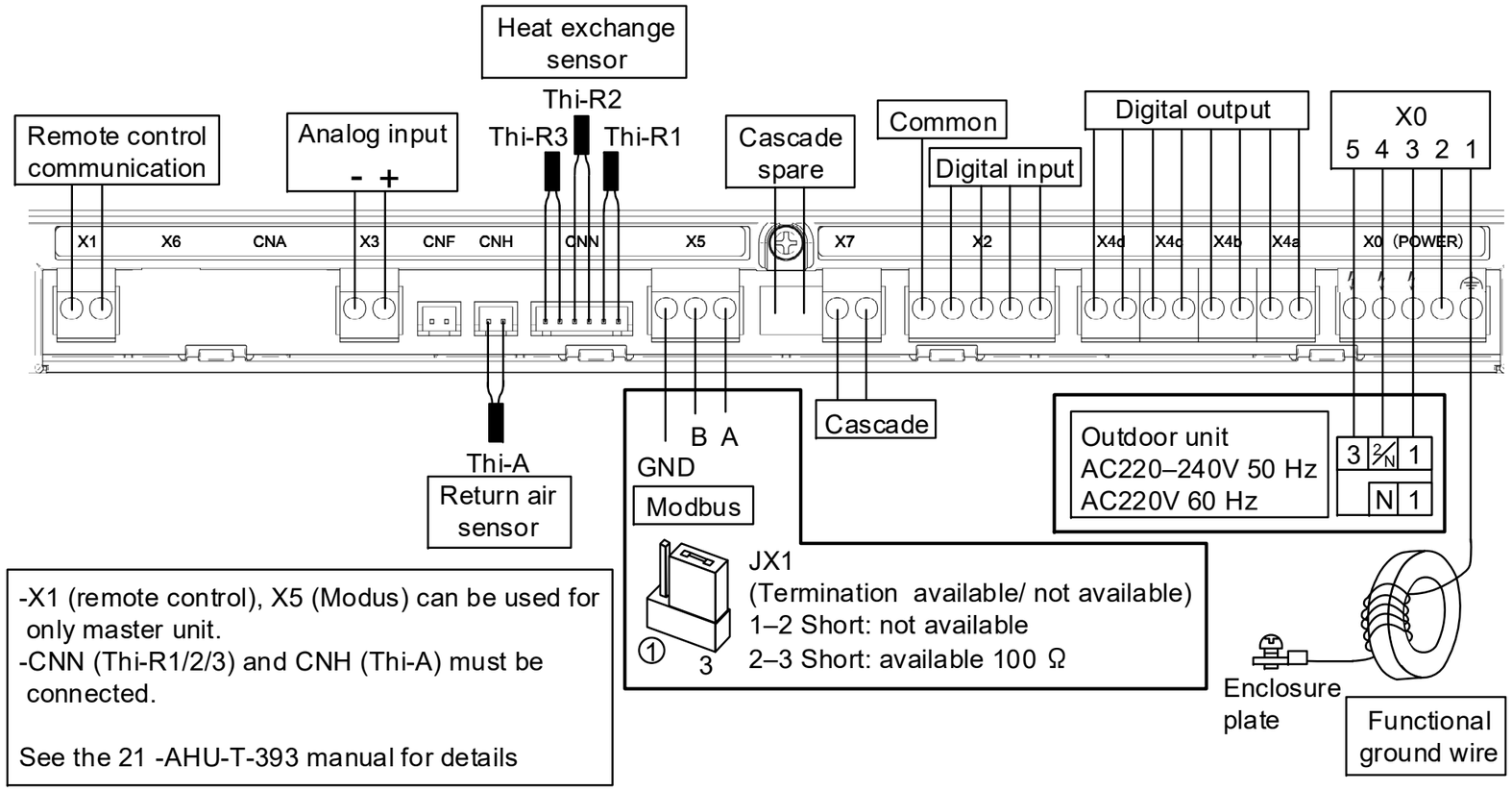
7. Input/output circuit

Refer to the diagram below for wiring.



-X1 (remote control), X5 (Modus) can be used for only master unit.
-CNN (Thi-R1/2/3) and CNH (Thi-A) must be connected.

See the 21 -AHU-T-393 manual for details

X0-1 is the functional ground.
Wrap the ferrite core included around 6 turns (5 loops).
Connect to the plate of the enclosure.
Wire diameter: 0.75 mm^2 Greater than or equal to.
Line length: 40 cm or more (recommended).

Connect the X0-3 to the L-phase of the outdoor unit.
Connect the X0-4 to the N-phase of the outdoor unit.
Connect the X0-5 to the communication terminal of the outdoor unit.
X0-2 is a free port. Do not connect anything.

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7.1 Input circuit

●Mounting guidelines for sensors

Mounting position of the sensor (example)

Installing temperature sensors

Correctly securing temperature sensors (Example)

When installing the temperature sensors, make sure that they have optimum contact with the surface to be measured.

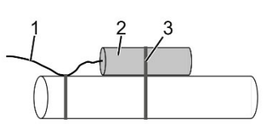
Secure with a wide-band hose clamp.

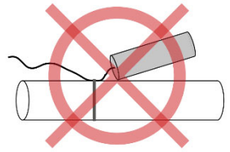
[Important]

Using cable ties will lead to faulty and squashed temperature sensors.

Use wide-band hose clamps for fastening.

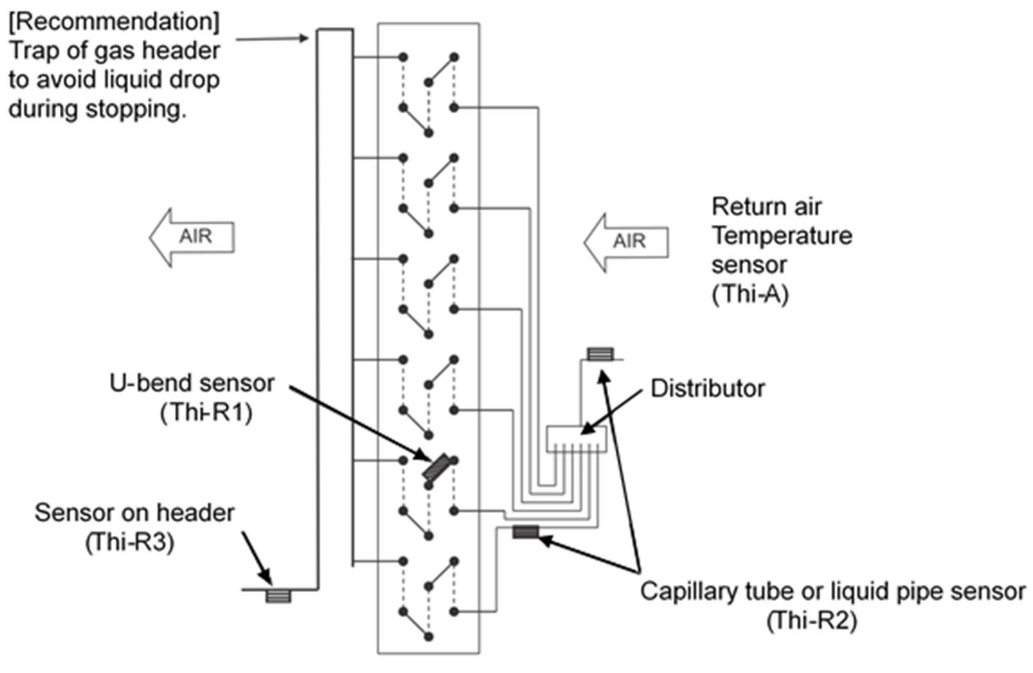
No.	Designation
1	Temperature sensor cable
2	Temperature sensor
3	Fastener





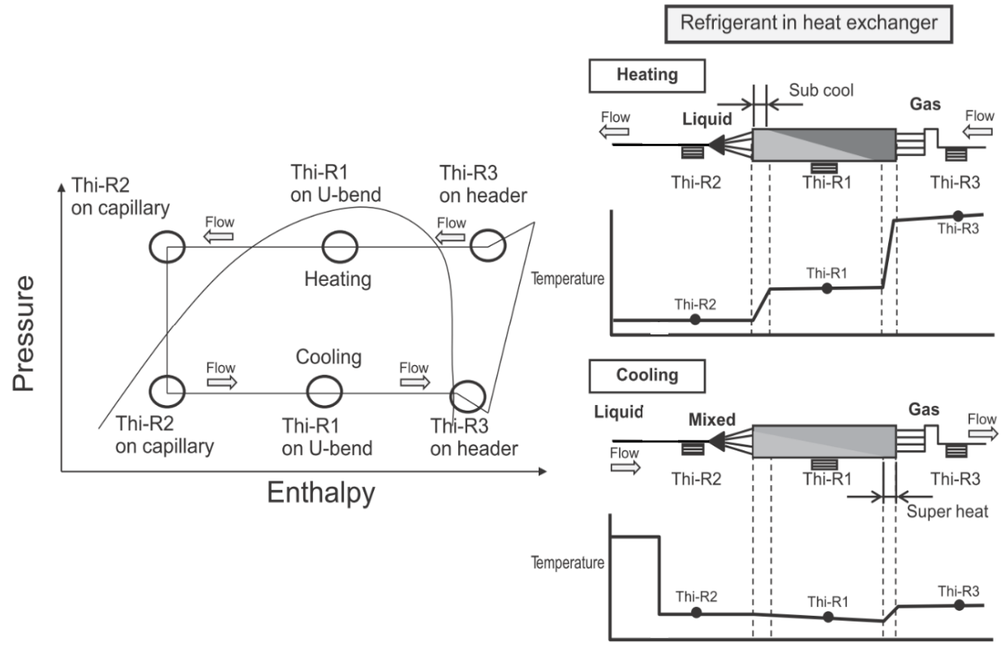
Installation locations of the heat exchanger sensor

Mounting position of temperature sensors (example)



Function of each heat exchanger sensor

	Mounting position	Detected temperature		Purpose
		Cooling	Heating	
Thi-R1	U-bend	Evaporating temperature	Condensing temperature	Anti-freezing protection
Thi-R2	Capillary	Evaporating temperature	Outlet temperature	Anti-freezing protection
Thi-R3	Header	Outlet temperature	Inlet gas temperature	EEV-control



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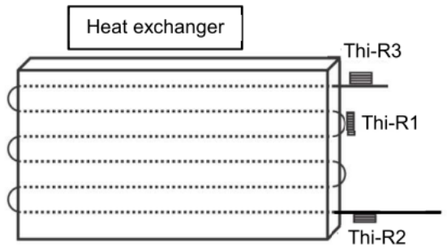
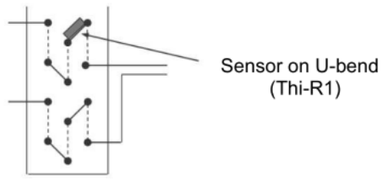


Each sensor has unique function,
Important to fix correct location.
If fixed to incorrect location, the system will not be controlled correctly, double check during commissioning.
The Thi-R3 sensor diameter is larger than the others to avoid mistakes.

