

**SUPERIOR SERIES**  
**INSTALLATION OPERATION AND SERVICE MANUAL**  
**(AMERICAS VERSION)**  
**PCG(H)-V/P~AECM SERIES**

V ~ 2 pipe

P ~ 4 pipe



**INVESTING IN QUALITY, RELIABILITY & PERFORMANCE.**

**ISO 9001 QUALITY**



Every product is manufactured to meet the stringent requirements of the internationally recognized ISO 9001 standard for quality assurance in design, development and production.

**World Leading Design and Technology**

Equipped with the latest CAD/CAM computer aided design and manufacturing technology, our factories in China and Thailand produce over 2,000,000 air conditioning units each year, all conforming to the highest international standards of quality and safety.

**CE SAFETY STANDARDS**



All products conform to the Certificate Europe directives (Machinery Safety, Electromagnetic Compatibility and Low Voltage), as required throughout the European Community, to guarantee correct standards of safety.

**The Highest Standards of Manufacturing**

In order to guarantee the very highest standards and performance, we manage every stage in the manufacturing of our products. Throughout the production process we maintain strict control, starting with our extensive resources in research and development through to the design and manufacture of almost every individual component, from molded plastics to the assembly of units and controllers.

**WEEE MARK**



All products conform to the "WEEE" directive to guarantee correct standards of environmental solutions.

**Quality Controlled from Start to Finish**

Our highly trained staff and strict quality control methods enable us to produce products with an exceptional reputation for reliability and efficiency, maintained over many years. As well as full CE certification and ISO 9001, several products have UL/ ETL / CSA (NRTL) safety approval plus ARI Certification in the USA and Canada, in addition to ROHS compliance for Europe, giving you the confidence of knowing our company is the right choice when selecting air conditioning equipment.

ALWAYS MAKE SURE THIS MANUAL REMAINS WITH THE WATER CASSETTE. READ THIS MANUAL BEFORE PERFORMING ANY OPERATION ON THE WATER CASSETTE.

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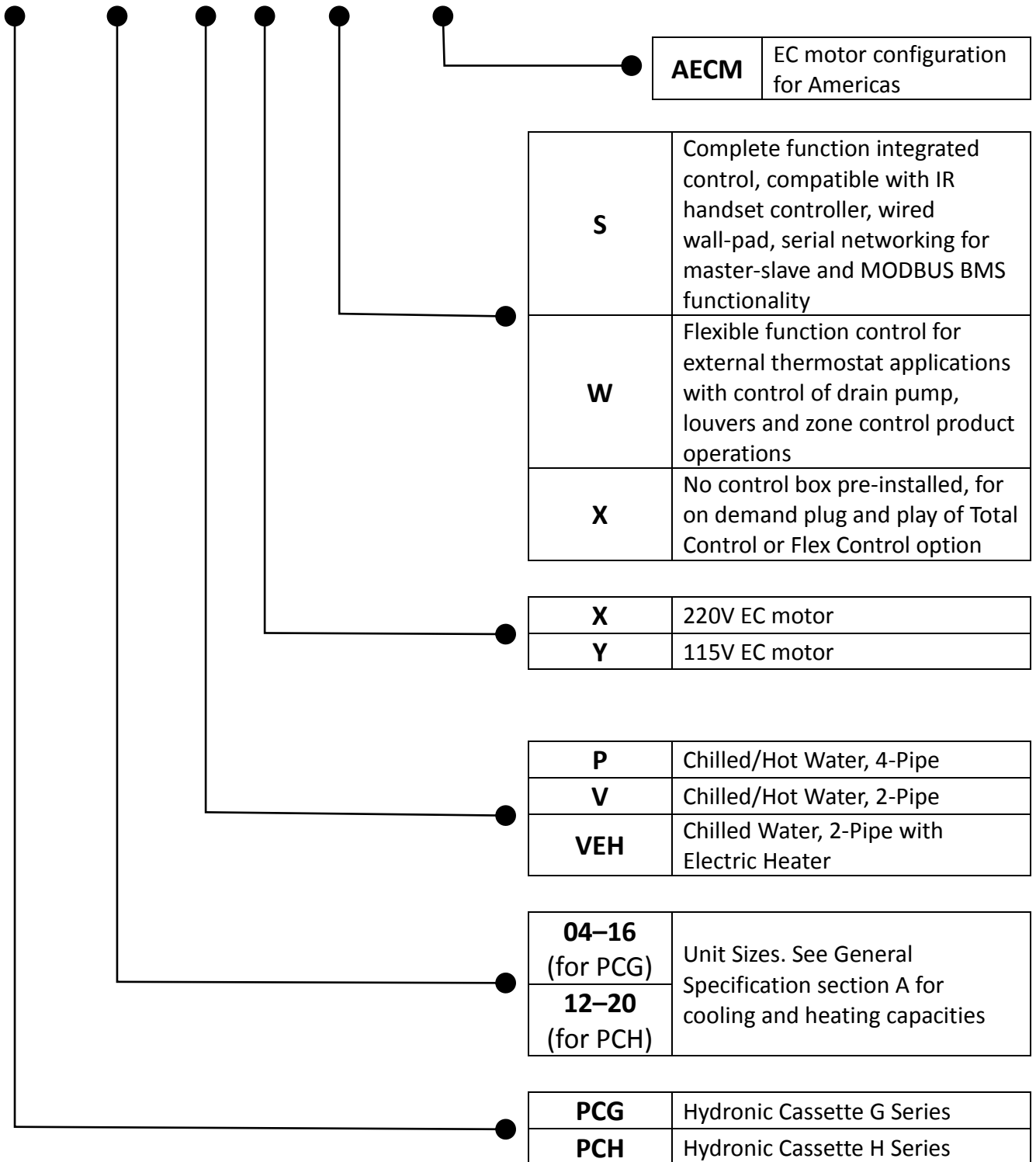
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## Model Code Nomenclature

PCG - 04 - V X - S - AECM



# A. Technical Data

## A.1. General Specification

### A.1.1. 2-Pipe Systems

**Product range:** PCG(H) -AECM Flexi Hydronic Cassette with EC Motor



PCG(H)-V~-AECM Hydronic Cassette 2-pipe with EC Motor (Americas Version)

		PCG(H)-[Size]-V~-AECM		PCG-04R	PCG-08	PCG-08R	PCG-09	
Unit Configuration	Configuration		2-pipe					
	Number Of Fan Blowers		Single			Twin		
	Power Supply	(V/Ph/Hz)	115/1/60 220/1/60					
	Operation Control - PCG(H)		~S: Complete function onboard PCB with integrated group control functionality, incl. 1 pc return air sensor and 2 pcs temperature sensors. ~W: Limited function onboard PCB with drain-pump, louver and zone control functionality, incl. 1 pc coil temperature sensor. ~X: No control box pre-installed.					
Performance Data	Air	Total Air Flow	H	CFM	338	476	476	600
			M		235	306	306	318
			L		118	118	118	212
	Cooling	Cooling Capacity	H	BTU/Hr	11348	16019	16857	20850
			M		8129	11200	11742	12341
			L		4721	5051	10372	8799
		Sensible Cooling Capacity	H		7702	10802	11208	13999
			M		5466	7486	7751	8184
			L		3129	3315	6830	5791
	Heating	Heating Capacity	H	BTU/Hr	17105	23840	24436	30813
			M		12089	16453	16831	17898
			L		6867	7204	14809	12605
		Max. Electric Heater Capacity @ 115V			1700		3400	
	Max. Electric Heater Capacity @ 202V		3400		6800		10200	
	Sound	Sound Pressure Level ( Outlet )		dB(A)	38/35/27		46/35/24	
		Sound Power Level ( Outlet )			52/45/38		60/45/35	
	Electrical	Fan Motor Power	H	W	30		40	
			M		9		18	
			L		8		8	
		Fan Motor Apparent Power @ H		60		80		80
Fan Motor Running Current @ 115V		H	A	0.26		0.35		
Fan Motor Running Current @ 220V		H		0.14		0.18		
Hydraulic	Cooling Water Flow Rate	H	GPM	2.262		3.188		
		M		1.616		2.233		
		L		0.941		1.005		
	Cooling Pressure Drop	H	Ft.wg	3.498		7.943		
		M		1.979		4.288		
		L		0.487		0.654		
	Heating Water Flow Rate @H/M/L		GPM		Same as "Cooling Water Flow Rate"			
	Heating Pressure Drop	H	Ft.wg	2.753		6.319		
M		1.537		3.362				
L		0.51		0.846				
Water Content		Gal		0.33		0.41		
Construction and Packing Data	Water Connections	Type		Socket (Threaded Female)				
		In	in.	3/4"				
	Out	in.		22.6		44.9		
	Condensate Drainage Connection		22.6		22.8			
	Dimensions		10.0		11.4		10.0	
	Panel Dimensions		26.8 x 26.8 x 1.1		26.8 x 48.8 x 1.1			
Net Weight		lbs		61.7		72.8		

**a. Cooling mode (2-pipe):**

- Return air temperature: 80F DB/ 67F WB..
- Inlet/ Outlet water temperature: 45F/55F.

**b. Heating mode (2-pipe):**

- Return air temperature: 70F
- Inlet water temperature: 140F.
- Water flow-rate: same as 2-pipe cooling.

**Product range: PCG(H) -AECM Flexi Hydronic Cassette with EC Motor**



PCG(H)-V~-AECM Hydronic Cassette 2-pipe with EC Motor (Americas Version)

		PCG(H)-[Size]-V~-AECM		PCG-16	PCH-12	PCH-20	
<b>Unit Configuration</b>	Configuration		2-pipe				
	Number Of Fan Blowers		Twin		Single		
	Power Supply	(V/Ph/Hz)	115/1/60 220/1/60				
	Operation Control - PCG(H)		~S: Complete function onboard PCB with integrated group control functionality, incl. 1 pc return air sensor and 2 pcs temperature sensors. ~W: Limited function onboard PCB with drain-pump, louver and zone control functionality, incl. 1 pc coil temperature sensor. ~X: No control box pre-installed.				
<b>Performance Data</b>	Air	Total Air Flow	H	CFM	853	765	1240
			M		536	483	812
			L		212	212	483
	Cooling	Cooling Capacity	H	BTU/Hr	28882	23678	38241
			M		19798	16376	29869
			L		17385	8352	17164
		Sensible Cooling Capacity	H		19440	16165	36426
			M		13207	11081	20488
			L		11562	5553	11586
	Heating	Heating Capacity	H	BTU/Hr	42839	35968	59135
			M		28973	24554	45725
			L		25323	12196	25687
		Max. Electric Heater Capacity @ 115V			5100		6800
	Max. Electric Heater Capacity @ 220V		10200		13600		
	Sound	Sound Pressure Level ( Outlet )		dB(A)	48/37/26	50/40/28	54/45/30
		Sound Power Level ( Outlet )			63/47/37	67/53/39	66/58/42
	Electrical	Fan Motor Power	H	W	80	88	200
			M		52	32	61
			L		16	20	22
		Fan Motor Apparent Power @ H		240		144	362
Fan Motor Running Current @ 115V		H		0.70	0.77	1.74	
Fan Motor Running Current @ 220V		H		0.36	0.40	0.91	
Hydraulic	Cooling Water Flow Rate	H	GPM	5.751	4.71	7.611	
		M		3.942	3.26	5.945	
		L		3.461	1.666	3.418	
	Cooling Pressure Drop	H	Ft.wg	8.846	7.785	7.785	
		M		4.604	4.13	5.077	
		L		3.678	1.307	1.959	
	Heating Water Flow Rate @H/M/L		GPM		Same as "Cooling Water Flow Rate"		
	Heating Pressure Drop	H	Ft.wg	7.041	6.206	6.228	
		M		3.633	3.25	4.017	
L		2.888		1.006	1.525		
Water Content		Gal		0.73	0.47	0.63	
<b>Construction and Packing Data</b>	Water Connections	Type		Socket (Threaded Female)			
		In	in.	3/4"			
	Out						
	Condensate Drainage Connection						
	Dimensions	L	in.	44.9	28.7	32.7	
		W		22.8	28.7	32.7	
		H		10.0	10.2	11.4	
Panel Dimensions				26.8 x 48.8 x 1.1	32.7 x 32.7 x 1.1	38.6 x 38.6 x 1.1	
Net Weight		lbs		115	79.4	110	

**a. Cooling mode (2-pipe):**

- Return air temperature: 80F DB/ 67F WB
- Inlet/ Outlet water temperature: 45F/55F.

**b. Heating mode (2-pipe):**

- Return air temperature: 70F.
- Inlet water temperature: 140F.
- Water flow-rate: same as 2-pipe cooling.

A.1.2. 4-Pipe Systems



**Product range:** PCG(H) -AECM Flexi Hydronic Cassette with EC Motor



PCG(H)-P~-AECM Hydronic Cassette 4-pipe with EC Motor (Americas Version)

		PCG(H)-[Size]-P~-AECM		PCG-08	PCG-09	PCG-16	PCH-12	PCH-20	
<b>Unit Configuration</b>	Configuration		4-pipe						
	Number Of Fan Blowers		Single	Twin			Single		
	Power Supply	(V/Ph/Hz)	115/1/60 220/1/60						
	Operation Control - PCG(H)		~S: Complete function onboard PCB with integrated group control functionality, incl. 1 pc return air sensor and 2 pcs temperature sensors. ~W: Limited function onboard PCB with drain-pump, louver and zone control functionality, incl. 1 pc coil temperature sensor. ~X: No control box pre-installed.						
<b>Performance Data</b>	Air	Total Air Flow	H	CFM	477	600	853	765	1240
			M		306	318	536	483	812
			L		118	212	212	212	483
	Cooling	Cooling Capacity	H	BTU/Hr	13020	14451	21393	19707	26817
			M		9720	8885	15011	13822	23060
			L		8225	6498	12614	12201	18104
		Sensible Cooling Capacity	H		8997	9943	14793	13621	18777
			M		6662	6047	10286	9465	16072
			L		5612	4392	8666	8329	12527
	Heating	Heating Capacity	H	BTU/Hr	15289	26600	30446	17993	34859
			M		12895	16404	21665	17224	32083
			L		11764	12030	19281	12393	27395
		Max. Electric Heater Capacity @ 115V	3400		5100		6800		
	Max. Electric Heater Capacity @ 220V	6800		10200		13600			
	Sound	Sound PressureLevel ( Outlet )	dB(A)	46/37/24	48/34/26	48/37/26	50/40/28	54/45/30	
		Sound Power Level ( Outlet )		60/49/35	50/41/37	63/47/37	65/53/39	66/58/42	
	Electrical	Fan Motor Power	H	W	40	60	80	88	200
			M		18	24	40	32	61
			L		8	16	16	20	22
		Fan Motor Apparent Power @ H	80		120		240		362
		Fan Motor Running Current @ 115V	H	A	0.35	0.52	0.70	0.77	1.74
	Fan Motor Running Current @ 220V	H	0.18		0.27	0.36	0.40	0.91	
	Hydraulic	Cooling Water Flow Rate	H	GPM	2.592	2.879	4.258	3.927	5.342
			M		1.939	1.766	2.987	2.75	4.595
			L		1.637	1.292	2.513	2.427	3.604
		Cooling Pressure Drop	H	Ft.wg	4.152	5.551	3.949	9.297	5.168
			M		2.505	2.415	2.144	5.032	3.994
			L		1.891	1.417	1.487	4.062	2.64
Heating Water Flow Rate		H	GPM	0.761	1.321	1.587	0.898	1.738	
		M		0.642	0.819	1.077	0.854	1.601	
		L		0.586	0.599	0.962	0.617	1.364	
Heating Pressure Drop		H	Ft.wg	0.361	0.616	0.781	0.465	0.878	
		M		0.269	0.266	0.431	0.431	0.758	
		L		0.23	0.157	0.352	0.244	0.575	
Water Content	Chilled Water	Gal	0.28	0.36	0.51	0.36	0.44		
	Hot Water		0.13	0.23	0.23	0.11	0.2		
<b>Construction and Packing Data</b>	Water Connections	Type	Socket (Threaded Female)						
		In Out	in.	3/4"					
	Condensate Drainage Connection			in.					
	Dimensions	L	22.6		44.9		28.7	32.7	
		W	22.6		22.8		28.7	32.7	
	Panel Dimensions		H	11.4	10.0	11.4	10.2	11.4	
Net Weight		lbs	26.8 x 26.8 x 1.1	26.8 x 48.8 x 1.1		32.7 x 32.7 x 1.1	38.6 x 28.6 x 1.1		
			66.1	110	115	79.4	110		

**a. Cooling mode (4-pipe):**

- Return air temperature: 80F DB/ 67F WB.
- Inlet/ Outlet water temperature: 45F/55F.

