

Air-handling unit (AHU) design manual

September 2013

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Related documents: Please also refer to the following manuals

•PAC-IF012B-E INSTALLATION MANUAL

•Air to Water (ATW) Heat pump, Interface (I/F) and Flow temp. controller (FTC) Technical manual

1. Interface unit and line up for Outdoor unit

1.1 Interface for AHU

MODEL NAME		PAC-IF012B-E (I/F)
Power supply		~/N(Single Phase), 50Hz, 230V
Dimension(mm) H×W×D		278×336×69
Weight(kg)		2.5
Function	AUTO STEP mode	✓
	MANUAL STEP mode	✓

AUTO STEP MODE:

* Variable capacity request signals for Heat pump are calculated by INTERFACE

MANUAL STEP MODE:

* Variable capacity request signals for Heat pump need to be calculated by LOCAL SYSTEM CONTROLLER

* System controller can send "Capacity steps" by non-voltage contact signals or analog signals to Interface. With interface, there are steps 1 to 7.

* Refer to "Air to Water (ATW) Heat pump, Interface (I/F) and Flow temp. controller (FTC) Technical manual" for details.

1.2 Outdoor unit line up for AHU

OUTDOOR UNIT *1		35	50	60	71	100	125	140	200	250
PUHZ-RP		-	-	-	-	-	-	-	✓	✓
PUHZ-ZRP		✓	✓	✓	✓	✓	✓	✓	-	-
PUHZ-SHW	*2	-	-	-	✓	✓	✓	-	-	-
Pipe Diameter	Gas	φ9.52	φ12.7	φ15.88	φ15.88	φ15.88	φ15.88	φ15.88	φ25.4	φ25.4
	Liquid	φ6.35	φ6.35	φ6.35	φ9.52	φ9.52	φ9.52	φ9.52	φ9.52	φ12.7
Outdoor operation range		refer to the specifications of outdoor unit								

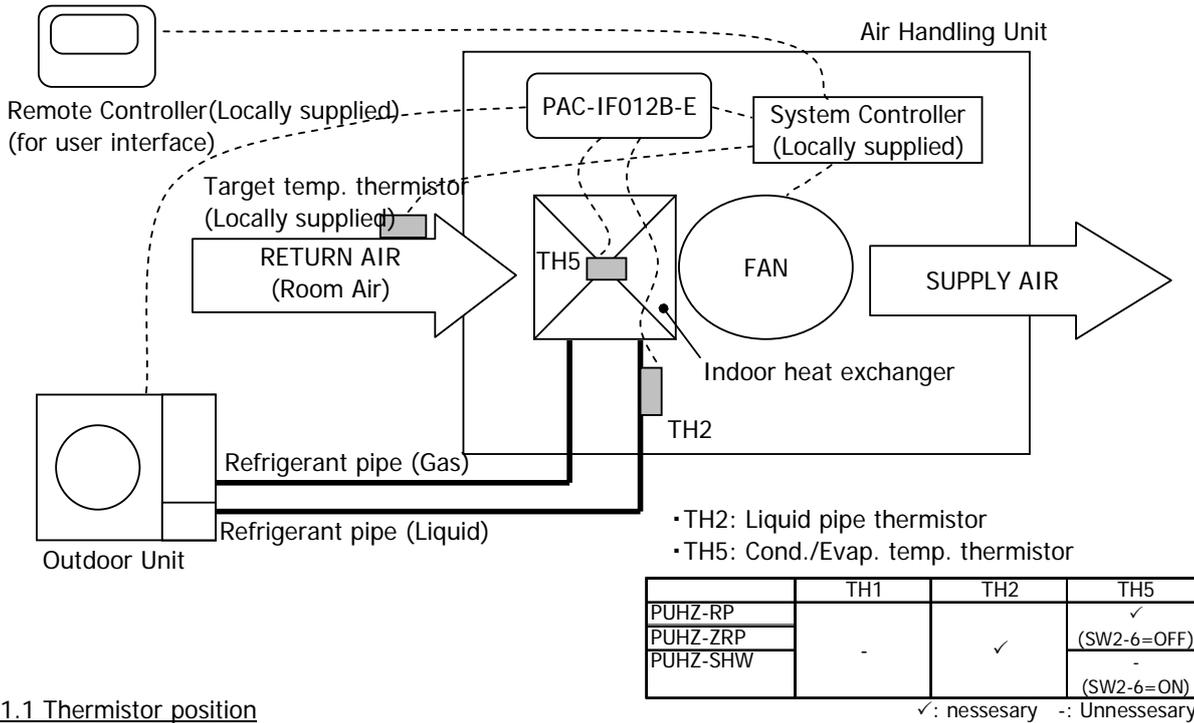
*1 Basically, model name of outdoor unit shows rated cooling capacity, however, for SHW series, they are named by Air to Water rated heating capacity. Please see below conversion nominal heating list.