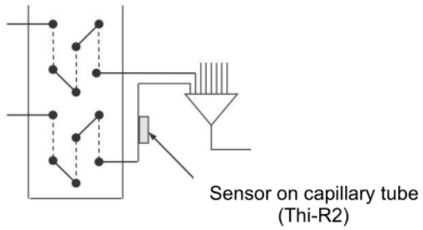
Items to be checked

1. Thi-R1 : On U-bend section (with **RED** tape)
   a) Considering the frost of the heat exchanger in cooling, mount the sensor on the circuit with the lowest temperature among all circuits (Avoid mounting on the lowest position of the circuit). However the circuit in which the liquid refrigerant is not held in heating operation is better.
   b) Mounting the sensor at the middle point of the circuit pass is recommended. If it is mounted near to the header side or the distributor side, it will detect the temperature at the overheat or sub cool area, so it cannot detect the actual condensing/evaporating temperature correctly.

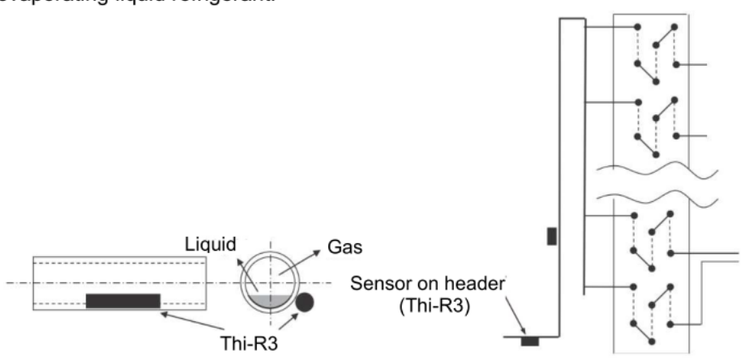
   Be sure to check whether the refrigerant is 2-phase flow in the circuit by testing the actual unit.



2. Thi-R2 : On capillary tube section of distributor (with **YELLOW** tape)
   a) It should be mounted on the capillary tube section to detect the evaporating temperature under the condition for good response.
   b) It should be mounted at the position to be able to detect the averaged outlet temperature and not to hold the liquid refrigerant in heating operation.



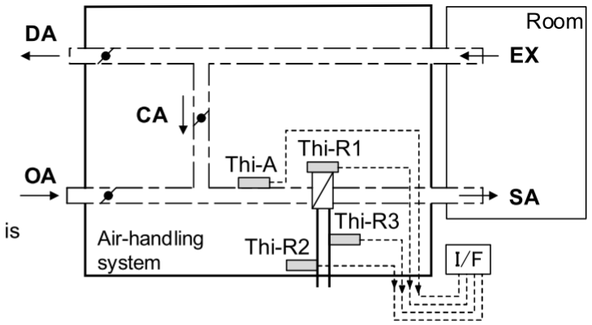
3. Thi-R3 : On header section (without tape)
   a) It should be mounted on the header main pipe after collecting refrigerant in cooling.
   b) If the header main pipe runs horizontally, be sure to mount the sensor on the side part of the pipe to prevent from evaporating liquid refrigerant.



4. Thi-A : Return air temperature sensor. (with **BLACK** tape)
   Fixed location
   a) Position where the air flow does not stagnate.
   b) Position not to be affected by other heat source. (heat exchanger and etc.)

List of abbreviations	
EX	Exhaust air
OA	Outside air
DA	Discharge air
CA	Circulating air
SA	Supply air

※Due to the system's complexity, the illustration is schematic and simplified.



5. Be careful to mount the sensors in the correct position and by identifying the attached colour tape of each sensor.
6. Be sure to confirm whether the sensed temperature of each sensor is correct or not by actual operation testing at commissioning.

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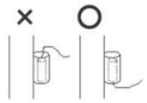
Other items to be checked

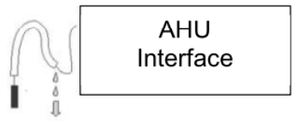
1. The indoor heat exchangers should have pockets for installing sensors.
2. The indoor heat exchanger sensors should not be affected by other heat sources.
   - ・Avoid installing the sensors near any electrical devices that generate heat.
   - ・Wrap the sensors with insulation and check any affect of temperature change form air flow.
   - ・Confirm that the sensors do not touch incorrect piping.
   - ・The sensors must be installed where the temperature can be measured accurately.
   - ・The sensors must have a good response and vary correctly.
3. The sensor should be inserted into the holder from the bottom side and the wiring should have a trap. This is to avoid intrusion of drain water into the sensor through the gap between the lead wire and the resin at the connecting part of sensor.

To avoid water intrusion from molding part



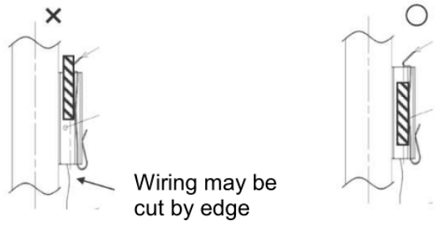
To have a trap

4. The drain water does not intrude into the connection part of the control box through the sensor wire (protective tube).
   The wiring route must have a trap so that the drain water drops down just before the control box.

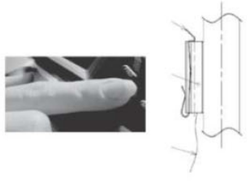


5. The sensor wiring should be loose and not tight.

6. The sensors should not be inserted into the holder too deeply in order to prevent the sensor wire being damaged.

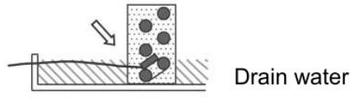


7. The sensors should not make contact with other parts.
8. The sensor wiring should not be in the place where a person can touch it. If it can be touched, ensure it is covered by a protective tube with 1mm or more thickness. (for safety reasons)



Wrong temperature will be detected.

9. The sensors should not be mounted in a position where the drain water accumulates.



10. The sensor wiring should be covered by a protective tube or rerouted to prevent it from been cut by metal edges.

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●Analog input circuit

・Compressor speed can be controlled by the analog input signal (0–10V / 4–20mA).
AHU interface converts 0–10V/4–20mA signal into the 0–100% range to understand how much capacity are required as a AHU.
Outdoor unit operates with the maximum compressor speed when 100% required capacity is used.
To use analog input function, make sure you enable the capacity control by configuring DIP SW7-4 as "OFF" (see 5 for more details).

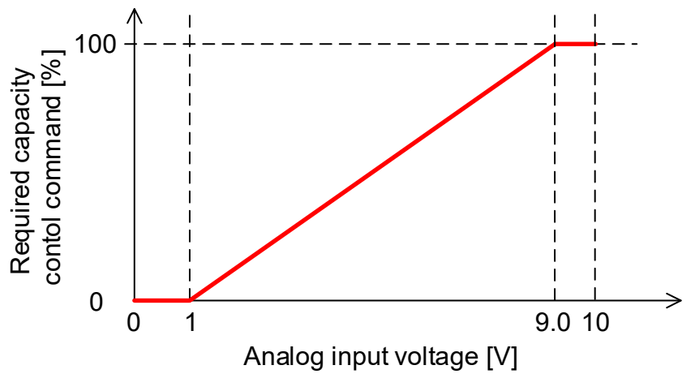
① **0–10V Capacity Control (SW7-1: OFF and JX2 1-2 short)**

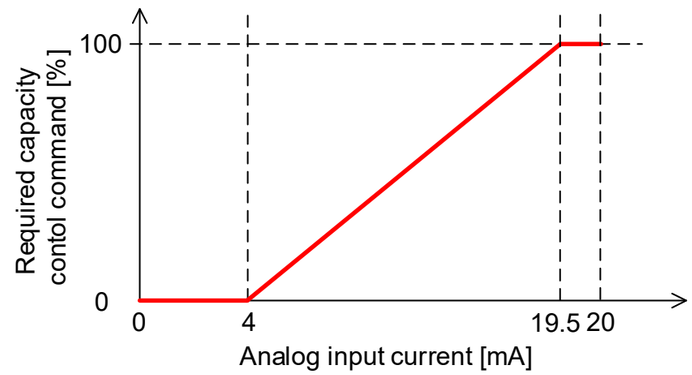
0–10V signal is regarded as a required capacity of 0–100%.
Please note that there is a dead band in certain ranges.
(ex) When 0.5V is input, it would be regarded as 0% required capacity.

② **4–20mA Capacity Control (SW7-1: ON and JX2 2–3 short)**

4–20mA signal is regarded as a required capacity of 0–100%.
Please note that there is a dead band in certain ranges.
(ex) When 0.9V is input, it would be regarded as 0% required capacity.

・The analog input signal: 0–10[V]/4–20[mA] controls the required capacity of the outdoor unit in the following range.



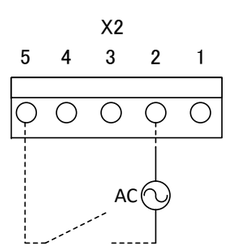


●Digital input circuit

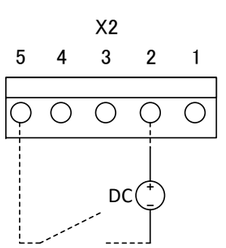
・ON/OFF can be recognised by the changing edge of the voltage to the digital input terminal.
・X2-5 is a common terminal.
When using X2-1 to X2-4, wire them together with X2-5.
・The functions of the digital input terminals are as follows.

Terminal	Function	ON	OFF
X2-1	Run/Stop	Run	Stop
X2-2	Cooling/Heating	Heating	Cooling
X2-3	Emergency stop	Emergency stop	Emergency stop release
X2-4	Reserve	-	-
X2-5	Common		

Digital input：Example X2-2



Power supply
AC24V-240V



Power supply
DC20V-130V

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7.2 Output circuit

●Digital output circuit

・The digital output terminal output ON/OFF status.

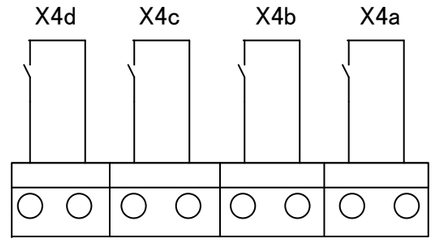
・The functions of the digital output are as follows.

Terminal	Function	ON	OFF
X4a	Outdoor unit/interface error	Error	Normal
X4b	Compressor ON	Compressor ON	Compressor OFF
X4c	Defrost ON	Defrost ON	Defrost OFF
X4d	Function selectable*	Run	Stop

(*) Setting of Xd4 can be changed by SW8 -1.