**b. Heating mode (4-pipe):**

- Return air temperature: 70F.
- Inlet/ outlet water temperature: 180F/140F.

## A.2. Coil Data

### A.2.1. 2-Pipe Systems

Model	Fin Height (inch)	Fin Length (inch)		Fins / inch	No. of rows	No. of circuits	Tube Diameter (inch)
		Inner	Outer				
PCG-04R-V	7.9	47.1	51.1	13	2	3	3/8"
PCG-08-V	9.8	47.1	51.1	13	2	3	3/8"
PCG-08R-V	9.8	47.1	51.1	13	3	5	0.276"
PCG-09-V	7.9	84.6	90.0	13	2	4	3/8"
PCG-16-V	9.8	84.6	90.0	13	2	5	3/8"
PCH-12-V	8.7	60.2	64.3	13	2	4	3/8"
PCH-20-V	9.8	73.8	77.9	13	2	6	3/8"

### A.2.2. 4-Pipe Systems

#### Cooling Coil

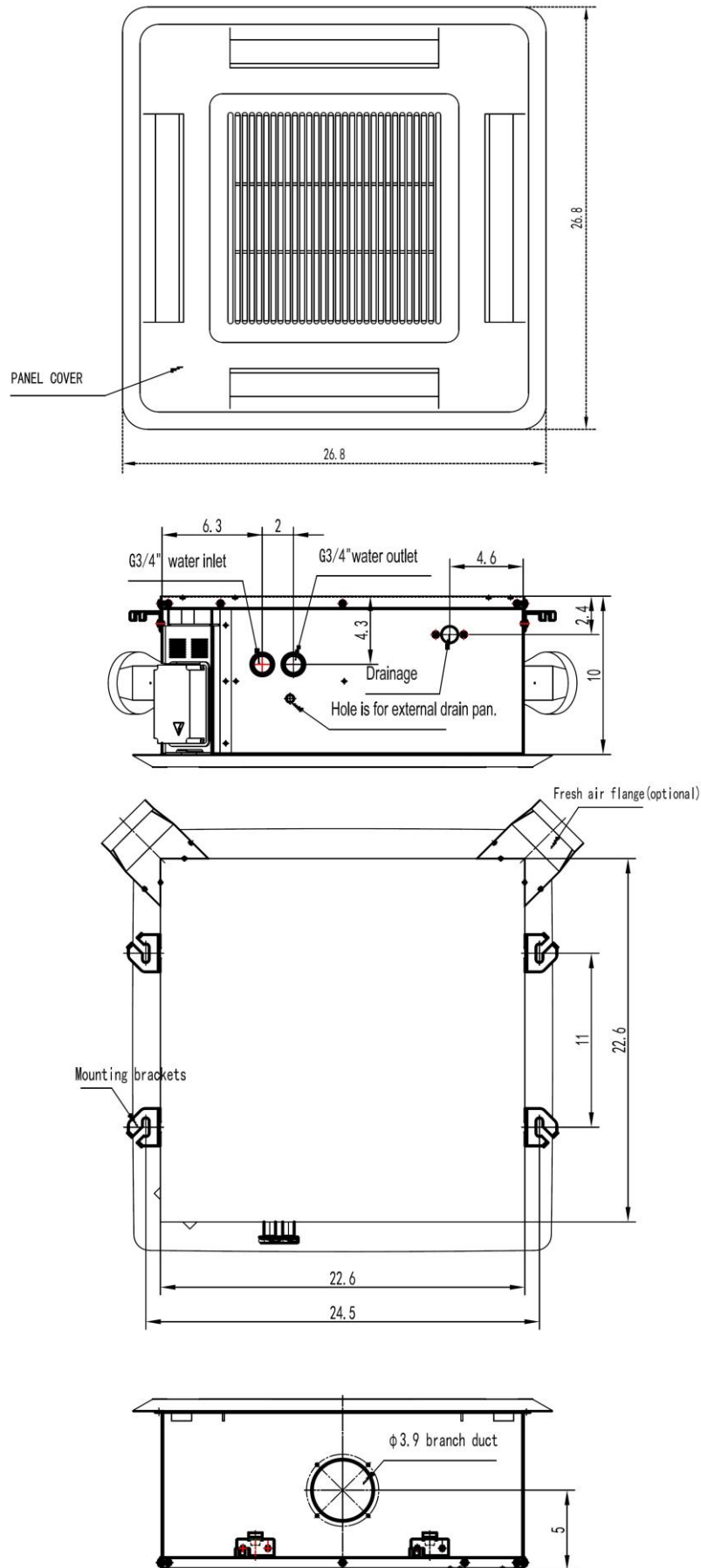
Model	Fin Height (inch)	Fin Length (inch)		Fins / inch	No. of rows	No. of circuits	Tube Diameter (inch)
		Inner	Outer				
PCG-08-P	9.8	47.1	51.1	13	2	3	3/8"
PCG-09-P	7.9	84.6	90.0	13	2	3	3/8"
PCG-16-P	9.8	84.6	90.0	13	2	5	3/8"
PCH-12-P	8.9	60.2	64.3	13	2	3	3/8"
PCH-20-P	9.8	73.8	77.9	13	2	5	3/8"

#### Heating Coil

Model	Fin Height (inch)	Fin Length (inch)		Fins / inch	No. of rows	No. of circuits	Tube Diameter (inch)
		Inner	Outer				
PCG-08-P	9.8	47.1	51.1	13	1	3	3/8"
PCG-09-P	7.9	84.6	90.0	13	1	3	3/8"
PCG-16-P	9.8	84.6	90.0	13	1	3	3/8"
PCH-12-P	8.7	60.2	64.3	13	1	2	3/8"
PCH-20-P	9.8	73.8	77.9	13	1	3	3/8"

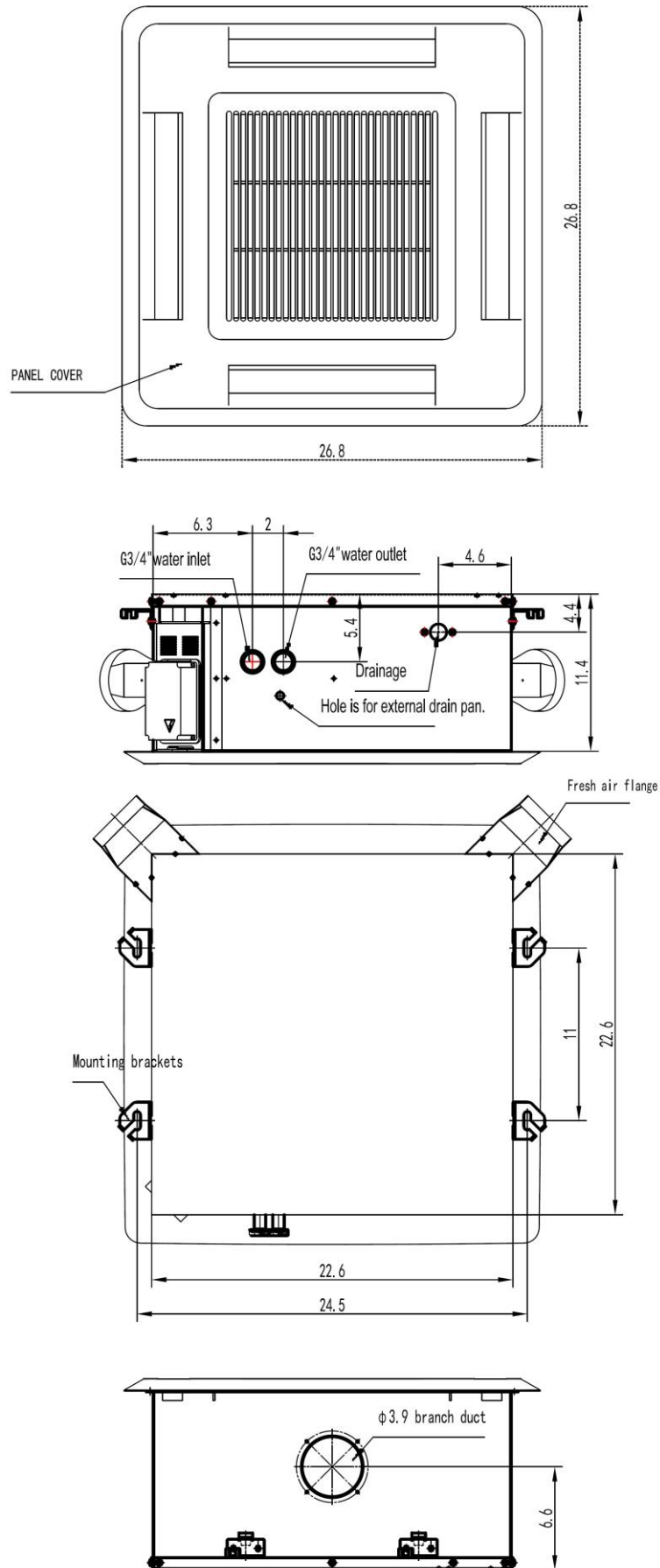
### A.3. Dimensional Drawings

#### Dimensional Drawings: PCG-04R-V



(All dimensions in inch.)

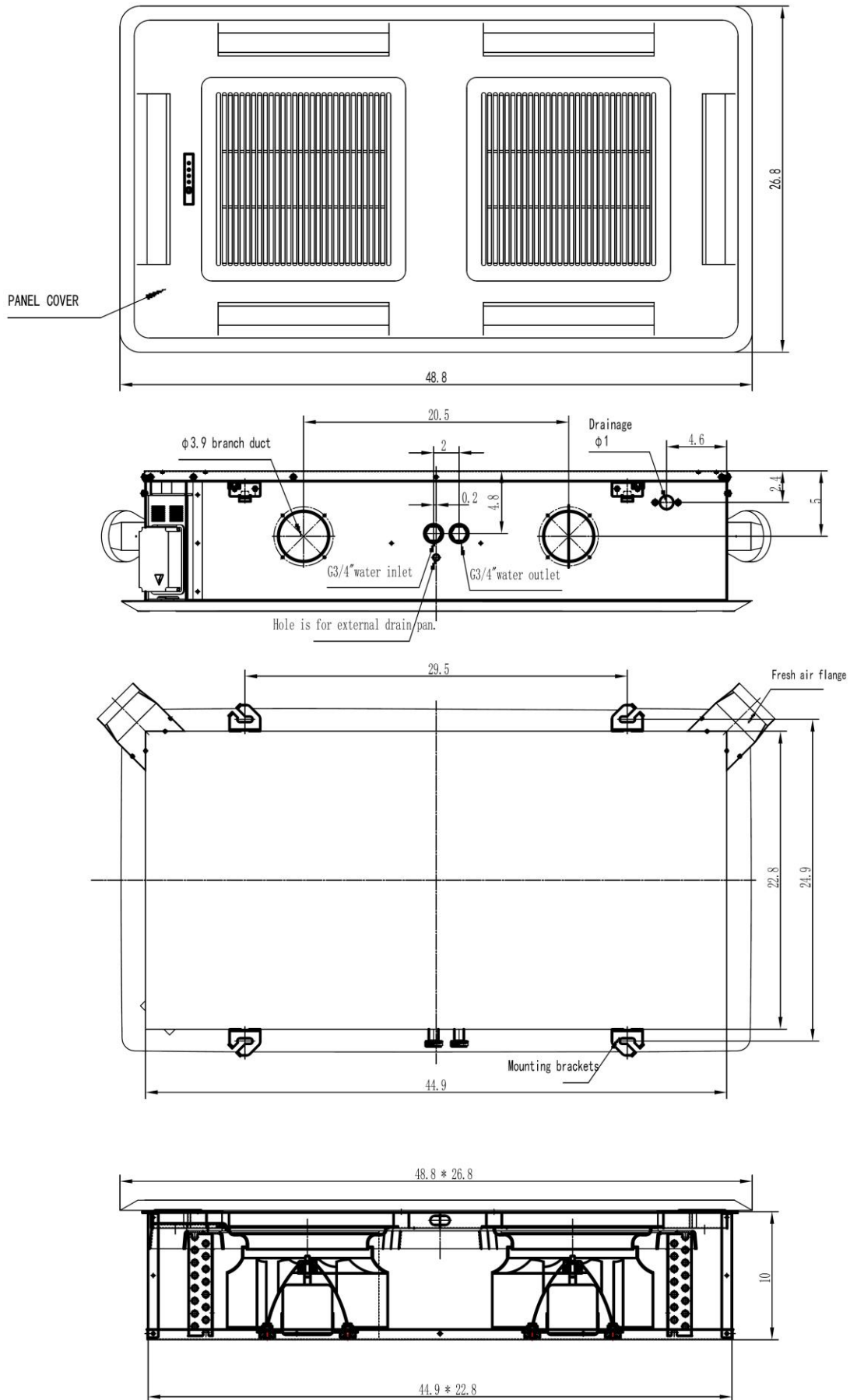
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(All dimensions in inch.)