SHW80: 71 SHW112: 100 SHW140: 125

*2 SHW230 : **CAN NOT** be used as heat source for AHU.

2. System configuration

2.1 Return air temp. control: MANUAL STEP MODE



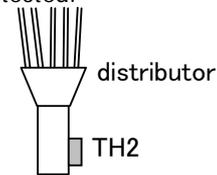
2.1.1 Thermistor position

<Target temp. thermistor (Locally supplied) >

Secure thermistor where average return air temperature for heat exchanger can be detected.
Secure thermistor where radiant heat from heat exchanger can be avoided.

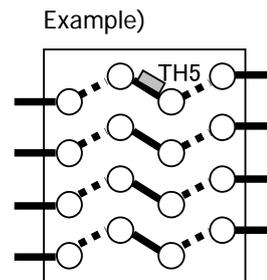
<Liquid pipe thermistor (TH2) >

Secure thermistor where liquid refrigerant pipe temperature can be detected.
Protect the thermistor with heat insulating materials to eliminate affect by ambient temperature, etc.
Place the thermistor before distributor head as per example.



< Cond./Evap. temp. thermistor (TH5) > (RP/ZRP models only)

Secure thermistor where Cond./Evap. temperature can be detected on the indoor HEX pipe.
It should be located in the middle of inlet and outlet ports.
If there are several paths, please locate it on the top one.



2.1.2 Indoor unit operation range

	Return air operation range
COOLING	19~32°C
HEATING	17~28°C

2.1.3 Requirement on AHU design

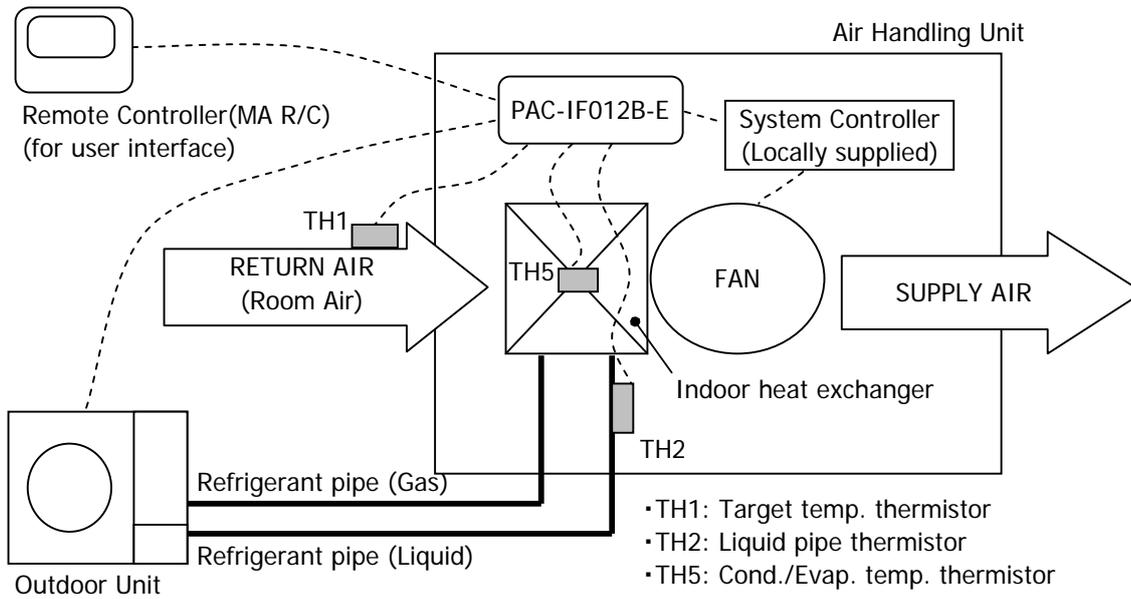
Refer to page 6. [3.Requirement on AHU design]

2.1.4 Caution

- * Please don't select step 0 for 3min. after compressor ON. (= Keep compressor ON for 3 min. at least.)
- * Please keep operating range shown at 2.1.2.
- * Auto change-over function between cooling and heating mode is not available with PAC-IF012B-E.
- * Please don't send STEP 0 during defrost operation

2. System configuration

2.2 Return air temp. control: AUTO STEP MODE



	TH1	TH2	TH5
PUHZ-RP			✓
PUHZ-ZRP	✓	✓	(SW2-6=OFF)
PUHZ-SHW			-
			(SW2-6=ON)

✓: necessary - : Unnesesary

2.2.1 Thermistor position

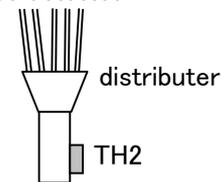
<Target temp. thermistor (TH1) >

Secure thermistor where average return air temperature for heat exchanger can be detected.
Secure thermistor where radiant heat from heat exchanger can be avoided.