DipSW8-1	Digital Output:**X4d**		
	Function	ON	OFF
ON	Operation mode output	Heating	Cooling
OFF	Run/stop (Fan ON/OFF)	Run (Fan ON)	Stop (Fan OFF)

Digital output
Voltage free a contact output



Where two of more units are connected, Master outputs signals from Digital output if any unit is turned ON.
Slave outputs individually.

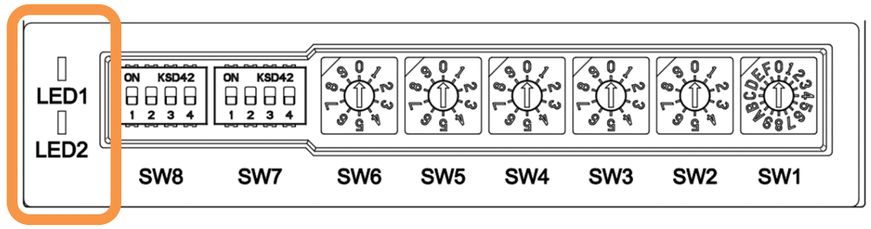
●LED output circuit

・The LED output shows the normal/abnormal status of the system.

・LED 1 (green): blinks at 0.5 sec intervals during normal operation.

・LED 2 (red): flashes when abnormal (lights out when normal).

The number of flashes changes depending on the error status. For details, refer to (13) error display.



7.3 Input/output circuit

・Input/output functions are as follows.

Item	Connector	Housing	Function
Input/output	X1	2P	Remote control
	X5	3P	Modbus
	X7	2P	Cascade control
		2P	Cascade control (reserve)
	X0	5P	Power (X0-2 is an empty port)

・X5 : Modbus communication circuit terminal.

X5-1	A polor
X5-2	B polor
X5-3	GND
JX1 (termination)	1–2: not available 2–3: available 100Ω

・X7 : Cascade connection terminal.

However, X7-3 and X7-4 are reserve circuits.

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8. Cascade control

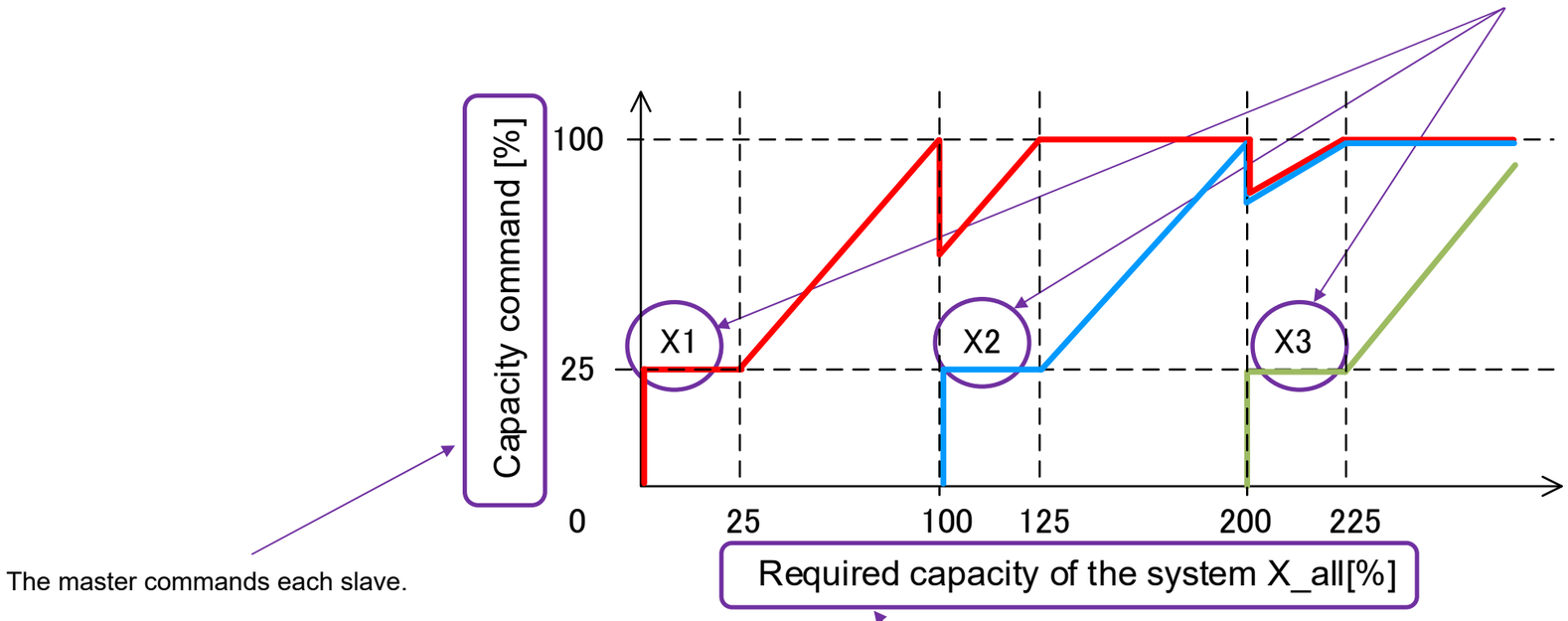
●Multiple refrigerant system

- By connecting the AHU interface with the X7 connector, up to 16 units can be connected.
- The interface address of master is fixed to 0. Slave address can be set from 1 to F.
- Connect one outdoor unit per AHU interface.
- Run/stop, operation mode, and thermo ON/OFF are all judged by master.
- Slave only receives commands from master.
- In cascade control, rotation control and fault backup control are automatically enabled.

●Capacity distribution of cascade control

- The master commands the capacity to each slave.
- The image is shown below.

Each slave operates according to the master command.



The master commands each slave.

The master calculates X_all from the following:

- Analog input or Modbus or remote control
  (0–10V/4-20mA, 0–100%, set temperature)
- Number of outdoor units

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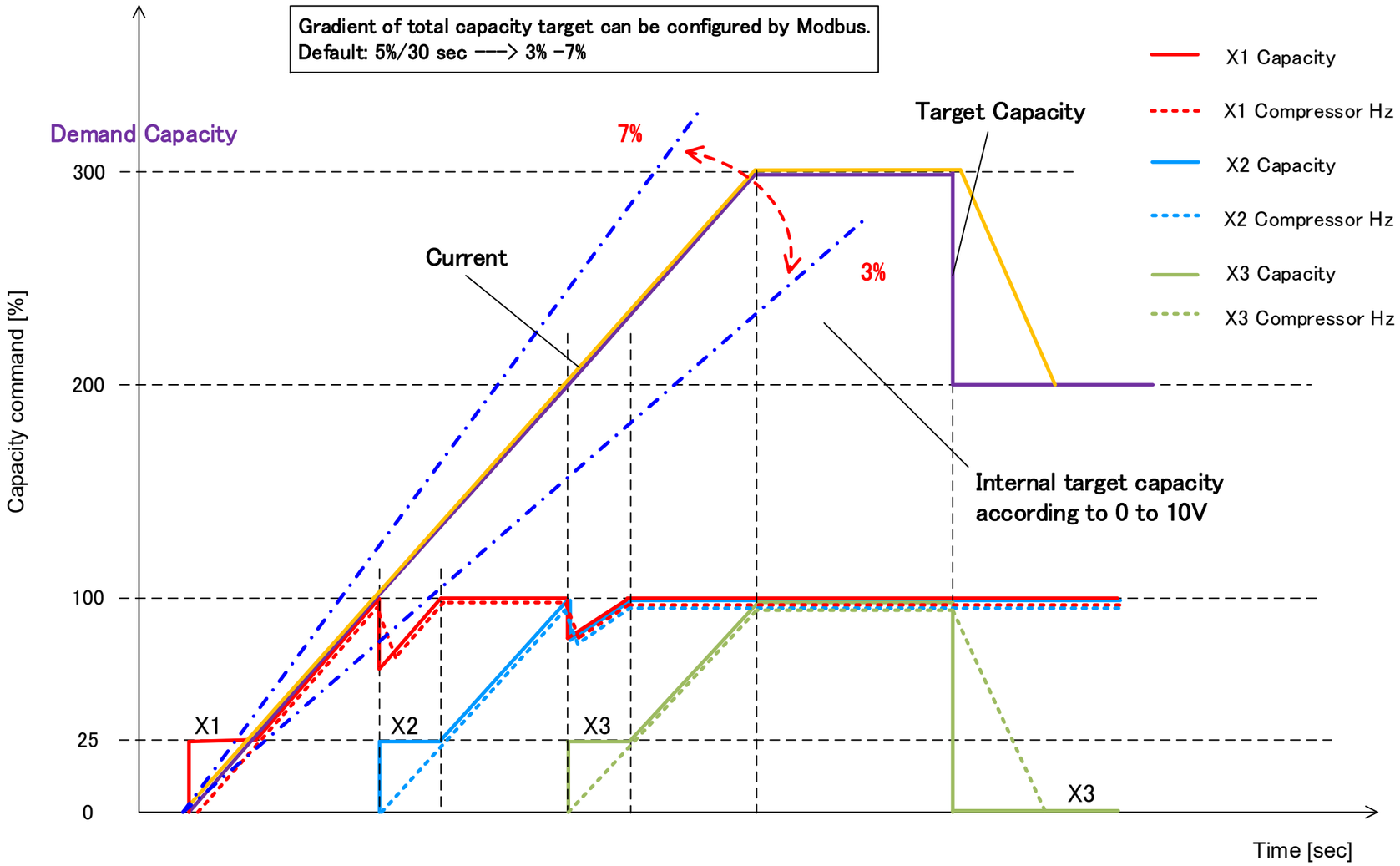
●Capacity step up control (SW8-2: ON)

・When a demand capacity is received from AHU control, this control operates outdoor units step by step or one after another, instead of operating all units simultaneously.

・Although it takes time to raise the speed to the demand capacity, it allows to raise it gradually.

・Use this control in the event that a hunting occurs on PID control at AHU control side because multiple outdoor units are operated simultaneously after receiving a high demand capacity input suddenly.