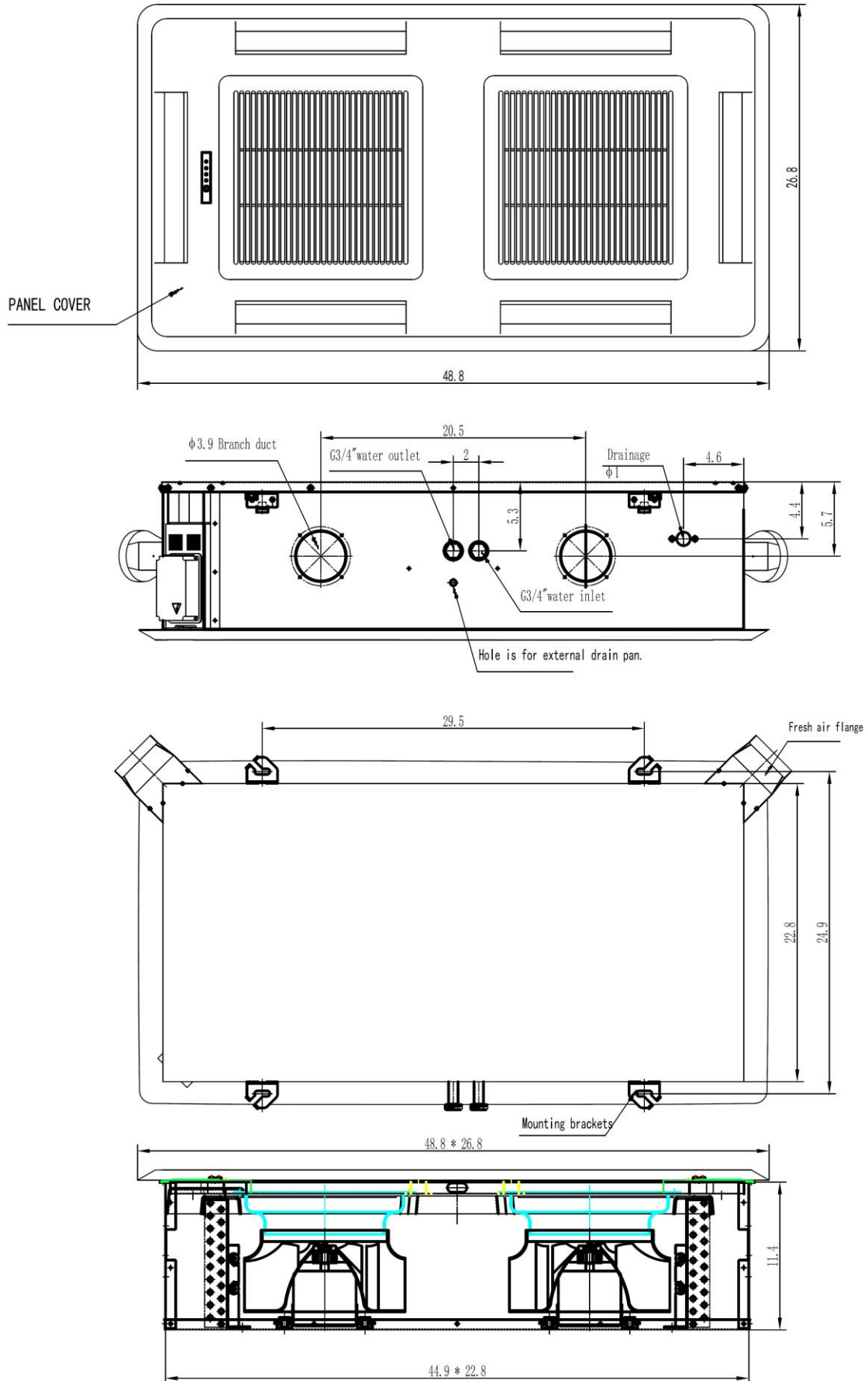


**Dimensional Drawings: PCG-09-V**



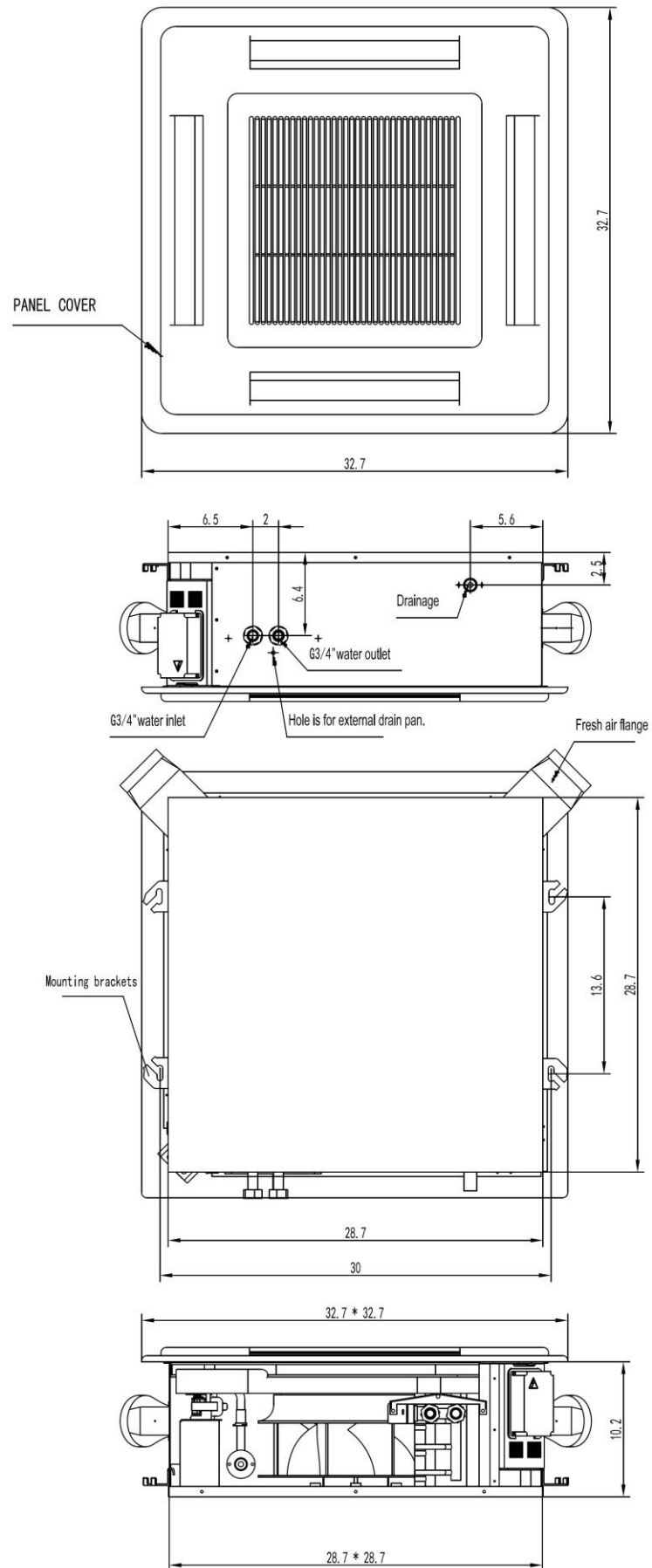
(All dimensions in inch.)

# Dimensional Drawings: PCG-16-V



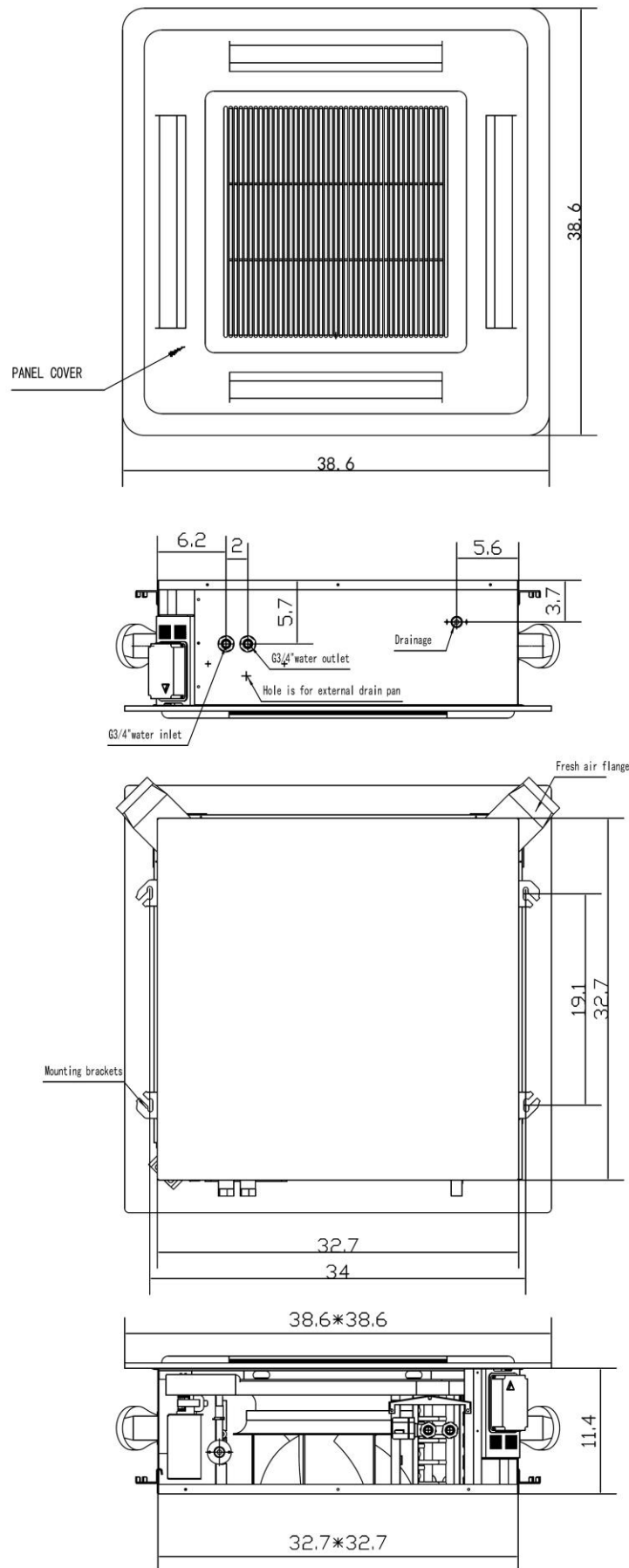
(All dimensions in inch.)

# Dimensional Drawings: PCH-12-V



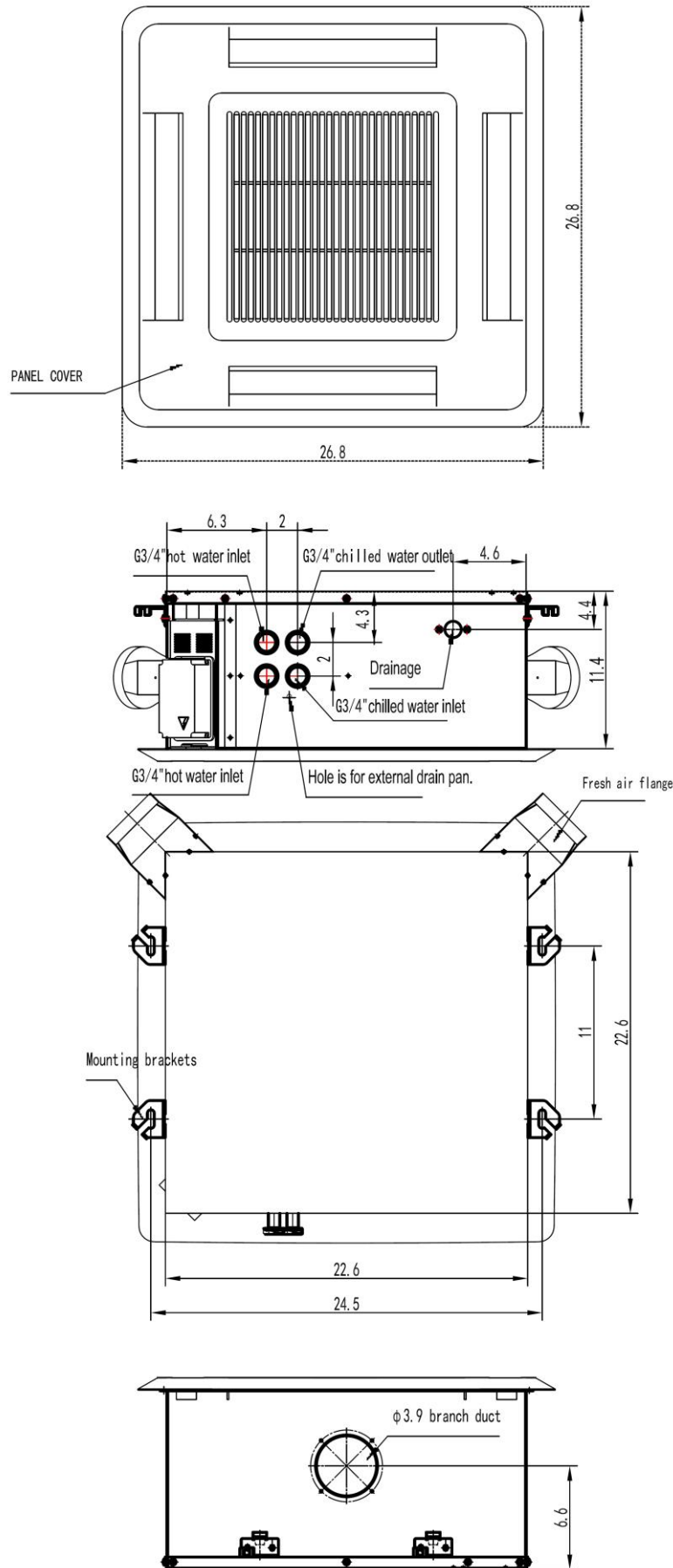
(All dimensions in inch.)

**Dimensional Drawings: PCH-20-V**



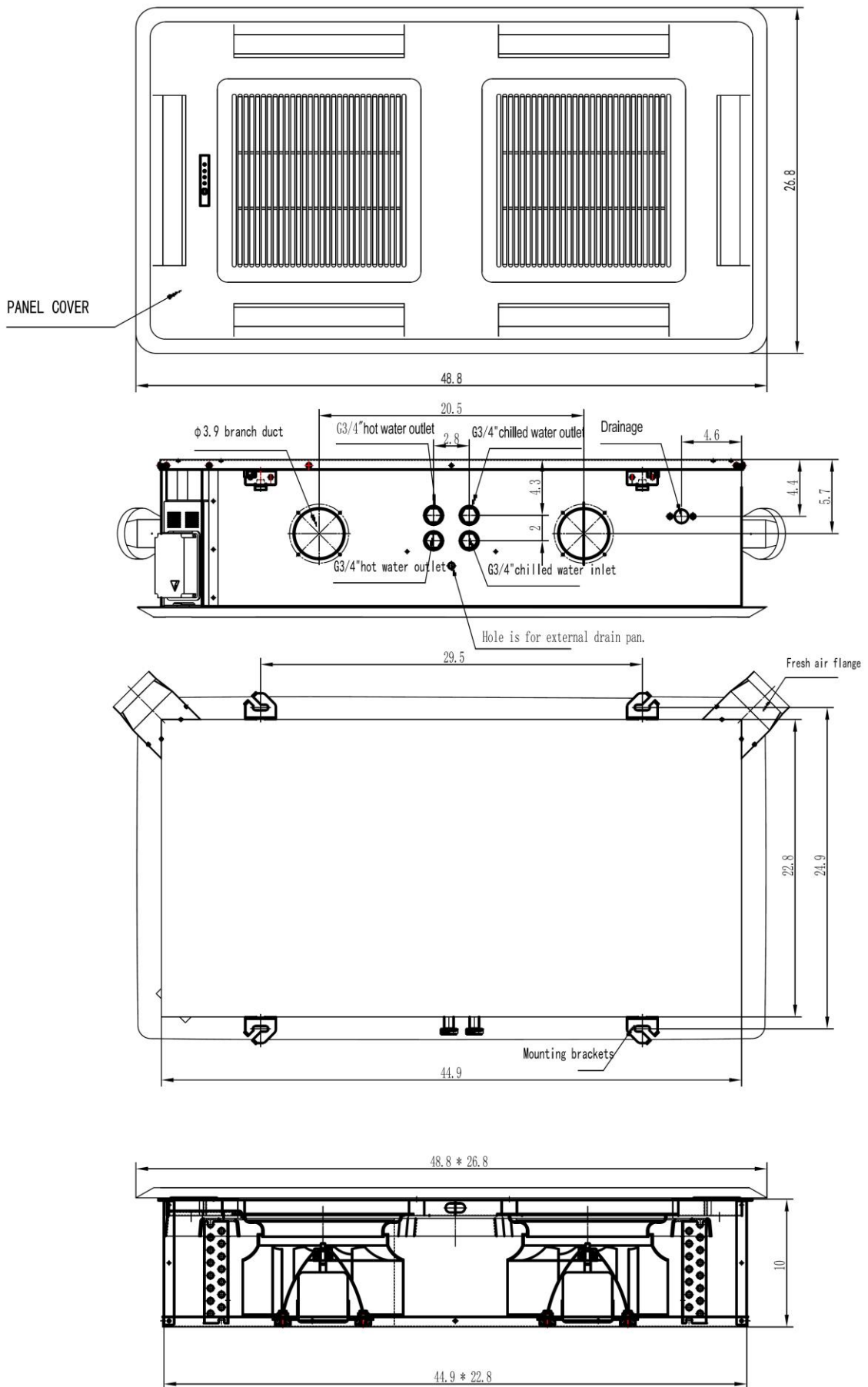
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**Dimensional Drawings: PCG-08-P**



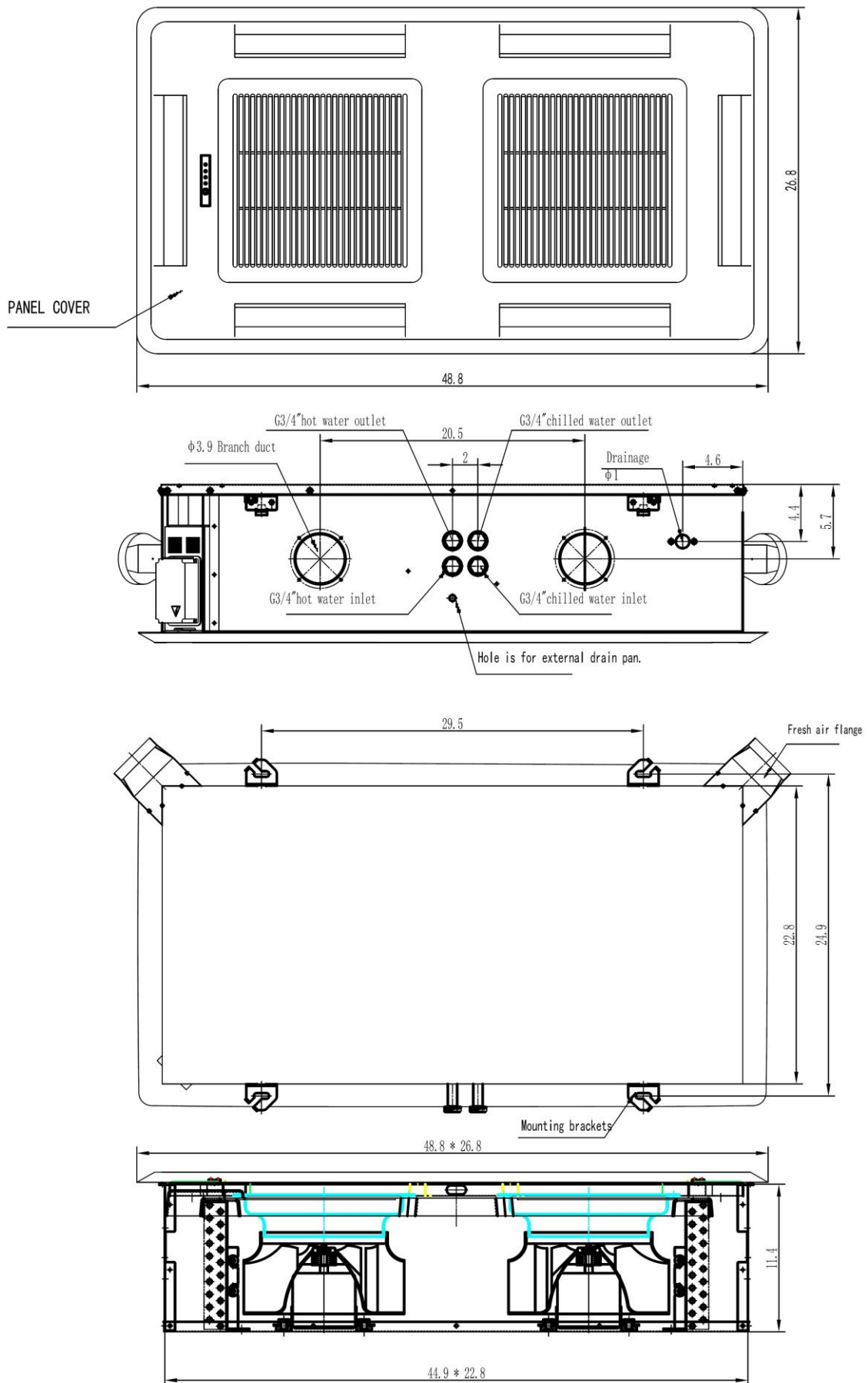
(All dimensions in inch.)