<Liquid pipe thermistor (TH2) >

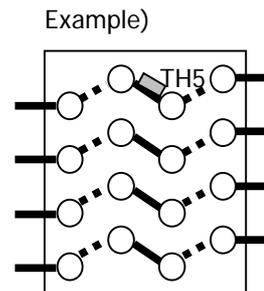
Secure thermistor where liquid refrigerant pipe temperature can be detected.
Protect the thermistor with heat insulating materials to eliminate affect by ambient temperature, etc.

Place the thermistor before distributor head as per example.



< Cond./Evap. temp. thermistor (TH5) > (RP/ZRP models only)

Secure thermistor where Cond./Evap. temperature can be detected on the indoor HEX pipe.
It should be located in the middle of inlet and outlet ports.
If there are several paths, please locate it on the top one.



2.2.2 Indoor unit operation range

	Return air operation range
COOLING	19~32°C
HEATING	17~28°C

2.2.3 Requirement on AHU design

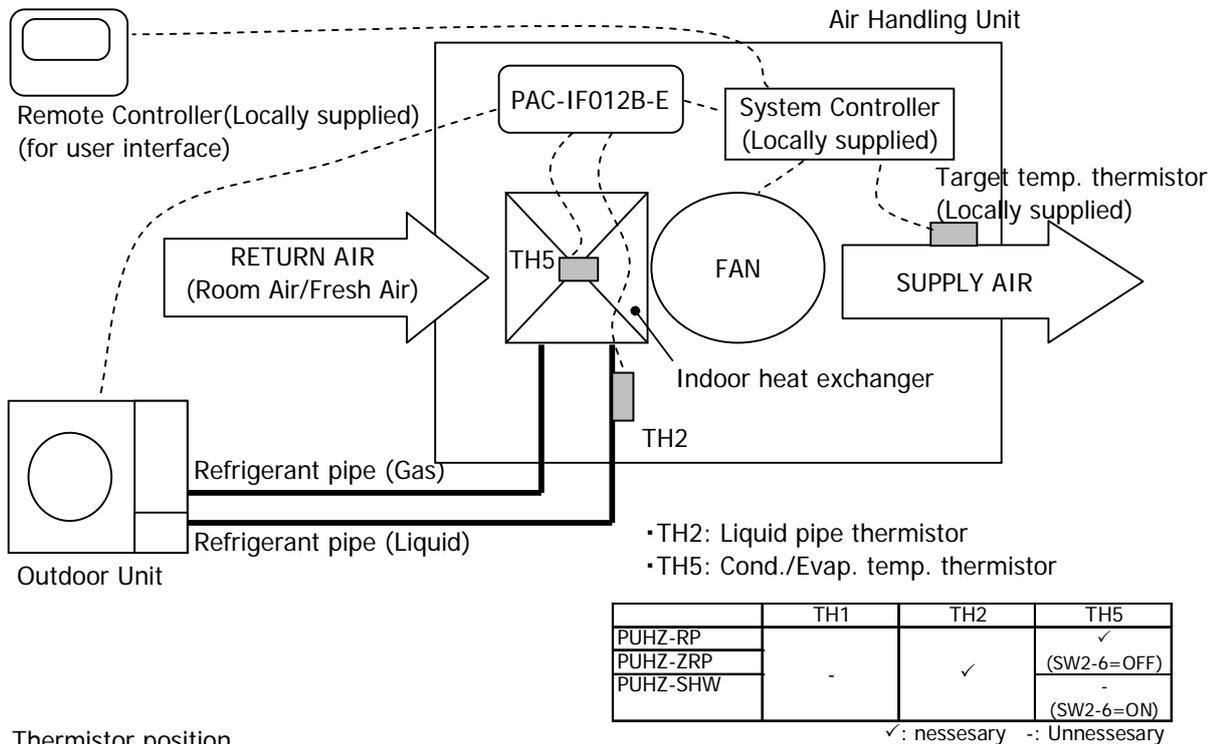
Refer to page 6. [3.Requirement on AHU design]

2.2.4 Caution

* Please keep operating range shown at 2.2.2.

2. System configuration

2.3 Supply air temp. control: MANUAL STEP MODE



2.3.1 Thermistor position

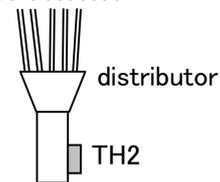
< Target temp. thermistor (Locally supplied) >

Secure thermistor where average supply air temperature for heat exchanger can be detected.
Secure thermistor where radiant heat from heat exchanger can be avoided.