Example of Capacity step up control (Outdoor unit: 3 units)

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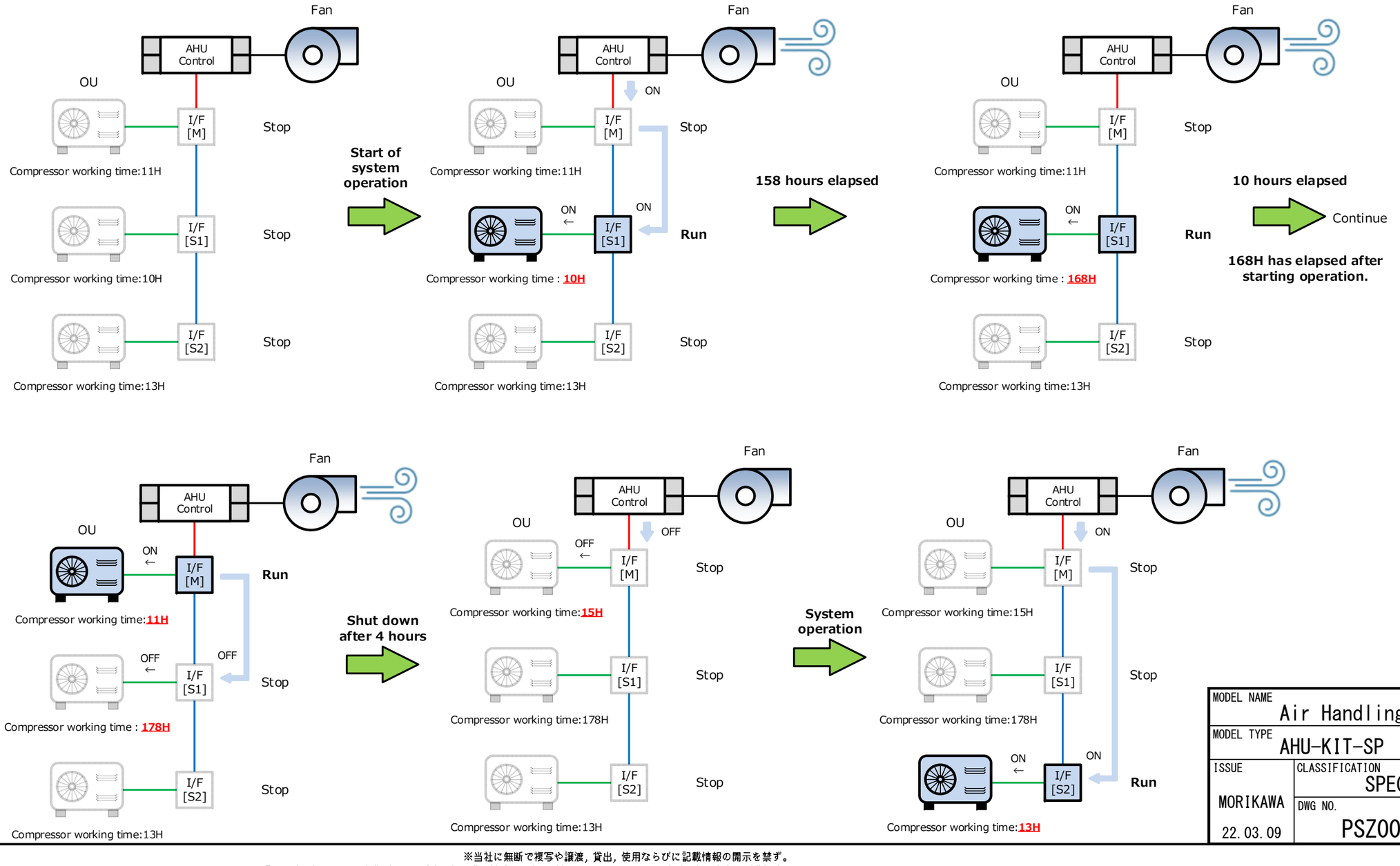
9. Rotation control

・In cascade control, rotation control is automatically enabled.
・This control averages the compressor accumulated time of all outdoor units.
・When the outdoor unit starts operating, the outdoor unit with the lowest compressor accumulated time is preferentially operated.
・When 168 hours have elapsed since the outdoor unit started operating, the outdoor unit will be switched.
*Operation switching time: 168 hours is fixed.

・This is an example of rotation control.

Rotation control example



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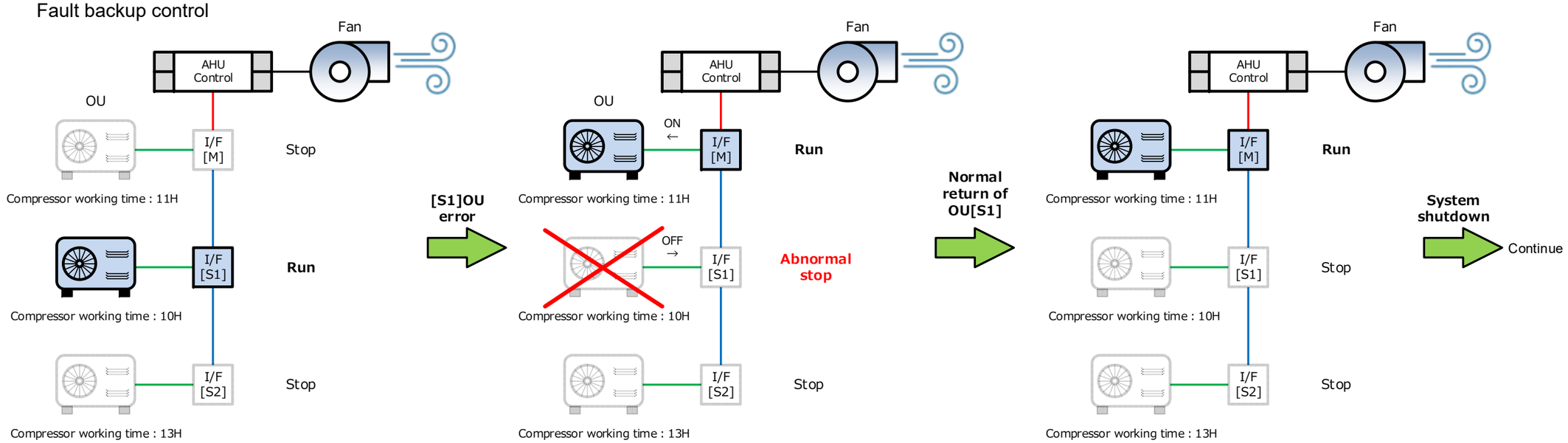
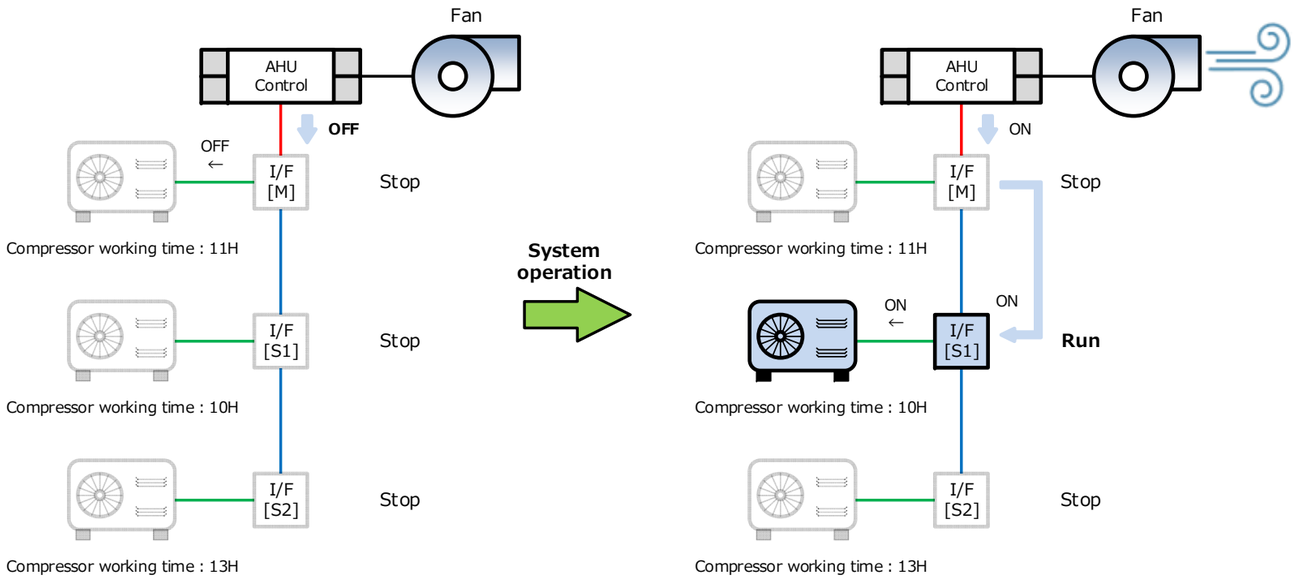
10. Fault backup control

・In cascade control, fault backup control is automatically enabled.
・When an abnormality occurs in an outdoor unit during operation, another outdoor unit automatically starts operating.
・Even if the outdoor unit that stopped abnormally is restored, the operation of the outdoor unit does not change.

・An example of fault backup control is shown below.

Fault backup control





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11. Modbus communication

・X5 is Modbus communication connector.

・Modbus communication specifications are as follows.

Item	Specification	Note
Transmission mode	RTU (remote terminal unit)	
Transmission speed	(1) 9600bps (2) 19200bps	DipSW7-2 ON DipSW7-2 OFF
Data bit	8	
Parity/stop bit	(1) Non parity + 2 stop bits (2) Even parity + 1 stop bit	DipSW7-3 ON DipSW7-3 OFF
Node number (slave address)	01～99 (initial：01)	RotarySW5: ones place RotarySW6: tens place
Connection	RS-485 communication	X5-1: A polar X5-2: B polar X5-3: GND
Combinations	Modbus master: External controller : 1pcs Modbus slave: AHU interface :1pcs	

・Modbus can monitor the status of the AHU interface and outdoor units.
Modbus can also change some settings.

●Modbus function

・The function codes are as follows:

Function code		Function name	Remarks
3	(0x03)	Read holding register	Read the contents of the holding register
4	(0x04)	Read input register	Read the contents of the input register
6	(0x06)	Preset single register	Change the contents of the holding register
16	(0x10)	Preset multiple registers	Change the contents of multiple consecutive holding registers

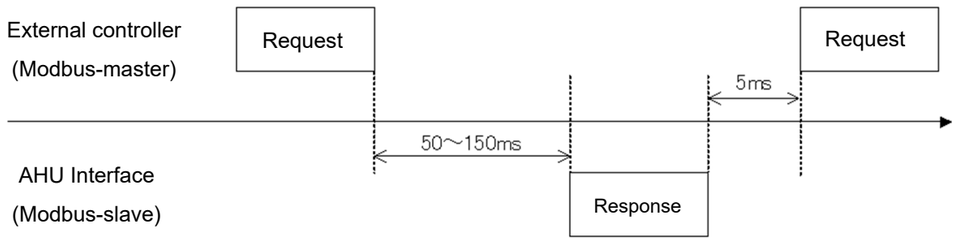
●Modbus data information

・Modbus data type, data length and address allocation range are as follows.

Target register	Data length	Type of access	Register address range
Input register	2 byte	Monitoring only	30001～39999
Holding register	2 byte	Monitoring / control	40001～49999

●Overview of Modbus communication

・The time from the completion of the request to the start of the response and the time from the completion of the response to the start of the next request are as shown in the figure below.