**Dimensional Drawings: PCG-09-P**



(All dimensions in inch.)

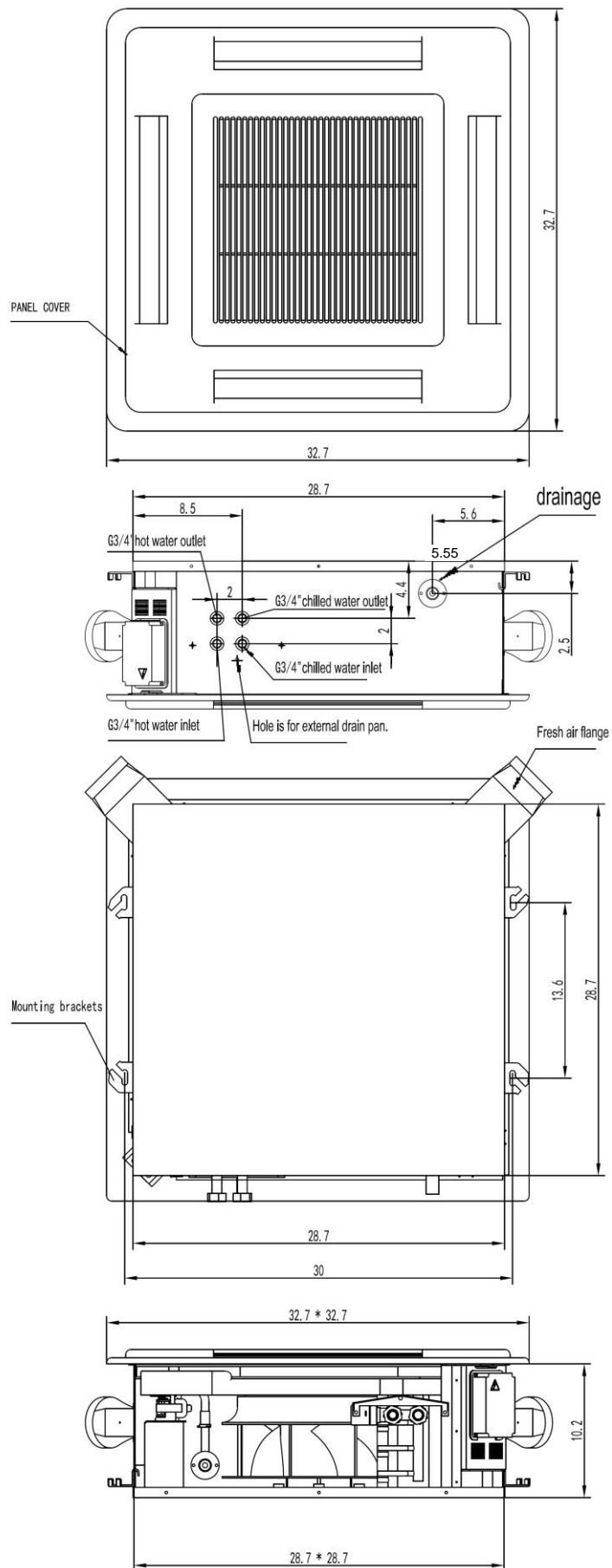
# Dimensional Drawings: PCG-16-P



(All dimensions in inch.)

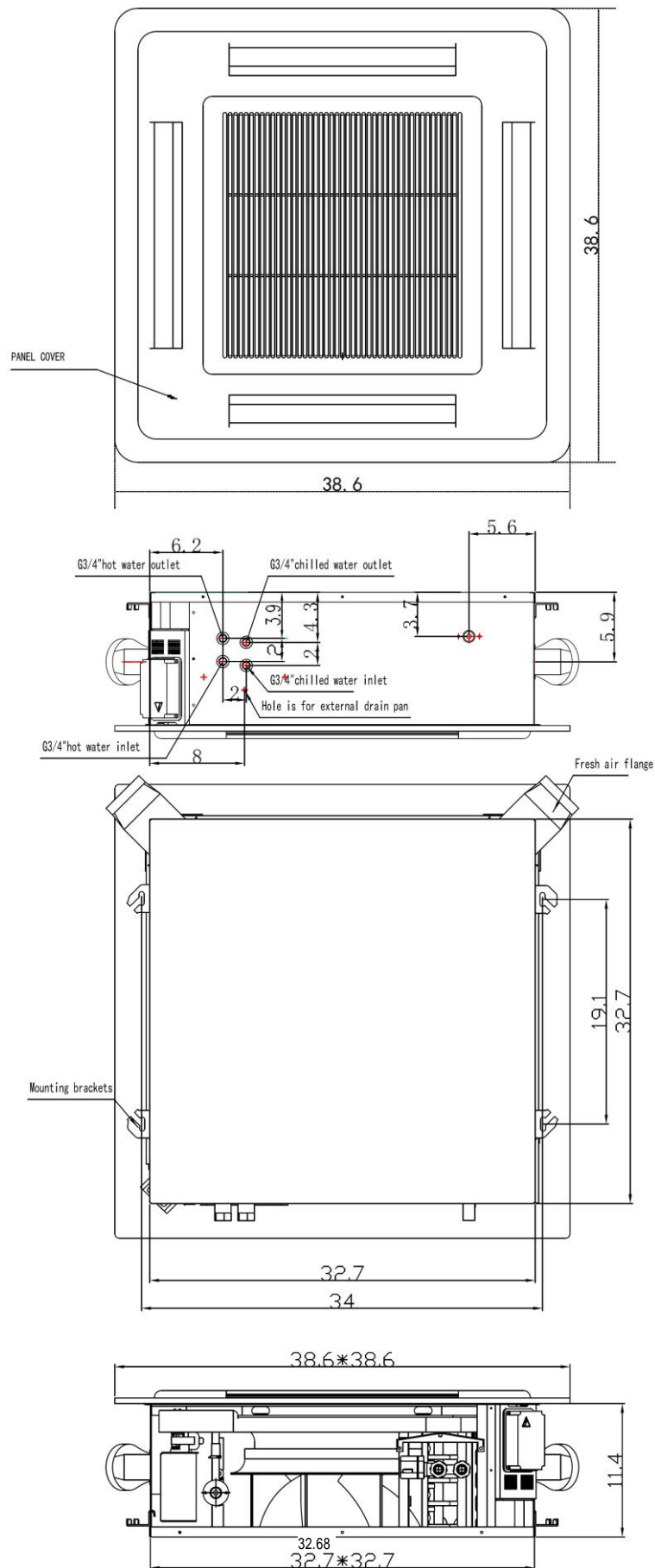


**Dimensional Drawings: PCH-12-P**



(All dimensions in inch.)

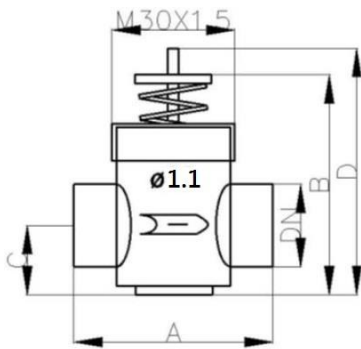
# Dimensional Drawings: PCH-20-P



(All dimensions in inch.)

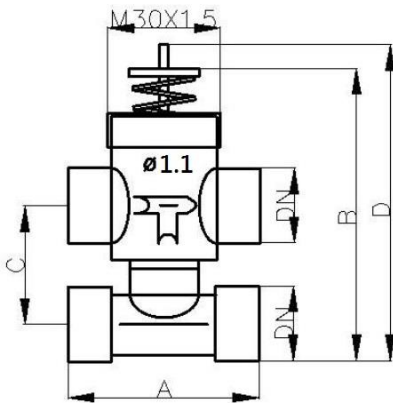
## A.4. Valve Information

### A.4.1. 2-Way Valve Body



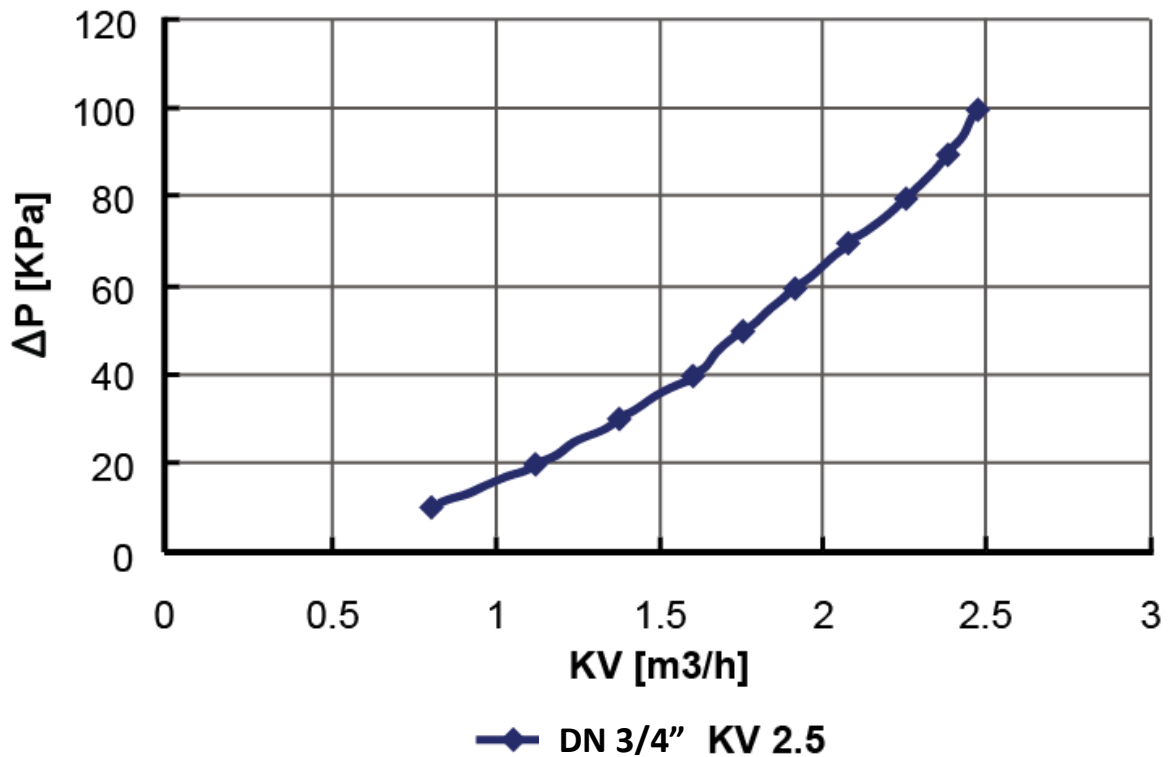
Valve Dimensions (inch)				
DN	A	B	C	D
D20 (G3/4")	2.2	1.9	0.9	2.5

### A.4.2. 3-Way Valve Body



Valve Dimensions (inch)				
DN	A	B	C	D
D20 (G3/4")	2.2	3.5	2	4

## Differential Pressure Chart



## B. Safety Precautions

- When installing or performing maintenance or servicing the air conditioning equipment, observe the precautions stated in this manual, in addition to those stated in the labels attached around the unit.
- Ensure all local and national safety codes, laws, regulations, as well as general electrical and mechanical safety guidelines are followed for installation, maintenance and service.
- The appliance is for indoor use only.
- Ensure the correct mains supply, with respect to the rating label on the unit, is used.
- Power supply shall be incorporated in the fixed wiring and must have an air gap of at least 0.1 inch between each active phase of conductors.
- If the supply cord is damaged, it must be replaced by qualified personnel.
- Installing and servicing air conditioning equipment should be done by qualified service personnel only.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning it.
- Children should be supervised to ensure they do not play with the appliance.
- The user of this appliance is responsible for his / her own safety.
- Warranty shall be voided if installation instructions and safety precaution stated in this manual are not observed.
- Never cut off the mains supply when unit is under operation. The unit should be switched off by using only the ON-OFF button on the control interface.

### **WARNING**

*Before any service or maintenance operations turn off the mains electrical supply.*

## B.1. Installation

First check the contents of the package.

### B.1.1. Standard Configurations and Accessories

There are three types of plug-and-play control box:

- **SKUSA-NCGH-001-AECM plug-and-play control box:**

PCG(H)-(V/P)S configuration – complete function integrated controller, compatible with IR handset controller, wired wall-pad, serial networking for master-slave and MODBUS applications.

- **SKUSA-NCGH-002-AECM plug-and-play control box:**

PCG(H)-(V/P)W configuration – limited function controller, compatible with standard wired thermostat controller, with zone control functionality.

- **SKUSA-NCGH-003-AECM plug-and-play control box:**

PCG(H)-(V/P)W-EH configuration – limited function controller, compatible with standard wired thermostat controller, with zone control functionality, with electrical heater compatibility.

Optional and standard accessories supplied with the unit are dependent on control configuration type.

Accessory list:	Control Configuration Type	
	~S: Complete function onboard PCB with integrated group control functionality.	~W: Limited function onboard PCB with drain-pump, louver and zone control functionality.
SKUSA-NCGH-001-AECM Plug-and-play control box with complete function controller.	Standard: Factory installed/ Optional: Field installed	N/A
SK-DFPS-A-002.1: IR remote handset	Optional (1 pc)	N/A
SK-DFPS-A-002.2: Wired wall-pad	Optional (1 pc)	N/A
SKUSA-NCGH-002/003-AECM Plug-and-play control box with limited functionality	N/A	Standard: Factory installed/ Optional: Field installed
SKUSA-DFPS-A-001~: STCD wired thermostats ALL models	N/A	Optional (1 pc)
Installation Manual	Standard (1 pc)	Standard (1 pc)
External Drain Pan	Standard (1 pc)	Standard (1 pc)

### B.1.2. Operating Limits

#### Power supplies

Volt	Phase	Hz	Remark
208~240	1	60	PCG/PCH~X-AECM
110~120	1	60	PCG/PCH~Y-AECM

#### Water circuit

Minimum entering water temperature	+2 °C (35.6°F)
Maximum entering water temperature	+80 °C (176°C)
Water side maximum pressure	1400 kPa (142 m.w.c)

### B.1.3. Before Installation

- The installation site must be established by the system designer or other qualified professional, taking account of the technical requisites and current standards and legislation.
- Cassette fan coils must be installed by an authorized company only.
- Cassette fan coils are designed for installation in a false ceiling, for intake of fresh air from outside and for diverting a small part of the treated air into a neighboring room.
- They must be installed in such a way as to enable treated air to circulate throughout the room and allow the minimum distances required for technical maintenance operations.
- It is advisable to place the unit close to the installation site without removing it from the packaging.
- Do not put heavy tools or weights on the packaging.
- Upon receipt the unit and the packaging must be checked for damage sustained in transit and if necessary, a damage claim must be filed with the shipping company.
- Check immediately for installation accessories inside the packaging.
- Do not lift unit by the condensate drain discharge pipe or by the water connections; lift it by the four corners.(Figure 1)
- Check and note the unit serial number.