< Liquid pipe thermistor (TH2) >

Secure thermistor where liquid refrigerant pipe temperature can be detected.
Protect the thermistor with heat insulating materials to eliminate affect by ambient temperature, etc.

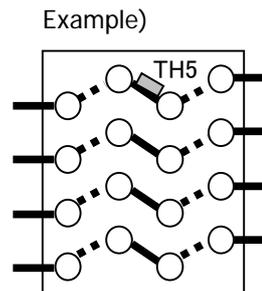
Place the thermistor before distributor head as per example.



< Cond./Evap. temp. thermistor (TH5) > (RP/ZRP models only)

Secure thermistor where Cond./Evap. temperature can be detected on the indoor HEX pipe.

It should be located in the middle of inlet and outlet ports.
If there are several paths, please locate it on the top one.



2.3.2 Indoor operation range

	Return air operation range	Supply air operation range
COOLING	19~32°C	10~25°C
HEATING	0~28°C	20~60°C

2.3.3 Requirement on AHU design

Refer to page 6. [3.Requirement on AHU design]

2.3.4 Caution

- * Please don't select step 0 for 3min. after compressor ON. (= Keep compressor ON for 3 min. at least.)
- * Please keep operating range shown at 2.3.2.
- * When the fresh air inlet is below 0°C, heat the air to at least 0°C before delivering it to the heat exchanger.
- * Please don't send STEP 0 during defrost operation.

3. Requirement on AHU design

3.1 Indoor unit heat exchanger volume

Please make sure to keep the HEX capacity within the following range.
If the piping length is 30m or shorter, HEX capacity can be increased as follows.

OUTDOOR UNIT		35	50	60	71	100	125	140	200	250
Maximum Volume(cm ³)										
Pipe Length	30m~	1050	1500	1800	2130	3000	3750	4200	6000	7500
	20m	1350	1800	2700	3030	3900	4650	5100	7800	9300
	10m	1650	2100	3600	3930	4800	5550	6000	9600	11100
Minimum Volume(cm ³)		350	500	600	710	1000	1250	1400	2000	2500

*For other pipe lengths not shown on this table, please calculate them by linear interpolation.

3.2 MAX Air flow volume

Please make sure to keep the air flow volume less than maximum air flow volume, shown in the table below.

OUTDOOR UNIT	35	50	60	71	100	125	140	200	250
Max Air flow [m ³ /min]	15	20	23	27	37	46	51	72	89

3.3 Selection of Indoor heat exchanger

Please make sure to size HEX properly so that the **nominal capacity can be kept within 90%-110%** under Standard conditions.

<Standard conditions>

[1]COOLING

Evaporation temp. (refrig.)	10°C
Superheat at evaporator outlet (refrig.)	5°C
Expansion valve inlet temp. (refrig.)	40°C
Air inlet temp.	27°C/19°C
Ambient temp. (outdoor)	35°C/27°C

[2]HEATING

Condensing temp. (refrig.)	45°C
Superheat at condenser inlet (refrig.)	20°C
Subcool at condenser outlet (refrig.)	5°C
Air inlet temp.	20°C/15°C
Ambient temp. (outdoor)	7°C/6°C

<Nominal capacity>

OUTDOOR UNIT	35	50	60	71	100	125	140	200	250
COOLING(kW)	3.5	5.0	6.0	7.1	10.0	12.5	14.0	20.0	25.0
HEATING(kW)	4.1	6.0	7.0	8.0	11.2	14.0	16.0	22.4	27.0

3.4 Caution

* Diameter of HEADER is very important

The refrigerant flow velocity decrease will reduce oil migration through the system, and in turn will effect the lubrication of mechanical components.

(The compressor being the number one component that could seize.)

Please use the pipe outside diameter or less as shown in the table below.

OUTDOOR UNIT	35	50	60	71	100	125	140	200	250
MAX Diameter of HEADER	φ19				φ28				

* Withstanding pressure

Design pressure of outdoor unit is 4.15MPa. The following must be satisfied about burst pressure of connecting appliance.

Burst pressure: More than 12.45MPa(3 times more than design pressure)

* Contamination maintenance matters

Clean inside of heat exchanger to keep it clean. Be sure to rinse and not to leave any flux or residual materials.

NB : Do not use chlorine detergent when cleaning.

4. System Design Responsibility

* Mitsubishi Electric do not accept any responsibility on the local system design. Therefore, Mitsubishi Electric do not accept any responsibility on the failure (incl. outdoor unit) caused by inappropriate AHU design and local system design.

5. Laws and Regulations

*Please make sure to comply with localised laws and regulations in terms of the AHU system designed locally.

*The declaration of Conformity for our outdoor units and interface is available from the relevant factories.

mitsubishi **MITSUBISHI ELECTRIC CORPORATION**

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