・The following table shows the data length of the request frame.

Field	Detail	Data length
Address	Slave address	8 bit
Function	Function code	8 bit
Data	Request data	Variable
Error check	CRC error check	16 bit

・The data length of the response frame is shown in the table below.

Field	Detail	Data length
Address	Slave address	8 bit
Function	Function code	8 bit
Data	Respons data	Variable
Error check	CRC error check	16 bit

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●Input register

・The following table shows the input registers (read only, 2-byte data).

Data address	Item	Initial	Range	Units	Notes
30001	System Run/Stop display	0	0～65535	—	0：Stop
					1：Run
30002	Operation mode display	0	0～65535	—	0：Cooling
					1：Heating
30003	Set temperature display	46(23℃)	0～65535	0.5℃/count	18～30℃
30004	Center/Remote display	1	0～65535	—	0：Remote
					1：Center/Remote
					2：Center
30006	Emergency stop display	0	0～65535	—	0：Emergency stop release
					1：Emergency stop
30007	Return air temperature (Master)	0	-32768～32767	0.1℃/count	
30008	External temperature (Master)	-640	-32768～32767	0.1℃/count	
30009	Request capacity	0	0～65535	1 %/count	X_all

[Data address 30003 set temperature display example]
<0.5℃/count>
18=9℃
36=18℃
50=25℃
60=30℃

[Data address 30007 return air temperature display example]
<0.1℃/count>
10=1℃
30=3℃
500=50℃
600=60℃

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Data address	Item	Range	Units	Notes
30010	Analogue input voltage [V]	0～65535	0.1 V/count	0～10V
30011	Analogue input current [mA]	0～65535	0.1 mA/count	0～20mA
30012	Digital input X2-1	0～65535	—	0：OFF 1：ON
30013	Digital input X2-2	0～65535	—	0：OFF 1：ON
30014	Digital input X2-3	0～65535	—	0：OFF 1：ON
30015	Digital input X2-4	0～65535	—	0：OFF 1：ON
30016	Digital output X4a	0～65535	—	0：OFF 1：ON
30017	Digital output X4b	0～65535	—	0：OFF 1：ON
30018	Digital output X4c	0～65535	—	0：OFF 1：ON
30019	Digital output X4d	0～65535	—	0：OFF 1：ON
30020	Analogue input switching	0～65535	—	0：0～10V 1：4～20mA
30021	Modbus baudrate setting	0～65535	—	0：19200bps 1：9600bps
30022	Modbus Parity/Stop bit setting	0～65535	—	0：Even parity +1Stop bit 1：Non parity +2Stop bit
30023	Compressor control	0～65535	—	0：Capacity control 1：Temperature control
30024	SW8-1 Setting display	0～65535	—	0：Run/Stop 1：Cooling/Heating
30025	Capacity step up control setting	0～65535	—	0：Invalid 1：Valid
30026	SW8-3 Setting display	0～65535	—	0
30027	Reserve	0～65535	—	Reserve
30028	SW7-1 Reading value	0～65535	—	0：OFF 1：ON
30029	SW7-2 Reading value	0～65535	—	0：OFF 1：ON
30030	SW7-3 Reading value	0～65535	—	0：OFF 1：ON
30031	SW7-4 Reading value	0～65535	—	0：OFF 1：ON
30032	SW8-1 Reading value	0～65535	—	0：OFF 1：ON
30033	SW8-2 Reading value	0～65535	—	0：OFF 1：ON
30034	SW8-3 Reading value	0～65535	—	0：OFF 1：ON
30035	SW8-4 Reading value	0～65535	—	0：OFF 1：ON
30036	Modbus capacity control command display	0～65535	—	0：No command 1：Command
30037	Modbus capacity control value display	0～65535	0.01 %/count	0-100%
30038	Capacity step up control - Step up rate display	30-70	0.1 %/count	3-7%

Data address	Item	Initial	Range	Units	Notes
31001	Connection status:Slave1	0	0～65535	—	0:Unconnected 1:Connection
31002	Connection status:Slave2	0	0～65535	—	0:Unconnected 1:Connection
31003	Connection status:Slave3	0	0～65535	—	0:Unconnected 1:Connection
31004	Connection status:Slave4	0	0～65535	—	0:Unconnected 1:Connection
31005	Connection status:Slave5	0	0～65535	—	0:Unconnected 1:Connection
31006	Connection status:Slave6	0	0～65535	—	0:Unconnected 1:Connection
31007	Connection status:Slave7	0	0～65535	—	0:Unconnected 1:Connection
31008	Connection status:Slave8	0	0～65535	—	0:Unconnected 1:Connection
31009	Connection status:Slave9	0	0～65535	—	0:Unconnected 1:Connection
31010	Connection status:Slave10	0	0～65535	—	0:Unconnected 1:Connection
31011	Connection status:Slave11	0	0～65535	—	0:Unconnected 1:Connection
31012	Connection status:Slave12	0	0～65535	—	0:Unconnected 1:Connection
31013	Connection status:Slave13	0	0～65535	—	0:Unconnected 1:Connection
31014	Connection status:Slave14	0	0～65535	—	0:Unconnected 1:Connection
31015	Connection status:Slave15	0	0～65535	—	0:Unconnected 1:Connection
31016	Capacity command(Master)	0	0～65535	1 %/count	0～100%
31017	Capacity command(Slave1)	0	0～65535	1 %/count	0～100%
31018	Capacity command(Slave2)	0	0～65535	1 %/count	0～100%
31019	Capacity command(Slave3)	0	0～65535	1 %/count	0～100%
31020	Capacity command(Slave4)	0	0～65535	1 %/count	0～100%
31021	Capacity command(Slave5)	0	0～65535	1 %/count	0～100%
31022	Capacity command(Slave6)	0	0～65535	1 %/count	0～100%
31023	Capacity command(Slave7)	0	0～65535	1 %/count	0～100%
31024	Capacity command(Slave8)	0	0～65535	1 %/count	0～100%
31025	Capacity command(Slave9)	0	0～65535	1 %/count	0～100%
31026	Capacity command(Slave10)	0	0～65535	1 %/count	0～100%
31027	Capacity command(Slave11)	0	0～65535	1 %/count	0～100%
31028	Capacity command(Slave12)	0	0～65535	1 %/count	0～100%
31029	Capacity command(Slave13)	0	0～65535	1 %/count	0～100%
31030	Capacity command(Slave14)	0	0～65535	1 %/count	0～100%
31031	Capacity command(Slave15)	0	0～65535	1 %/count	0～100%

[Master/slave1~15]
<SW1 AHU interface address>
SW1:0=master
SW1:1=AHU interface No.1 (slave 1)
SW1:2=AHU interface No.2 (slave 2)
SW1:3=AHU interface No.3 (slave 3)
SW1:4=AHU interface No.4 (slave 4)
SW1:5=AHU interface No.5 (slave 5)
SW1:6=AHU interface No.6 (slave 6)
SW1:7=AHU interface No.7 (slave 7)
SW1:8=AHU interface No.8 (slave 8)
SW1:9=AHU interface No.9 (slave 9)
SW1:A=AHU interface No.10 (slave 10)
SW1:B=AHU interface No.11 (slave 11)
SW1:C=AHU interface No.12 (slave 12)
SW1:D=AHU interface No.13 (slave 13)
SW1:E=AHU interface No.14 (slave 14)
SW1:F=AHU interface No.15 (slave 15)

Data address	Item	Initial	Range	Units	Notes
31032	Compressor accumulated time(Master)	0	0～65535	1 H/count	
31033	Compressor accumulated time(Slave1)	0	0～65535	1 H/count	
31034	Compressor accumulated time(Slave2)	0	0～65535	1 H/count	
31035	Compressor accumulated time(Slave3)	0	0～65535	1 H/count	
31036	Compressor accumulated time(Slave4)	0	0～65535	1 H/count	
31037	Compressor accumulated time(Slave5)	0	0～65535	1 H/count	
31038	Compressor accumulated time(Slave6)	0	0～65535	1 H/count	
31039	Compressor accumulated time(Slave7)	0	0～65535	1 H/count	
31040	Compressor accumulated time(Slave8)	0	0～65535	1 H/count	
31041	Compressor accumulated time(Slave9)	0	0～65535	1 H/count	
31042	Compressor accumulated time(Slave10)	0	0～65535	1 H/count	
31043	Compressor accumulated time(Slave11)	0	0～65535	1 H/count	
31044	Compressor accumulated time(Slave12)	0	0～65535	1 H/count	
31045	Compressor accumulated time(Slave13)	0	0～65535	1 H/count	
31046	Compressor accumulated time(Slave14)	0	0～65535	1 H/count	
31047	Compressor accumulated time(Slave15)	0	0～65535	1 H/count	
31048	Error code display(Master)	0	0～65535	—	0～99
31049	Error code display(Slave1)	0	0～65535	—	0～99
31050	Error code display(Slave2)	0	0～65535	—	0～99
31051	Error code display(Slave3)	0	0～65535	—	0～99
31052	Error code display(Slave4)	0	0～65535	—	0～99
31053	Error code display(Slave5)	0	0～65535	—	0～99
31054	Error code display(Slave6)	0	0～65535	—	0～99
31055	Error code display(Slave7)	0	0～65535	—	0～99
31056	Error code display(Slave8)	0	0～65535	—	0～99
31057	Error code display(Slave9)	0	0～65535	—	0～99
31058	Error code display(Slave10)	0	0～65535	—	0～99
31059	Error code display(Slave11)	0	0～65535	—	0～99
31060	Error code display(Slave12)	0	0～65535	—	0～99
31061	Error code display(Slave13)	0	0～65535	—	0～99
31062	Error code display(Slave14)	0	0～65535	—	0～99
31063	Error code display(Slave15)	0	0～65535	—	0～99