Figure 1

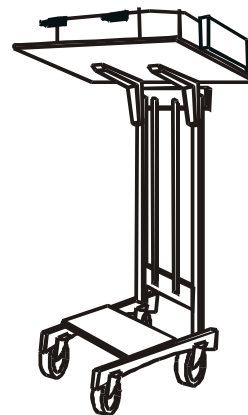


Figure 2

#### B.1.4. Installation Location

- Do not install the unit in rooms where flammable gas or alkaline acid substances are present. Aluminum/copper coils and/or internal plastic components can be damaged irreparably.
- Do not install in workshops or kitchens; drawn in oil vapors might deposit on the coils and alter their performance or damage the internal plastic parts of the unit.
- Installation of the unit will be facilitated by using a stacker and inserting a plywood sheet between the unit and the elevated stacker.(Figure 2)
- It is recommended to position the unit as centrally as possible in the room to ensure optimum air distribution.(Figure )
- Generally the best louver position is the one which allows air diffusion along the ceiling. Alternatively intermediate positions can be selected.
- Generally the best louver position should be adjust to allow air diffusion along the ceiling. Alternatively intermediate positions can be selected
- Check that it is possible to remove panels from ceiling in the selected position, to allow enough clearance for maintenance and servicing operations.

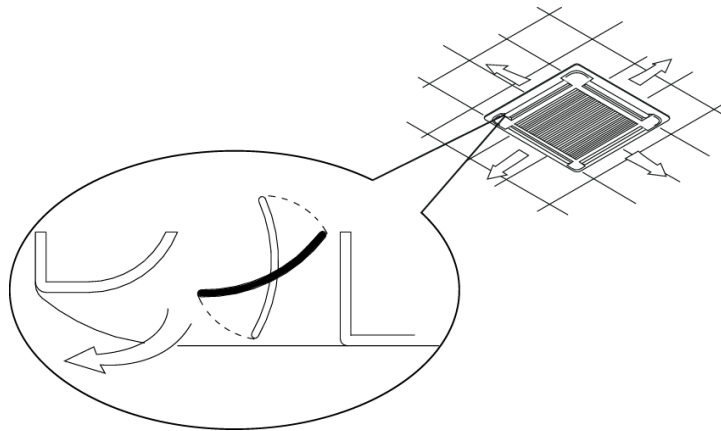


Figure 3



B.1.5. Installation and False Ceiling Clearance

- Surrounding area must have sufficient strength to carry the weight of the unit.
- The inlet and outlet grilles must not be obstructed and the conditioned air should be able to blow all over the room.
- Ensure location allows condensate to be easily drained.
- Check the distance between the upper slab and false ceiling to ensure the unit will fit comfortably.
- Ensure there is sufficient space around the unit to service it.

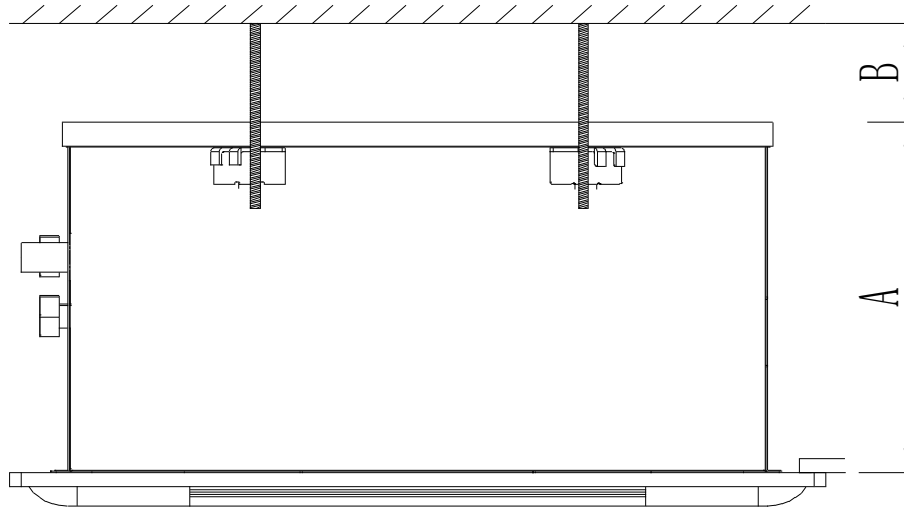


Figure 3

Model	A (inch)	B (inch)
PCG-04R/09	10	0.4 or more
PCG-08/08R/16 PCH-20	11.4	0.4 or more
PCH-12	10.2	0.4 or more

### B.1.6. Pipe Works

#### Indoor Unit

- The unit is fitted with a condensate pump with a 20 inch. lift.
- The unit is provided with 1 inch drainage head made of ABS.
- Before connecting polyvinyl tube with an inner diameter of 1 inch, check if the drainage head is in good condition.
- Fit drainage head into polyvinyl tube with a hose clip. (Figure 5).
- The drain must be installed with a downward slope.
- On completion the drain line should be insulated.

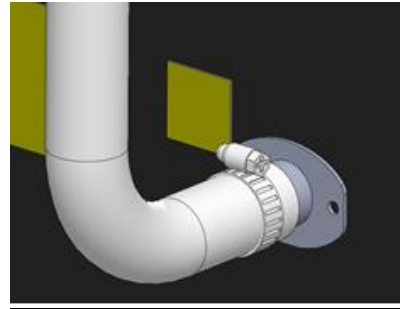


Figure 4

### B.1.7. Water Connections

The cassette unit uses a 3/4" water piping connection with gaskets. It is advisable to tighten the connections with two spanners.

### B.1.8. Valve configurations

- ~S: Units are compatible with:
  - 230VAC 2-way and 3-way on/off valves (thermoelectric or electric motor-driven actuation), with OPEN/CLOSE state actuation.
  - 24VAC 2-way and 3-way modulating valves with 0 – 10VDC modulating signal (motor-driven actuation) and variable size aperture (10% to 100%).
- ~W: Valve control originates in external wired thermostat. See thermostat manual for details.
- Connections:

Review below table for information on valve diameter.

Model	External valve information	
	Type	Connector dia. (inch)
All models	2-way & 3-way	3/4"

- Valve installations:

See drawings of external valve installation below, by model type.

2-pipe systems:

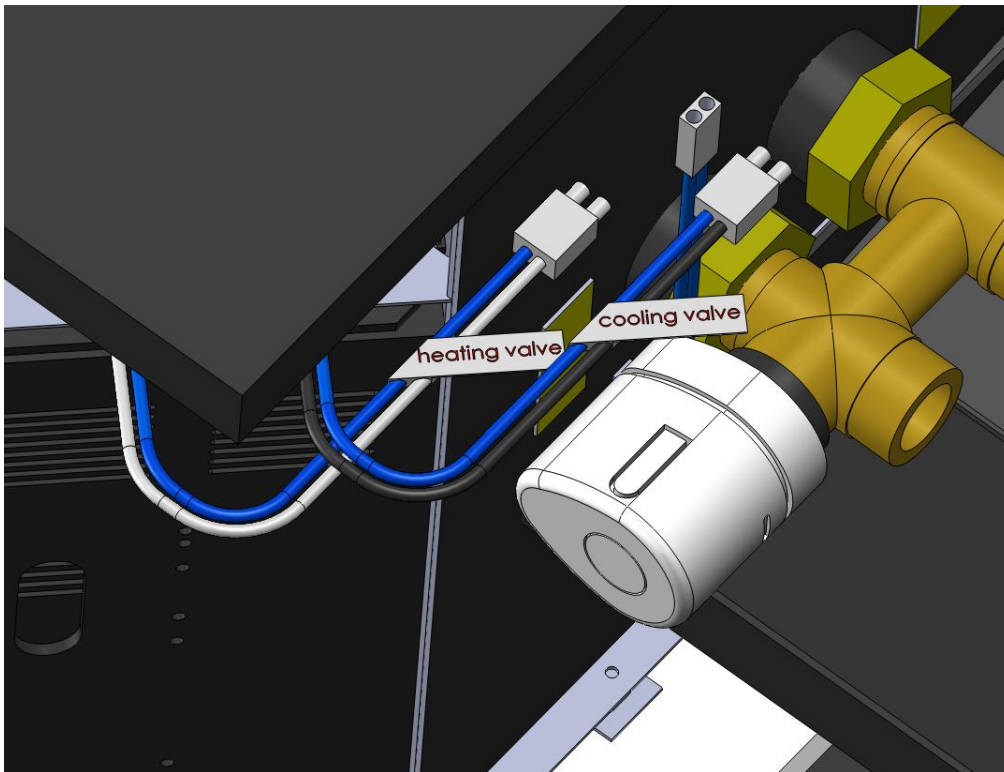


Figure 5

4-pipe systems:

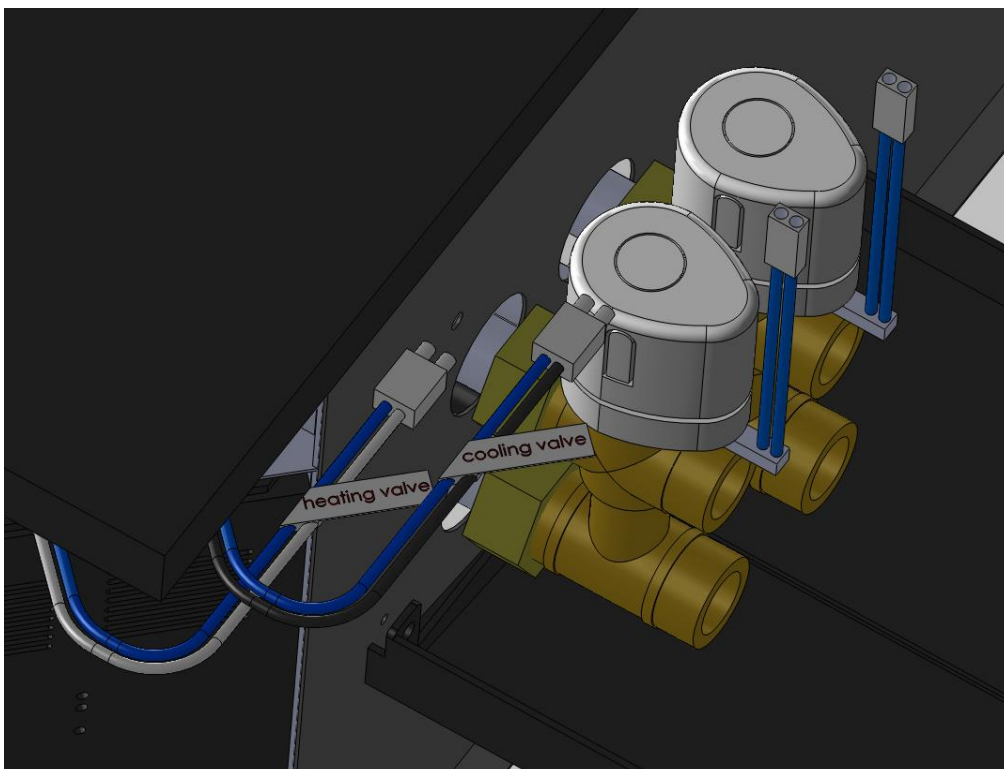


Figure 6

### B.1.9. External Drain Pan

Procedures:

1. Align the two screw holes in the fixing plate to the two holes in the external drain pan. (Figure 7)
2. Make sure the drain pan is horizontal.
3. Tighten the two screws while making sure the external drain pan is installed evenly against the fixing plate. (Figure 8)

When the installation is completed, it is necessary to wrap the connecting pipe with thermal insulation to prevent condensation on ceiling tiles.

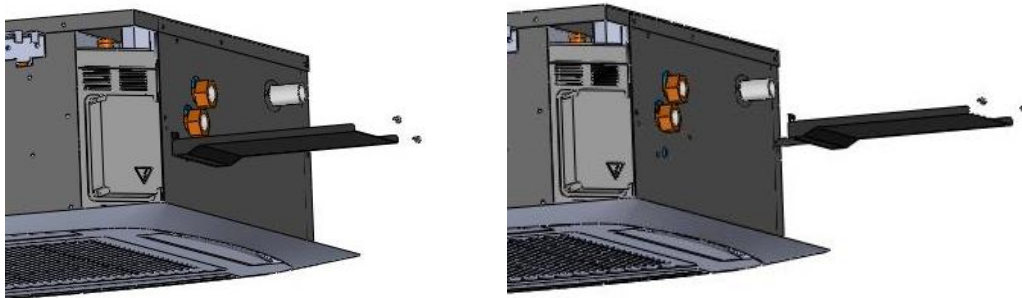


Figure 7

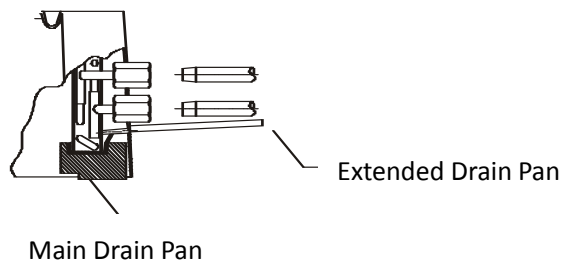


Figure 8

### B.1.10. Fresh Air Renewal Connection

The fresh air system for cassette units allows up to 15% of unit airflow to be fresh air intake (per connection). Maximum 2 fresh air connections per unit are allowed.

1. The corners of the cassette allow separate ductwork to be installed for outside air intake (Figure 9).
2. Cut and remove thermal insulating material.
3. Open the mounting plate (Figure 10 and Figure 11)
4. Install the flange to casing and attach with 2 screws. The flange is a rectangular duct with the dimensions of 4.3 x 2.2inch.

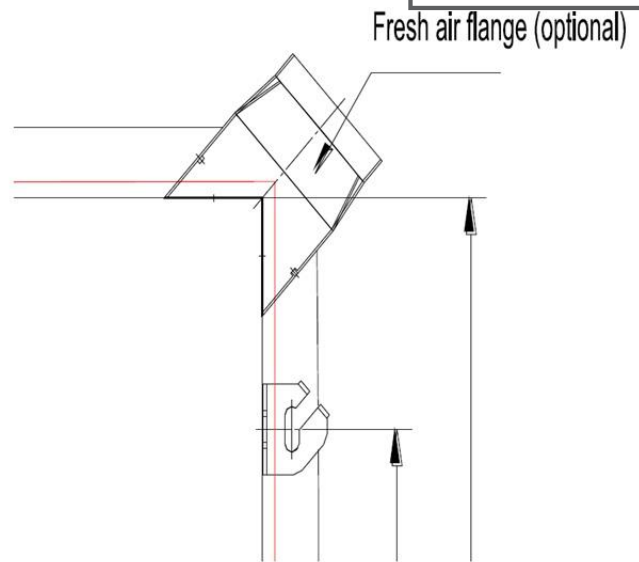
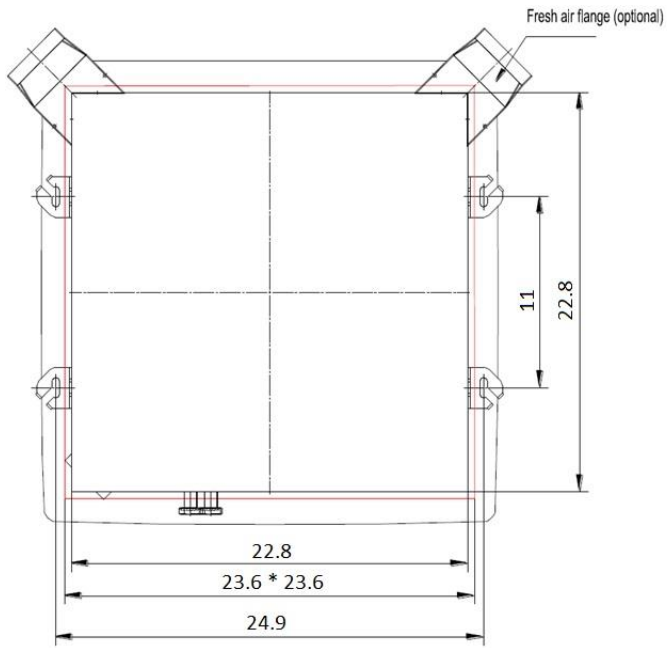


Figure 9

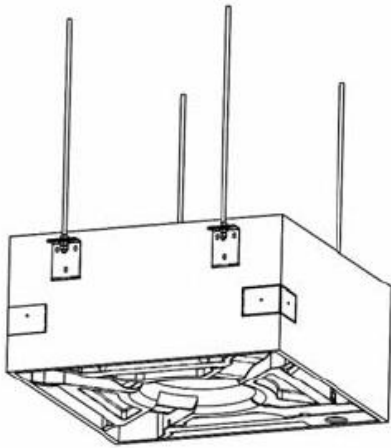


Figure 10

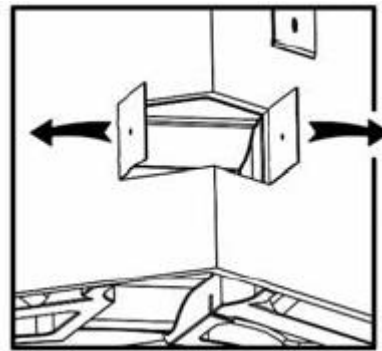


Figure 11

(All dimensions shown in inch)

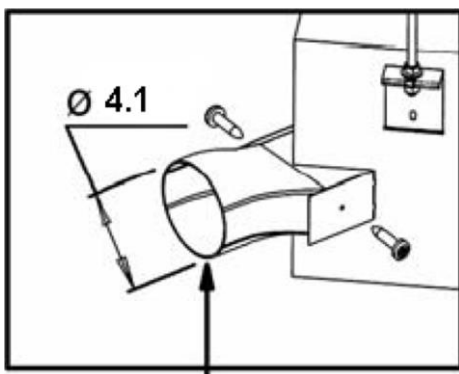


Figure 12

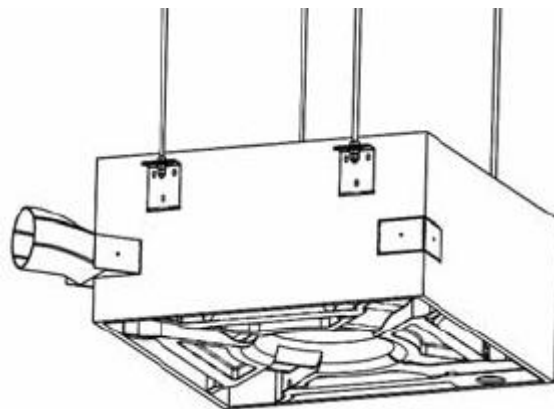


Figure 13

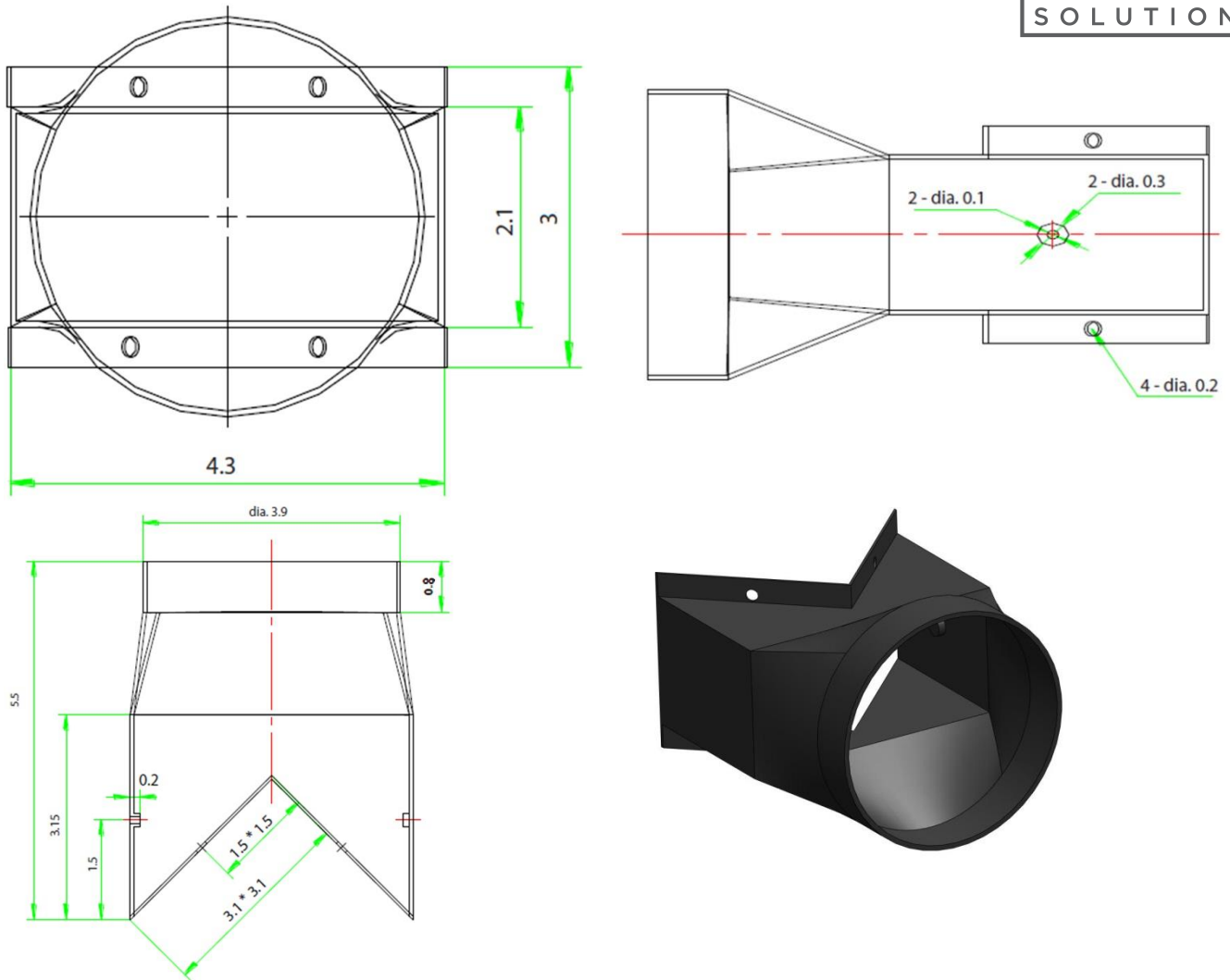


Figure 14 - Fresh Air Flange dimension

(All dimensions shown in inch)

B.1.11. Branch Duct Connection

- The side opening allows separate ductwork to be installed for branch ducting. (Figure 15 and Figure 16).
- Cut and remove anti-condensate insulating material.
- Install your flanges and conduits to casing. Conduit can be flexible polyester with spring core or corrugated aluminum externally coated (dia. 4 inch) with anti-condensate material (0.5-1 inch thick fiberglass).

Flanges (spigots) and blanking plates are available as separate accessories items.

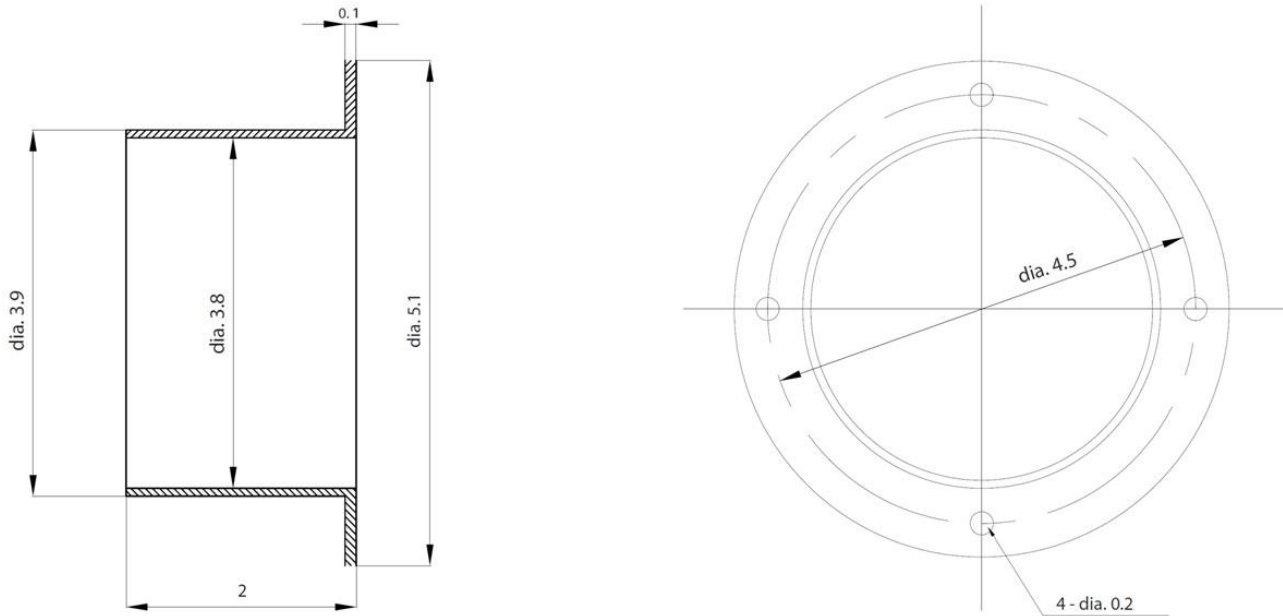


Figure 15 - Branch Duct Dimension

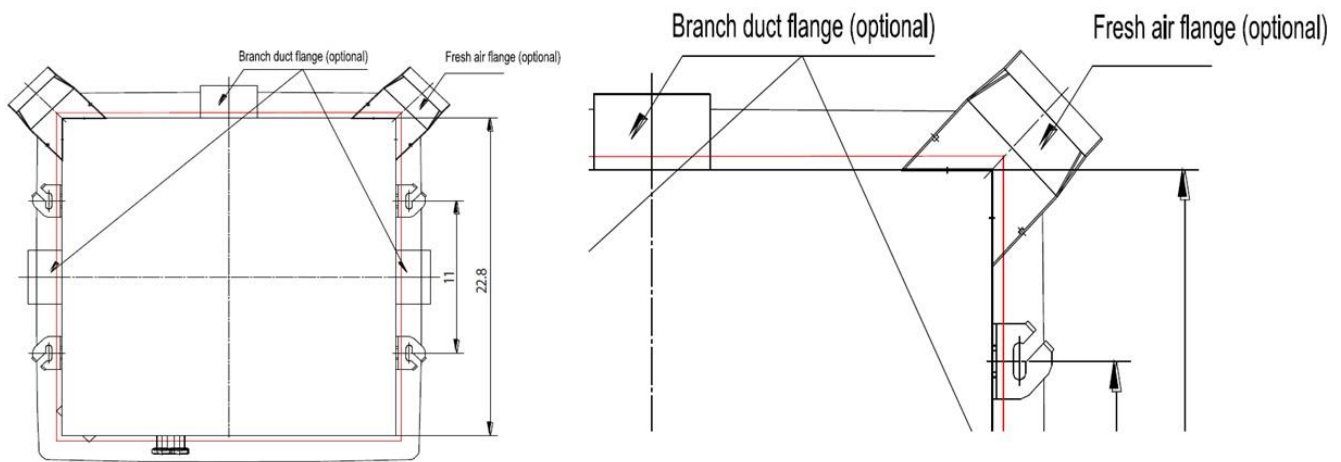


Figure 16

(All dimensions shown in inch)



B.1.12. Branch Duct Installation Procedure

1. Look for the yellow sticker on the casing for the location of branch duct or fresh air intake connections.
2. The sticker is at the center of a knock out hole underneath the casing insulation. Use a cutter and follow along the pre-cut circular marking as shown and trim off the insulation.
3. Knock out the pre-cut hole.
4. Connect the flange on to the opening with  $\Phi 0.1$  inch. x 0.5 inch. tapping screws.

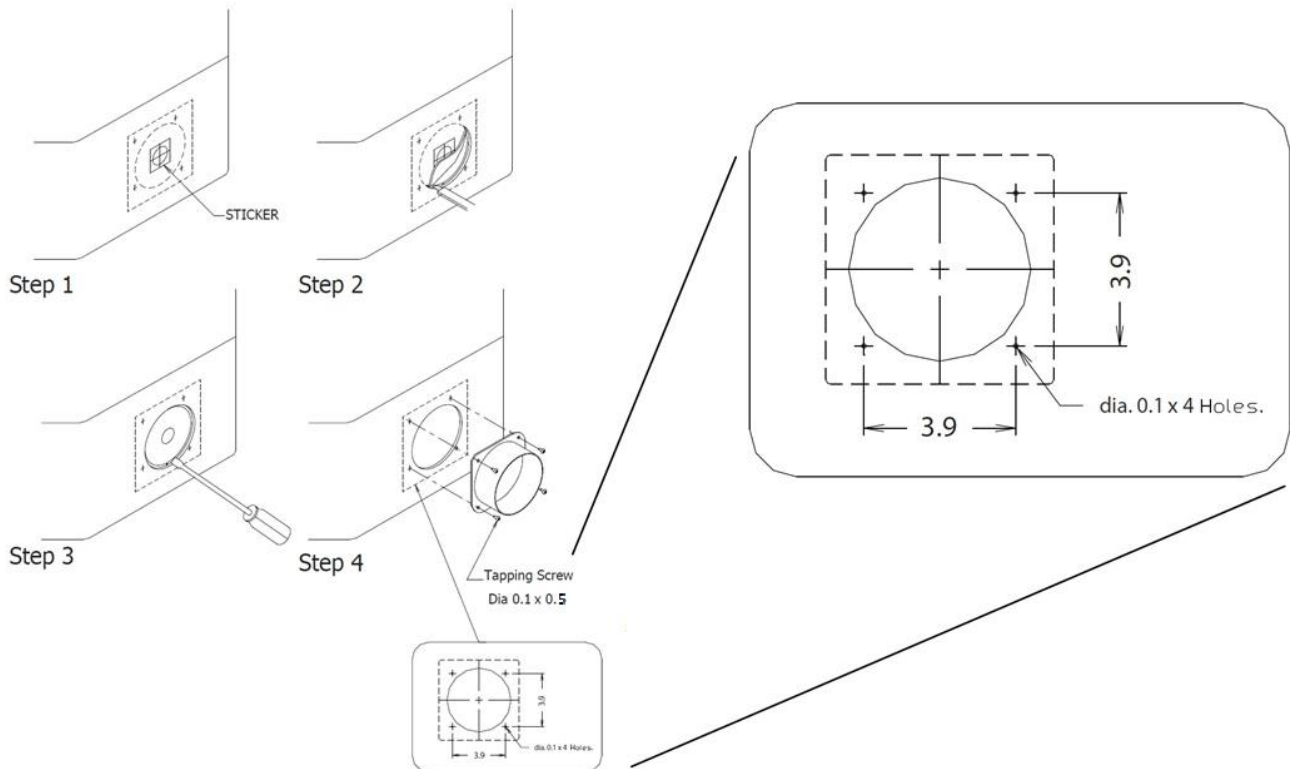


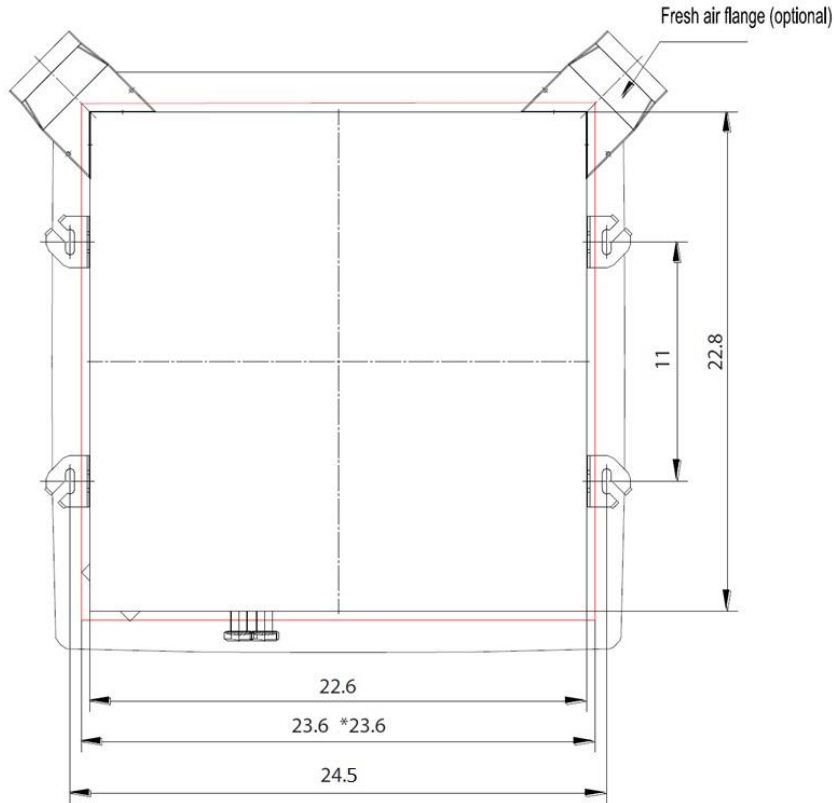
Figure 17

(All dimensions shown in inch)