[Error code display example]
0 : Normal
1 : E1
7 : E7
99 : E99

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Data address	Item	Initial	Range	Units	Notes
31064	Heat exchanger temperature:Thi-R1(Master)	-3276	-32768～32767	0.1℃/count	
31065	Heat exchanger temperature:Thi-R2(Master)	-3276	-32768～32767	0.1℃/count	
31066	Heat exchanger temperature:Thi-R3(Master)	-3276	-32768～32767	0.1℃/count	
31067	Heat exchanger temperature:Thi-R1(Slave1)	-3276	-32768～32767	0.1℃/count	
31068	Heat exchanger temperature:Thi-R2(Slave1)	-3276	-32768～32767	0.1℃/count	
31069	Heat exchanger temperature:Thi-R3(Slave1)	-3276	-32768～32767	0.1℃/count	
31070	Heat exchanger temperature:Thi-R1(Slave2)	-3276	-32768～32767	0.1℃/count	
31071	Heat exchanger temperature:Thi-R2(Slave2)	-3276	-32768～32767	0.1℃/count	
31072	Heat exchanger temperature:Thi-R3(Slave2)	-3276	-32768～32767	0.1℃/count	
31073	Heat exchanger temperature:Thi-R1(Slave3)	-3276	-32768～32767	0.1℃/count	
31074	Heat exchanger temperature:Thi-R2(Slave3)	-3276	-32768～32767	0.1℃/count	
31075	Heat exchanger temperature:Thi-R3(Slave3)	-3276	-32768～32767	0.1℃/count	
31076	Heat exchanger temperature:Thi-R1(Slave4)	-3276	-32768～32767	0.1℃/count	
31077	Heat exchanger temperature:Thi-R2(Slave4)	-3276	-32768～32767	0.1℃/count	
31078	Heat exchanger temperature:Thi-R3(Slave4)	-3276	-32768～32767	0.1℃/count	
31079	Heat exchanger temperature:Thi-R1(Slave5)	-3276	-32768～32767	0.1℃/count	
31080	Heat exchanger temperature:Thi-R2(Slave5)	-3276	-32768～32767	0.1℃/count	
31081	Heat exchanger temperature:Thi-R3(Slave5)	-3276	-32768～32767	0.1℃/count	
31082	Heat exchanger temperature:Thi-R1(Slave6)	-3276	-32768～32767	0.1℃/count	
31083	Heat exchanger temperature:Thi-R2(Slave6)	-3276	-32768～32767	0.1℃/count	
31084	Heat exchanger temperature:Thi-R3(Slave6)	-3276	-32768～32767	0.1℃/count	
31085	Heat exchanger temperature:Thi-R1(Slave7)	-3276	-32768～32767	0.1℃/count	
31086	Heat exchanger temperature:Thi-R2(Slave7)	-3276	-32768～32767	0.1℃/count	
31087	Heat exchanger temperature:Thi-R3(Slave7)	-3276	-32768～32767	0.1℃/count	
31088	Heat exchanger temperature:Thi-R1(Slave8)	-3276	-32768～32767	0.1℃/count	
31089	Heat exchanger temperature:Thi-R2(Slave8)	-3276	-32768～32767	0.1℃/count	
31090	Heat exchanger temperature:Thi-R3(Slave8)	-3276	-32768～32767	0.1℃/count	
31091	Heat exchanger temperature:Thi-R1(Slave9)	-3276	-32768～32767	0.1℃/count	
31092	Heat exchanger temperature:Thi-R2(Slave9)	-3276	-32768～32767	0.1℃/count	
31093	Heat exchanger temperature:Thi-R3(Slave9)	-3276	-32768～32767	0.1℃/count	
31094	Heat exchanger temperature:Thi-R1(Slave10)	-3276	-32768～32767	0.1℃/count	
31095	Heat exchanger temperature:Thi-R2(Slave10)	-3276	-32768～32767	0.1℃/count	
31096	Heat exchanger temperature:Thi-R3(Slave10)	-3276	-32768～32767	0.1℃/count	

Data address	Item	Initial	Range	Units	Notes
31097	Heat exchanger temperature:Thi-R1(Slave11)	-3276	-32768～32767	0.1℃/count	
31098	Heat exchanger temperature:Thi-R2(Slave11)	-3276	-32768～32767	0.1℃/count	
31099	Heat exchanger temperature:Thi-R3(Slave11)	-3276	-32768～32767	0.1℃/count	
31100	Heat exchanger temperature:Thi-R1(Slave12)	-3276	-32768～32767	0.1℃/count	
31101	Heat exchanger temperature:Thi-R2(Slave12)	-3276	-32768～32767	0.1℃/count	
31102	Heat exchanger temperature:Thi-R3(Slave12)	-3276	-32768～32767	0.1℃/count	
31103	Heat exchanger temperature:Thi-R1(Slave13)	-3276	-32768～32767	0.1℃/count	
31104	Heat exchanger temperature:Thi-R2(Slave13)	-3276	-32768～32767	0.1℃/count	
31105	Heat exchanger temperature:Thi-R3(Slave13)	-3276	-32768～32767	0.1℃/count	
31106	Heat exchanger temperature:Thi-R1(Slave14)	-3276	-32768～32767	0.1℃/count	
31107	Heat exchanger temperature:Thi-R2(Slave14)	-3276	-32768～32767	0.1℃/count	
31108	Heat exchanger temperature:Thi-R3(Slave14)	-3276	-32768～32767	0.1℃/count	
31109	Heat exchanger temperature:Thi-R1(Slave15)	-3276	-32768～32767	0.1℃/count	
31110	Heat exchanger temperature:Thi-R2(Slave15)	-3276	-32768～32767	0.1℃/count	
31111	Heat exchanger temperature:Thi-R3(Slave15)	-3276	-32768～32767	0.1℃/count	
31112	Compressor Hz display(Master)	0	0～65535	1 Hz/count	0～120Hz
31113	Compressor Hz display(Slave1)	0	0～65535	1 Hz/count	0～120Hz
31114	Compressor Hz display(Slave2)	0	0～65535	1 Hz/count	0～120Hz
31115	Compressor Hz display(Slave3)	0	0～65535	1 Hz/count	0～120Hz
31116	Compressor Hz display(Slave4)	0	0～65535	1 Hz/count	0～120Hz
31117	Compressor Hz display(Slave5)	0	0～65535	1 Hz/count	0～120Hz
31118	Compressor Hz display(Slave6)	0	0～65535	1 Hz/count	0～120Hz
31119	Compressor Hz display(Slave7)	0	0～65535	1 Hz/count	0～120Hz
31120	Compressor Hz display(Slave8)	0	0～65535	1 Hz/count	0～120Hz
31121	Compressor Hz display(Slave9)	0	0～65535	1 Hz/count	0～120Hz
31122	Compressor Hz display(Slave10)	0	0～65535	1 Hz/count	0～120Hz
31123	Compressor Hz display(Slave11)	0	0～65535	1 Hz/count	0～120Hz
31124	Compressor Hz display(Slave12)	0	0～65535	1 Hz/count	0～120Hz
31125	Compressor Hz display(Slave13)	0	0～65535	1 Hz/count	0～120Hz
31126	Compressor Hz display(Slave14)	0	0～65535	1 Hz/count	0～120Hz
31127	Compressor Hz display(Slave15)	0	0～65535	1 Hz/count	0～120Hz

Data address	Item	Initial	Range	Units	Notes
31128	Defrost display(Master)	0	0～65535	—	0:Normal 1:Defrost
31129	Defrost display(Slave1)	0	0～65535	—	0:Normal 1:Defrost
31130	Defrost display(Slave2)	0	0～65535	—	0:Normal 1:Defrost
31131	Defrost display(Slave3)	0	0～65535	—	0:Normal 1:Defrost
31132	Defrost display(Slave4)	0	0～65535	—	0:Normal 1:Defrost
31133	Defrost display(Slave5)	0	0～65535	—	0:Normal 1:Defrost
31134	Defrost display(Slave6)	0	0～65535	—	0:Normal 1:Defrost
31135	Defrost display(Slave7)	0	0～65535	—	0:Normal 1:Defrost
31136	Defrost display(Slave8)	0	0～65535	—	0:Normal 1:Defrost
31137	Defrost display(Slave9)	0	0～65535	—	0:Normal 1:Defrost
31138	Defrost display(Slave10)	0	0～65535	—	0:Normal 1:Defrost
31139	Defrost display(Slave11)	0	0～65535	—	0:Normal 1:Defrost
31140	Defrost display(Slave12)	0	0～65535	—	0:Normal 1:Defrost
31141	Defrost display(Slave13)	0	0～65535	—	0:Normal 1:Defrost
31142	Defrost display(Slave14)	0	0～65535	—	0:Normal 1:Defrost
31143	Defrost display(Slave15)	0	0～65535	—	0:Normal 1:Defrost
31144	Oil return display(Master)	0	0～65535	—	0:Normal 1:Oil return
31145	Oil return display(Slave1)	0	0～65535	—	0:Normal 1:Oil return
31146	Oil return display(Slave2)	0	0～65535	—	0:Normal 1:Oil return
31147	Oil return display(Slave3)	0	0～65535	—	0:Normal 1:Oil return
31148	Oil return display(Slave4)	0	0～65535	—	0:Normal 1:Oil return
31149	Oil return display(Slave5)	0	0～65535	—	0:Normal 1:Oil return
31150	Oil return display(Slave6)	0	0～65535	—	0:Normal 1:Oil return
31151	Oil return display(Slave7)	0	0～65535	—	0:Normal 1:Oil return
31152	Oil return display(Slave8)	0	0～65535	—	0:Normal 1:Oil return
31153	Oil return display(Slave9)	0	0～65535	—	0:Normal 1:Oil return
31154	Oil return display(Slave10)	0	0～65535	—	0:Normal 1:Oil return
31155	Oil return display(Slave11)	0	0～65535	—	0:Normal 1:Oil return
31156	Oil return display(Slave12)	0	0～65535	—	0:Normal 1:Oil return
31157	Oil return display(Slave13)	0	0～65535	—	0:Normal 1:Oil return
31158	Oil return display(Slave14)	0	0～65535	—	0:Normal 1:Oil return
31159	Oil return display(Slave15)	0	0～65535	—	0:Normal 1:Oil return

Data address	Item	Initial	Range	Units	Notes
31160	Abnormal stop status display(Master)	0	0～65535	—	0:Normal 1:Abnormal stop
31161	Abnormal stop status display(Slave1)	0	0～65535	—	0:Normal 1:Abnormal stop
31162	Abnormal stop status display(Slave2)	0	0～65535	—	0:Normal 1:Abnormal stop
31163	Abnormal stop status display(Slave3)	0	0～65535	—	0:Normal 1:Abnormal stop
31164	Abnormal stop status display(Slave4)	0	0～65535	—	0:Normal 1:Abnormal stop
31165	Abnormal stop status display(Slave5)	0	0～65535	—	0:Normal 1:Abnormal stop
31166	Abnormal stop status display(Slave6)	0	0～65535	—	0:Normal 1:Abnormal stop
31167	Abnormal stop status display(Slave7)	0	0～65535	—	0:Normal 1:Abnormal stop
31168	Abnormal stop status display(Slave8)	0	0～65535	—	0:Normal 1:Abnormal stop
31169	Abnormal stop status display(Slave9)	0	0～65535	—	0:Normal 1:Abnormal stop
31170	Abnormal stop status display(Slave10)	0	0～65535	—	0:Normal 1:Abnormal stop
31171	Abnormal stop status display(Slave11)	0	0～65535	—	0:Normal 1:Abnormal stop
31172	Abnormal stop status display(Slave12)	0	0～65535	—	0:Normal 1:Abnormal stop
31173	Abnormal stop status display(Slave13)	0	0～65535	—	0:Normal 1:Abnormal stop
31174	Abnormal stop status display(Slave14)	0	0～65535	—	0:Normal 1:Abnormal stop
31175	Abnormal stop status display(Slave15)	0	0～65535	—	0:Normal 1:Abnormal stop

●Holding register

・The holding registers (readable, changeable, 2-byte data) are as follows.