## B.2. Suspension Bolts Layout and False Ceiling Opening

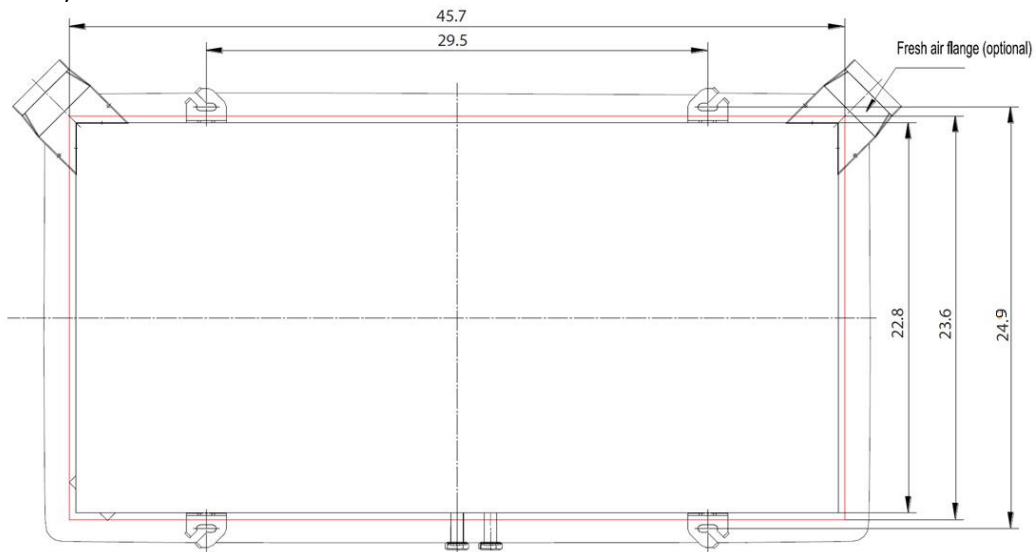
Using the installation template, open the ceiling panels and install the suspension bolts as in the images below.

PCG-04R/08/08R~



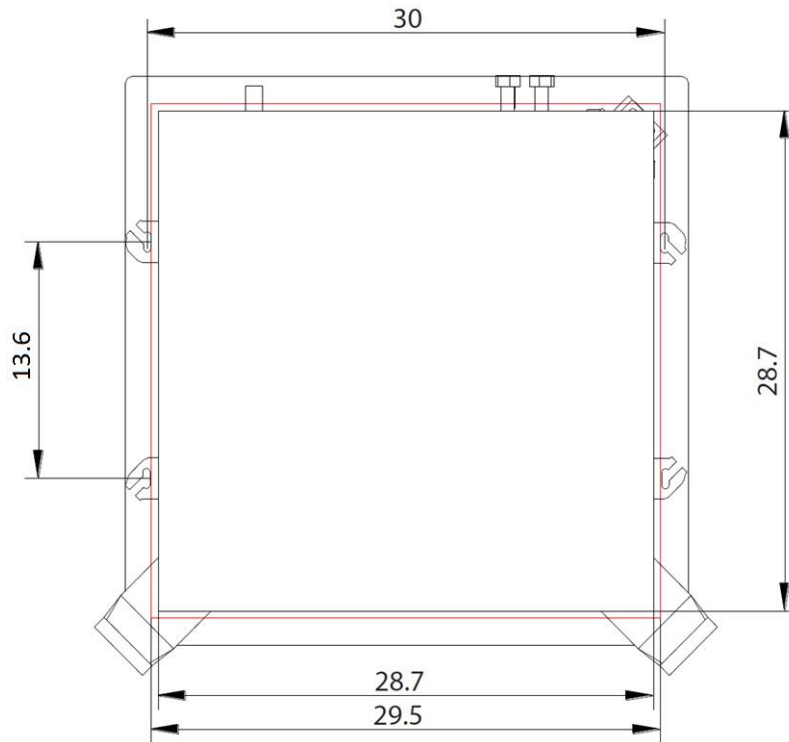
23.6 x 23.6 inch: Dimensions for opening  
24.5 x 11 inch: Suspension Bolts

PCG-09/16~



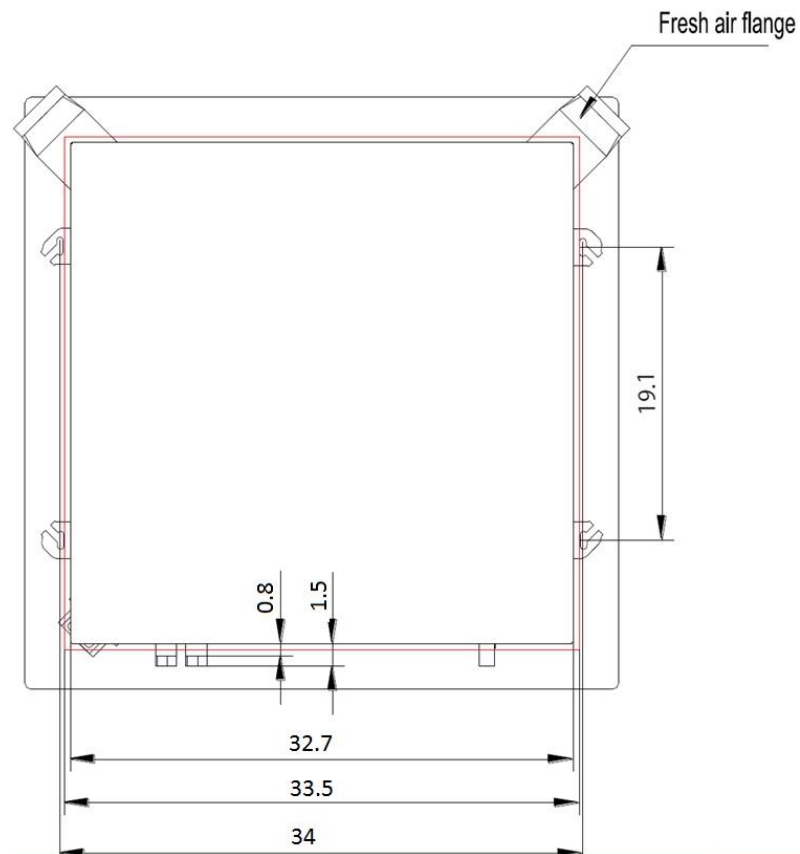
23.6 x 45.7inch: Dimensions for opening  
29.5 x 24.9 inch: Suspension Bolts

PCH-12~



29.5 × 29.5 inch: Dimensions for opening  
13.6 × 30 inch: Suspension Bolts

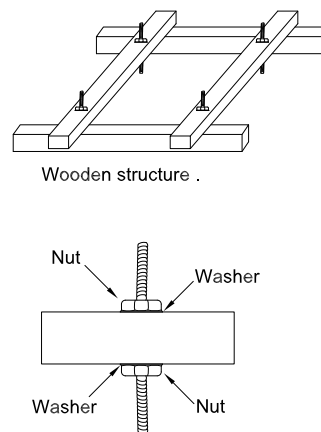
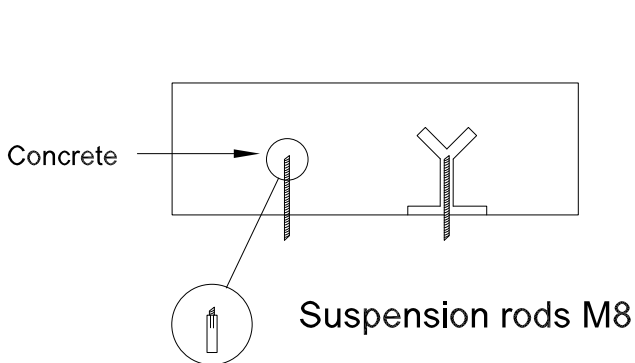
PCH-20~



33.5 × 33.5 inch: Dimensions for opening  
19.1 × 34 inch: Suspension Bolts

B.2.1. Suspension Structure

- Mark the position of the suspension rods, water lines, \_ condensate drain pipe, power supply cables and remote control cable.
- Supporting rods can be fixed, depending on the type of ceiling, as shown in Figure 18 and Figure 19.
- Fit suspension brackets supplied with the unit to the threaded rods (Figure 20)
- Do not tighten nuts and counter nuts; this should only be done after the final leveling of the unit\_ when all the connections have been completed.
- Ensure the ceiling is horizontally level, otherwise the condensate water cannot drain away.
- The casing is fixed to the slab with 4 drop rods. The rods should have two nuts and washers to lock the unit in position. The cassette brackets will then hook over the washers.
- Take care when lifting the cassette into position. Don't lift the unit by the drip tray.



Fixing on cement ceiling.

Fixing on wooden beam.

Figure 18

Figure 19

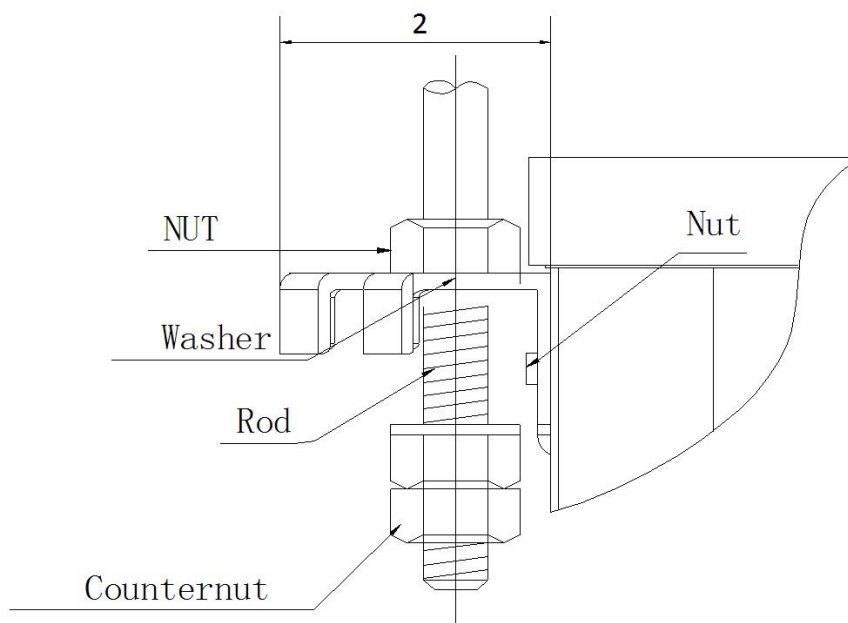


Figure 20

### B.2.2. Installation Procedure

1. Lift unit (without the air panel) with care by its four corners only. Do not lift unit by the condensate drain discharge pipe or by the piping connections.
2. Incline the unit (Figure 21, Figure 22, Figure 24 and Figure 25) and insert it into the false ceiling. Insert the rods into the bracket slot. With minimum false ceilings clearance, it might be necessary to remove some T bars of the false ceiling temporarily to ensure there is enough clearance.
3. Using a level guide, line up the unit with a spirit level\_ to ensure an even distance between the body of the unit and the lower part of the false ceiling (Figure 23, Figure 26).
4. Line up the unit to the supporting bars of the false ceiling tightening the nuts and counter nuts of the threaded rods.
5. After connecting of the condensate drain piping and piping connections, check again that the unit is level.
6. The spaces between the unit and ceiling can now be adjusted. Use the drop rods to make the adjustment.
7. Check to ensure the unit is level. The drain will then automatically be lower than the rest of the drip tray.
8. Tighten the nuts on the suspended rods.