Data address	Item	Initial	Range	Units	Notes
40001	Run/stop command	0	0～1	—	0: stop 1: run
40002	Operation mode command	0	0～1	—	0: cooling 1: heating
40003	Set temperature command	46 (23 ℃)	36～60	0.5℃/count	36=18 ℃ 60=30 ℃
40005	Emergency stop command	0	0～1	—	0：emergency stop release 1：emergency stop
40006	CPU reset command	0	0～1	—	0: NOP 1: reset
40007	Compressor accumulated time all reset command	0	0～1	—	0: NOP 1: reset
40008	Capacity Control command	0	0～10000	0.01 %/count	0–100%
40009	Capacity step up control - Step-up rate command	50	30-70	0.1 %/count	3–7%

If data outside the range is received, the data is not accepted and an error is returned.

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Data address	Item	Initial	Range	Units	Notes
41001	Compressor accumulated time reset command (master)	0	0～1	—	0: NOP 1: reset
41002	Compressor accumulated time reset command (slave 1)	0	0～1	—	0: NOP 1: reset
41003	Compressor accumulated time reset command (slave 2)	0	0～1	—	0: NOP 1: reset
41004	Compressor accumulated time reset command (slave 3)	0	0～1	—	0: NOP 1: reset
41005	Compressor accumulated time reset command (slave 4)	0	0～1	—	0: NOP 1: reset
41006	Compressor accumulated time reset command (slave 5)	0	0～1	—	0: NOP 1: reset
41007	Compressor accumulated time reset command (slave 6)	0	0～1	—	0: NOP 1: reset
41008	Compressor accumulated time reset command (slave 7)	0	0～1	—	0: NOP 1: reset
41009	Compressor accumulated time reset command (slave 8)	0	0～1	—	0: NOP 1: reset
41010	Compressor accumulated time reset command (slave 9)	0	0～1	—	0: NOP 1: reset
41011	Compressor accumulated time reset command (slave 10)	0	0～1	—	0: NOP 1: reset
41012	Compressor accumulated time reset command (slave 11)	0	0～1	—	0: NOP 1: reset
41013	Compressor accumulated time reset command (slave 12)	0	0～1	—	0: NOP 1: reset
41014	Compressor accumulated time reset command (slave 13)	0	0～1	—	0: NOP 1: reset
41015	Compressor accumulated time reset command (slave 14)	0	0～1	—	0: NOP 1: reset
41016	Compressor accumulated time reset command (slave 15)	0	0～1	—	0: NOP 1: reset

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12. Protection control

Protective control is implemented to protect the compressor of the outdoor unit.
If the conditions of the protection control are satisfied, the outdoor unit is temporarily placed in the protection stop state.
When the protection control condition is released, the compressor will run automatically again.

●Compressor inching prevention control

(a) 3-minute timer

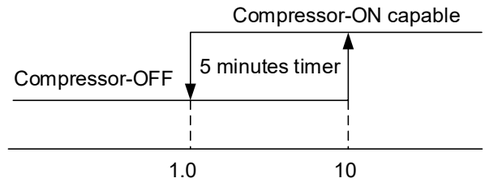
When the compressor has been stopped by the thermostat, remote control operation switch or anomalous condition, its restart will be inhibited for 3 minutes.
However, the 3-minute timer is invalidated at the power on the electric power source for the unit.

(b) 3-minute forced operation timer

Compressor will not stop for 3 minutes after the compressor ON. However, it stops immediately when the unit is stopped by means of the ON/OFF switch or when the thermostat is turned OFF by the change of operation mode.

●Cooling frost protection

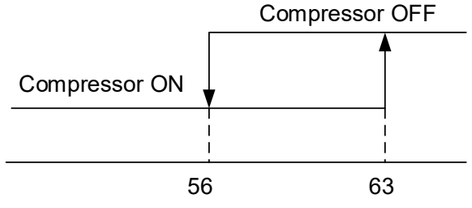
To prevent frosting during cooling mode operation, the compressor-OFF if the AHU heat exchanger temperature (detected with Thi-R) drops to 1.0℃ or lower at 4 minutes after the compressor-ON.
If the AHU heat exchanger temperature is 1.0℃ or lower after 5 minutes, the AHU interface is controlled compressor-OFF.
If it becomes 10℃ or higher, the control teminates.



AHU heat exchanger temperature (℃)

● Heating overload protection

If the AHU heat exchanger temperature (detected with Thi-R) at 63℃ or higher is detected for 2 seconds continuously, the compressor stops. When the compressor is restarted after 3-minute delay, if a temperature at 63℃ or higher is detected for 2 seconds continuously within 60 minutes after initial detection and if this is detected 5 times consecutively, the compressor stops with the anomalous stop (E8).
Anomalous stop occurs also when the AHU heat exchanger temperature at 63℃ or higher is detected for 6 minutes continuously.



AHU heat exchanger temperature (℃)

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● Abnormal temperature sensor (return air/ heat exchanger) broken wire/ short-circuit detection

(a) Broken wire detection

When the return air temperature sensor detects -50℃ or lower or the heat exchanger temperature sensor detect -50℃ or lower for 5seconds continuously, the compressor stops.
After 3-minute delay, the compressor restarts but, if it is detected again within 60 minutes after the initial detection for 6 minutes continuously, stops again (the return air temperature sensor: E7, the heat exhanger temperature sensor: E6)

(b) Short-circuit detection

If the heat exchanger temperature sensor detects short-circuit for 5 seconds continuously within 2 minutes to 2 minutes 20 seconds after the compressor-ON during cooling operation, the compressor stops (E6).

●Fan control during defrost control and oil return control

・During defrost control (defrosting control) and oil return control, it is necessary to stop the fan motor on the AHU side.
・However, if the fan motor cannot be stopped under the conditions of use of the air handling unit, fan operation can be continued during defrosting and oil return only if the following conditions are met.
If the following conditions are not met, stop the AHU fan motor during defrosting and oil return signal output.

< Condition >

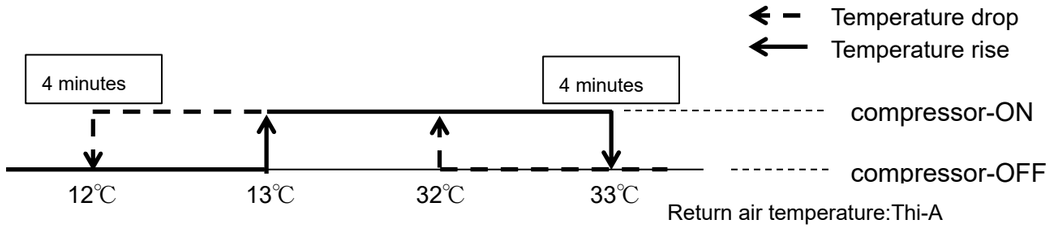
・Only when the difference in height between the outdoor unit and the AHU heat exchanger is 20[m] or less.

●Forced OFF control of compressor by return air temperature

If used beyond the range of use for air conditions, it will stop the compressor for protection.

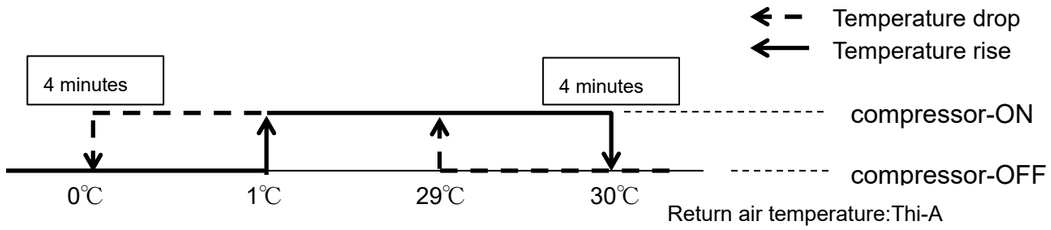
・During cooling mode operation, the compressor-OFF if the AHU interface return-air temperature (detected with Thi-A) is detected for 4 minutes continuously less to 12.0℃, or overs to 33.0℃.

<Cooling>



・During heating mode operation, the compressor-OFF if the AHU interface return-air temperature (detected with Thi-A) is detected for 4 minutes continuously less to 0.0℃, or overs to 30.0℃.

<Heating>



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13. Error display

AHU interface detects the following errors.

To check the error code, remote control or Modbus device is required.

To detect abnormalities in the AHU interface (including the outdoor unit), either the digital output, remote control or Modbus device must be connected.

Be sure to connect either the digital output, remote control or Modbus for safe system use.

Note: in cascade control, Modbus communication is required to check the individual abnormal state of slave.

When an error occurs, LED 2 (red) on the interface blinks as shown in the table below.

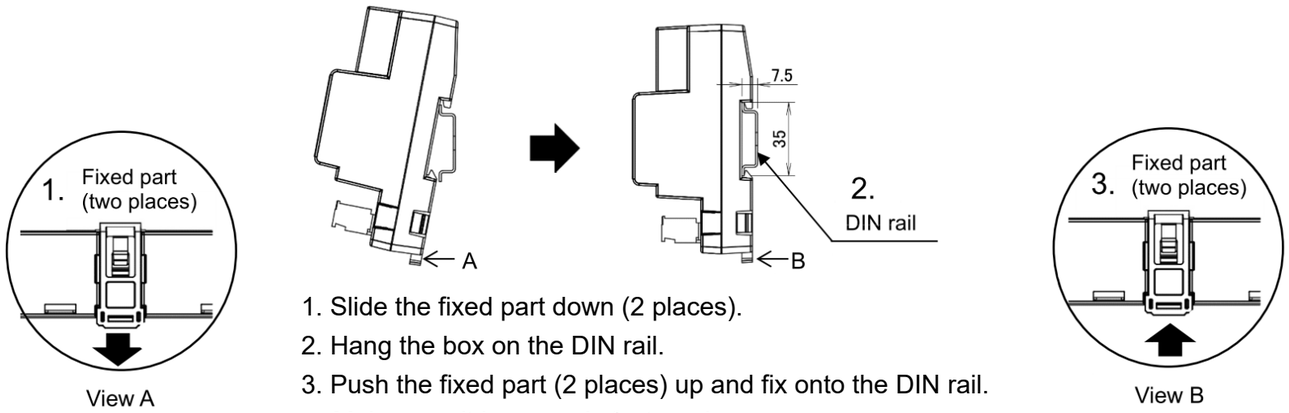
Error code	Error contents	Recovery condition	LED2 display (red) *
E1	AHU interface - remote control communication error	Normal reception of remote control signal	Indeterminate
E2	AHU interface address overlap	Resolution of address overlap	Once
E3	AHU interface - outdoor unit address pairing error	Resolution of address paring	Twice
E5	AHU interface - outdoor unit communication error	Normal reception of outdoor unit signal	Twice
E6	Heat exchanger sensor disconnection	Resolution of disconnection	Once
E7	Return air sensor disconnection	Resolution of disconnection	Once
E8	Heating overload error	Normalisation of heat exchanger temperature	Once
E14	Master – slave communication error	Normal reception of slave signal	Three times
E63	Emergency stop	Emergency stop release	Continuous

* The cycle is 5 seconds (blinking 0.5 seconds).

14. Installation work

●Installation procedure

Install AHU interface in the direction shown in the figure below so that letters can be read correctly.

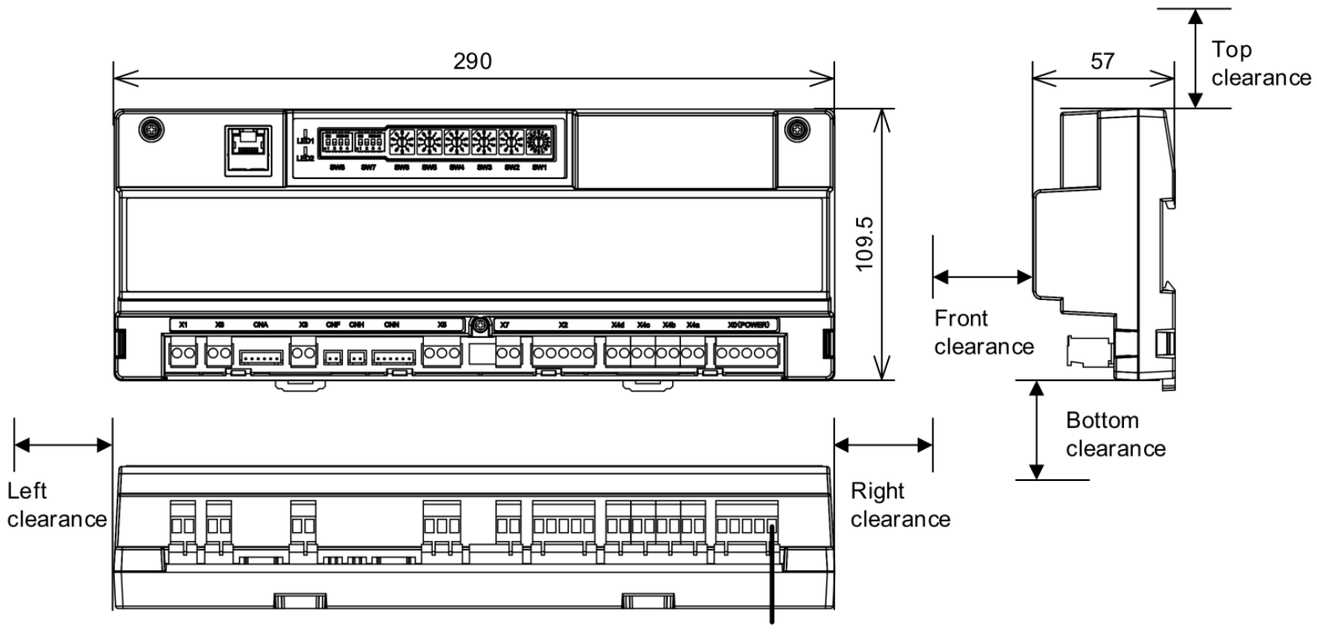


1. Slide the fixed part down (2 places).
2. Hang the box on the DIN rail.
3. Push the fixed part (2 places) up and fix onto the DIN rail.
   Make sure it is securely fastened.

●Installation clearances

For cooling and service work, provide the following clearances above and below and to the right and left.

Bottom clearance	Min. 100 mm（recommended length of 200 mm or more）	・・Space for wiring and service
Top clearance	Min. 50 mm	・・・・・・・・・・・・・・・・・・・・・・・・Space for cooling
Left clearance	Min. 30 mm	・・・・・・・・・・・・・・・・・・・・・・・・Space for cooling
Right clearance	Min. 30 mm	・・・・・・・・・・・・・・・・・・・・・・・・Space for cooling
Front clearance	Min. 50 mm	・・・・・・・・・・・・・・・・・・・・・・・・Space for cooling



Grounding position (1) for power supply (refer to 4.Wirng)
Functional ground terminal: X0 connector pin

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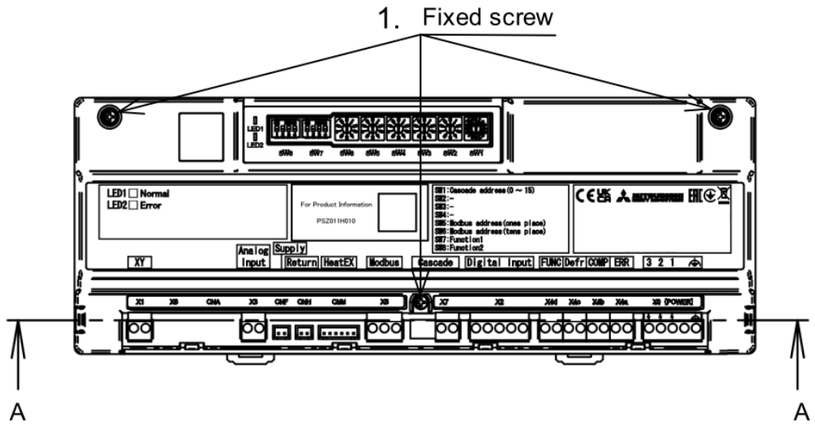
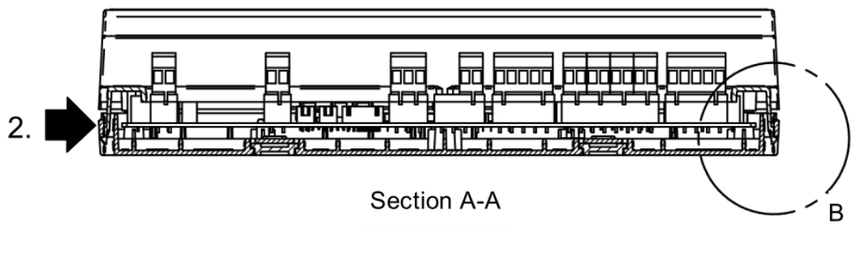
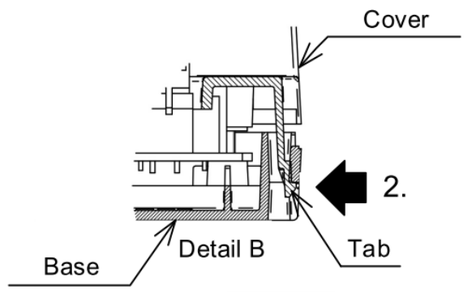
●Remove the cover

1. Remove the fixed screw.
2. Push the tab (2 places) and remove the cover from base.







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15. Wiring procedure

AHU interface incorporates an earth connection for functional purposes only.
Be sure to connect the functional ground wire to the sheet metal of the enclosure when connecting wires to the power supply terminal block.
Be sure to ground the sheet-metal part of the enclosure.
When removing wires from the enclosure, secure or cover the wires with conduit to prevent tension from being applied to the terminals.
Do not turn ON the power supply (power switch) until all the work is completed.
Except for the accessories, obtain other components locally.
If the supply cord is damaged, it must be replaced by the manufacturer, the service agent or similarly qualified persons to avoid any hazards.
Use only copper wires.
Do not use any supply cord lighter than the one specified in parentheses for each type below
- ordinary tough rubber sheathed cord (code designation 60245 IEC 53).

Do not use anything lighter than polychloroprene sheathed flexible cord (code designation 60245 IEC57) for supply cords of appliances parts for outdoor use.

Cascade connection (X7) signal lines

Wire diameter: 0.75mm^2 – 1.25mm^2
The line length between Master and Slave must be less than 2 m.
When using a cable longer than 2 m, use a shielded cable for the cascade signal line.
Wire the grounding of the body to the sheet metal of the enclosure.
Total wiring length of cascade connection can be up to 10 m.

Wiring to each connector (X1-X5)

Wire diameter: 0.3mm^2 or more
It is possible to enter into the superlink system by connecting the remote control communication line of SC-ADNA-E to X1.
Use a shielded cable when operating a cable longer than 2 m.

Power supply wire & functional ground wire (X0)

Wind the ferrite core supplied with the ground wire for **6 turns** (5 loops) and connect it to the sheet metal of the enclosure.
Wire diameter: 0.75mm^2 or more
Line length: 40 cm or more (recommendation)

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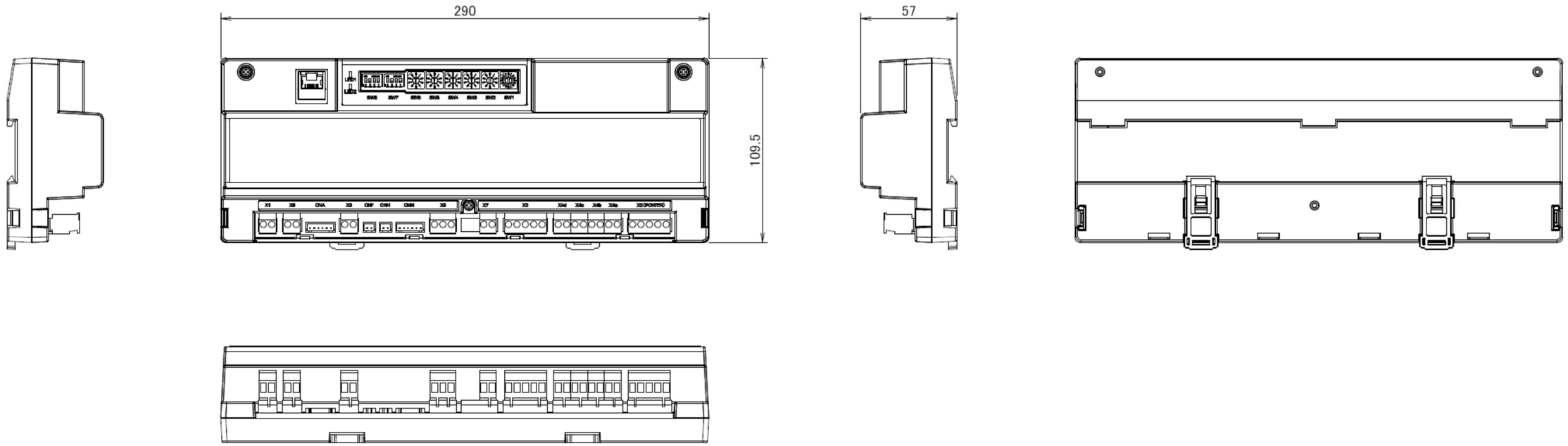
16. External dimensions



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