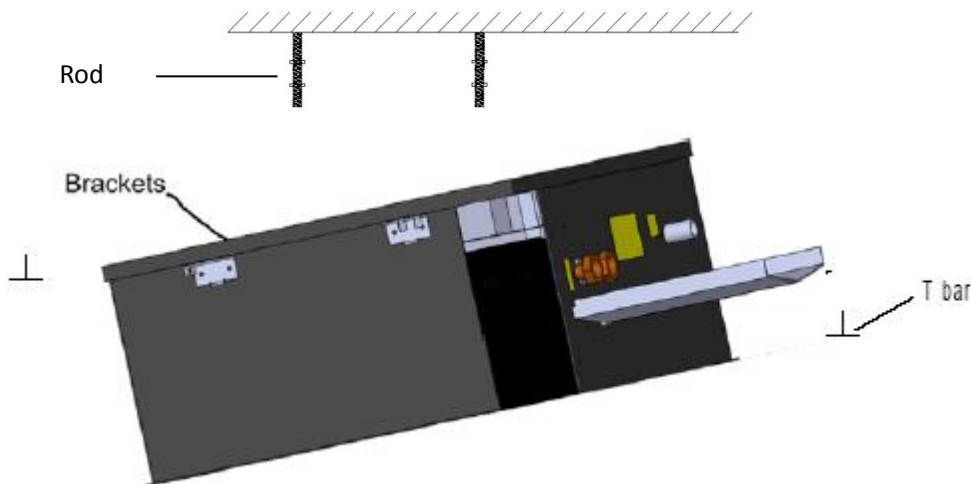


Figure 21

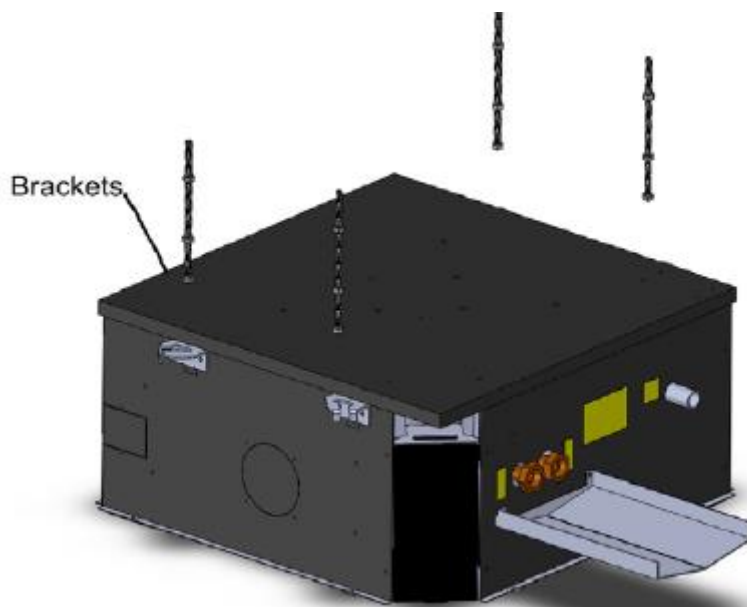


Figure 22

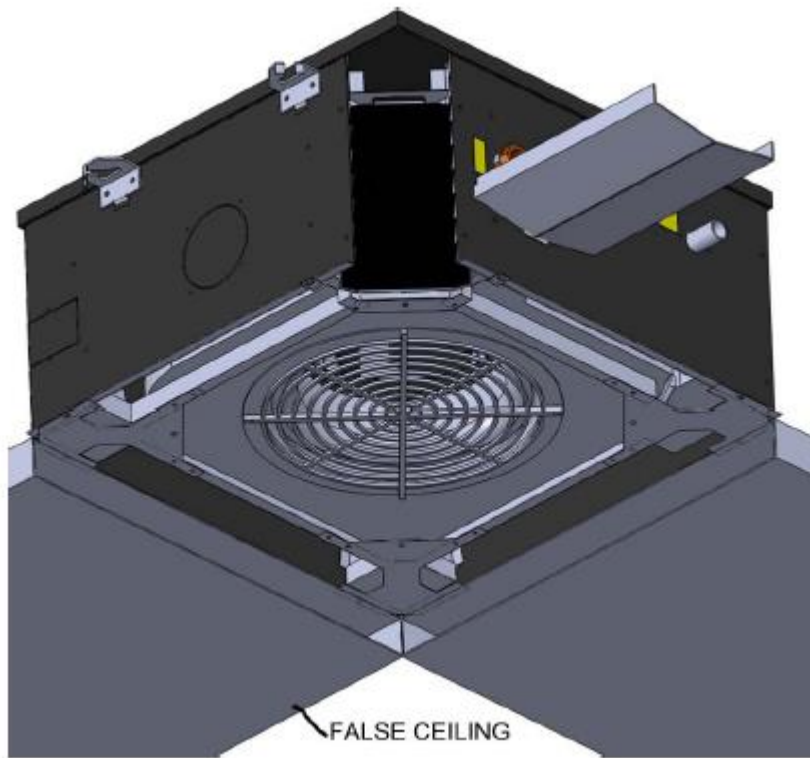


Figure 23

Clearance between the unit and false ceiling for models with single fan

MODEL	All single fan models
Clearance	0.1 inch

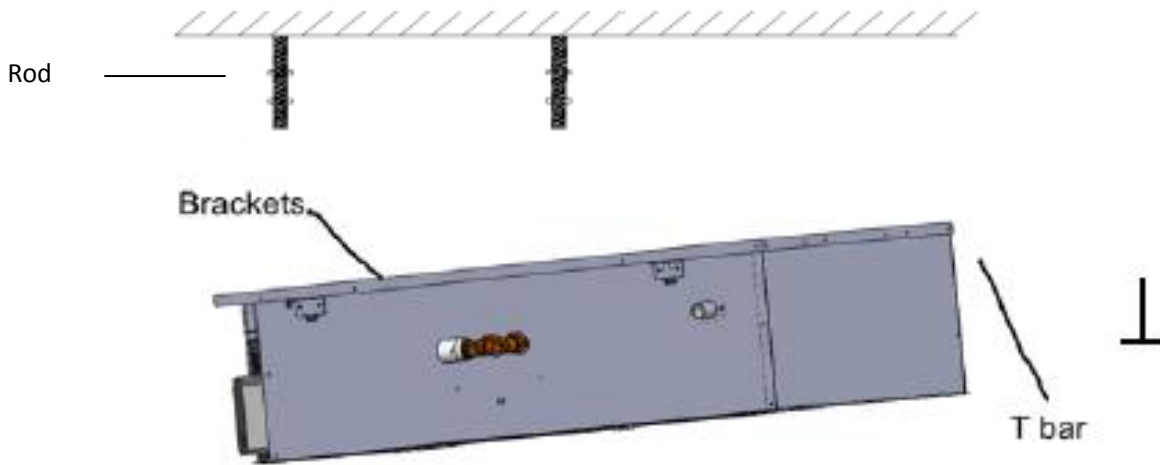


Figure 24

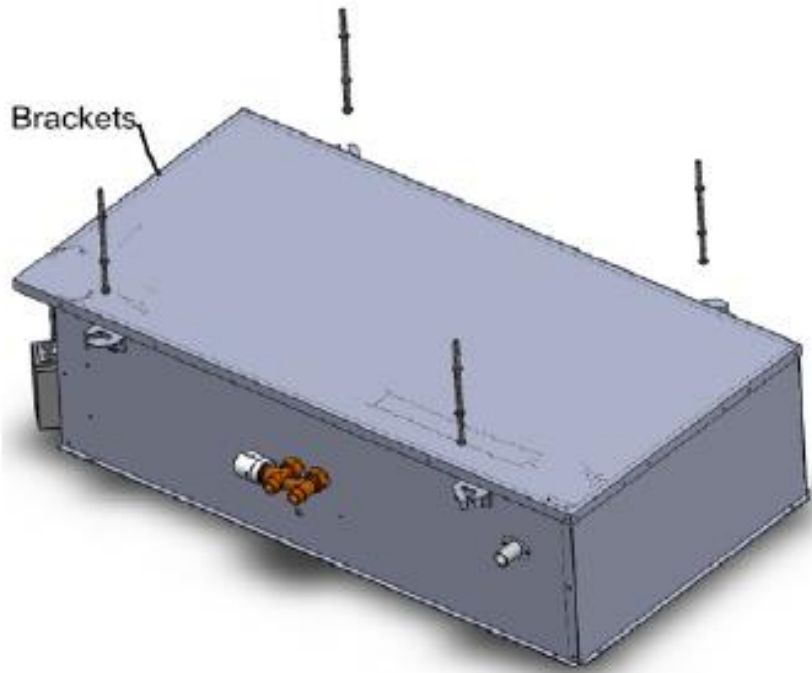


Figure 25

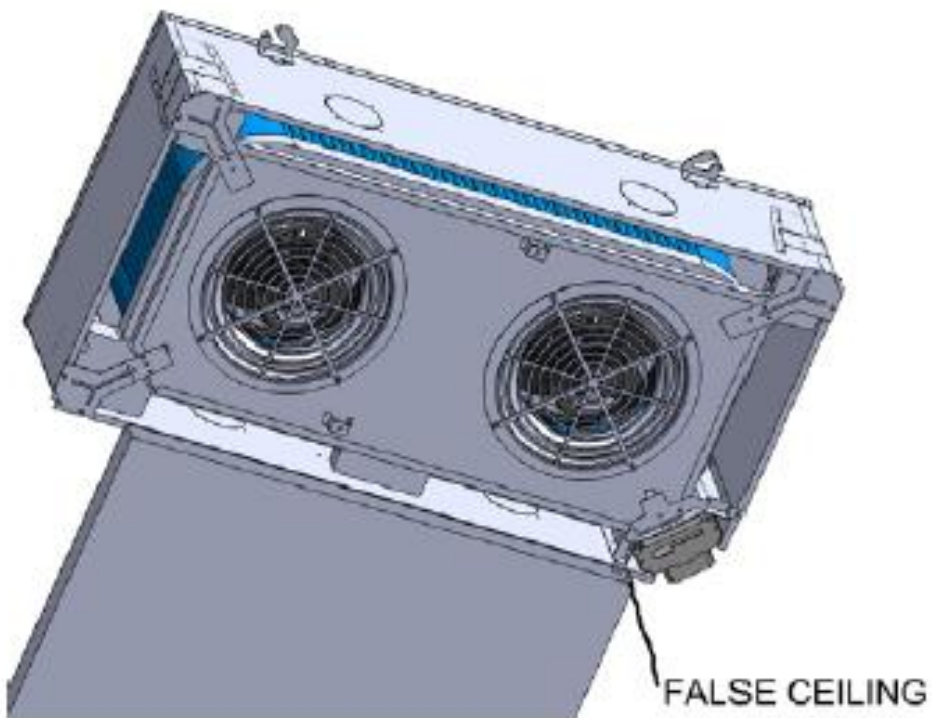


Figure 26

Clearance between the unit and false ceiling for models with twin fan

MODEL	All twin fan models
Clearance	0.1 inch

### B.3. Interconnecting Wiring

- We recommend that screened cable be used in electrically noisy areas.
- Always separate low voltage (5VDC) signal wires from power line (230 VAC).
- Do not install the unit where electromagnetic waves are directly emitted towards the infra red receiver on the unit.
- Install the unit and components as far away as is practical (at least 16.4 ft) from the electromagnetic wave source.
- Where electromagnetic waves exist use shielded sensor cable.
- Install a noise filter if the power supply generates disturbing noises.



Figure 27

**Important note:** Please ensure the cable of the main power supply is longer than 19.7 inch from the control box terminal block. This is to ensure the control box can be slid out easily during maintenance activities.

Always take safety precaution before wiring for mains supply. See section B. Safety Precaution.

#### B.3.1. Wiring procedures:

1. Open the terminal block cover by removing the 4 screws
2. Connect power cable to the terminal according to the wiring diagram
3. Connect room temperature sensor and coil temperature sensors to the control box
4. Connect stepping motor
5. Connect receiver display
6. Connect wall pad (optional)
7. Slide the control box into the unit casing and attach with 2 screws



### B.3.2. Mounting Front Panel Assembly

1. Remove return grille from the front panel.
2. Move the front panel to the unit casing.
3. Tighten 4 screws to attach the front panel as shown in Figure 28 and Figure 29.

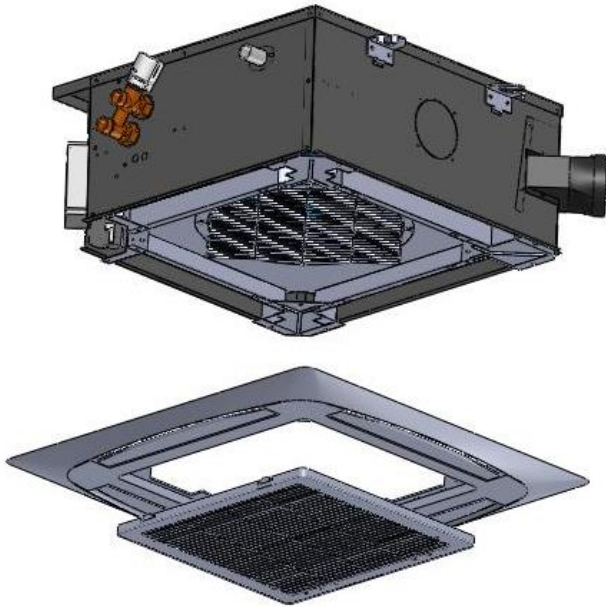


Figure 28

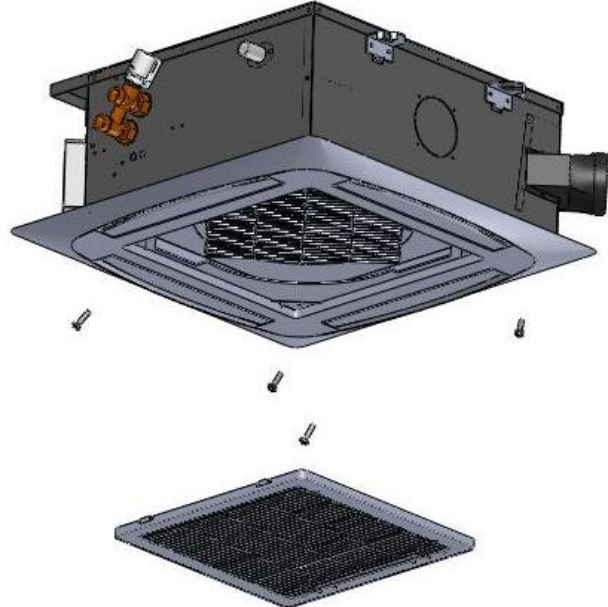


Figure 29

### B.3.3. Filter Removal

1. Unlock the two catches on the front panel.
2. Open the grille downward with care.
3. Pull the filter out along the slot.
4. Clean the filter and reassemble.

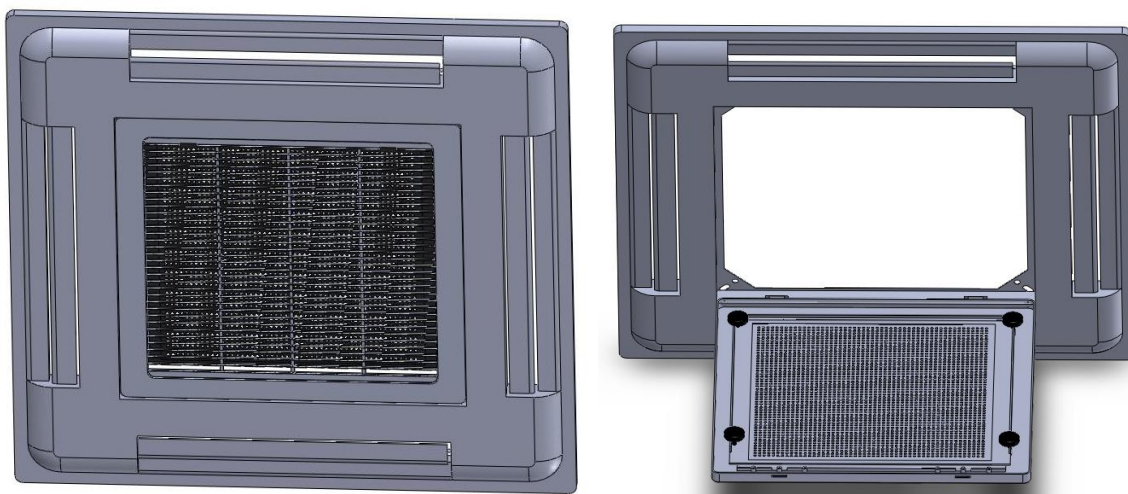


Figure 30

#### B.3.4. Getting Start-Up

- The unit should not be started up until the system piping has been cleaned and all the air has been purged.
- Check condensate drain pipe slope.
- After you have connected the main power supply to the cassette unit, it is necessary to check that the condensate water pump installed inside the unit is in working order.
- Due to transport vibration it is possible that the float switch is suspended and the pump might not work correctly. For this reason, you must do the following to ensure the unit works effectively.
  - Install the cassette unit in an absolute horizontal position.
  - Fill the internal drain pan (manually) with enough water to check the drain pump is working.
  - You can fill the internal drain pan by pouring water through the external drain pan.
  - If everything is functioning correctly, the water will be expelled from the unit into the pipe work you have installed. If the water is not expelled, please manually check the float switch is not faulty.
- Make sure that the air filter is clean and properly installed.
- Ensure that the power rating values of the electrical connection correspond with the unit rating label.
- Verify that all the louvers can be manually opened smoothly by hand.

## B.4. Maintenance

- 1) Turn off the main power switch before performing any service or maintenance operations. Please see section B. "Safety Precautions".
- 2) The air filter is made of acrylic fiber and is washable in water. To remove filter simply open the intake grille by releasing the two catches. See Figure 30 for the section filter removal.
- 3) Check the filter before the operating season and then periodically while in use; clean or replace as necessary.

### B.4.1. For Units Out Of Use for Extended Period.

Prior to restarting the unit:

- Clean or replace the air filters.
- Check and remove any obstruction from the external drain pan and the internal drain pan.

### B.4.2. Extra Maintenance

- The electrical panel is easily accessible by removing the cover panel.
- The inspection or replacement of internal components such as the heat exchanger coil, condensate drain pump, or float switch, involves the removal of the condensate drain pan.
- During the removal of the condensate drain pan protect the floor under the unit from water spillage with a plastic sheet.
- Unscrew the drain pan fixture and remove the condensate drain pan with care.
- The appliance is meant to be maintained by qualified service personnel and located at a height of 8.2ft or more.
- Please see section B. Safety Precaution.

## B.5. Air Vent and Water Purge

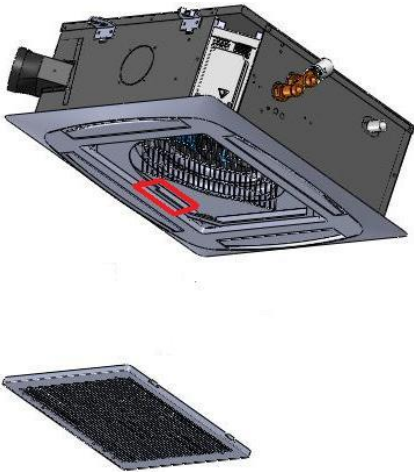


Figure 31  
Step 1: Remove grille to access the area indicated by the red line.



Figure 32

Step 2: Release the air vent / water purge by turning the knobs.

## B.6. Replacing Motor and Fan Blower

Refer to Section B.3.2 for Step 1 - 3.



Figure 33  
Step 4 : Use a spanner to remove the fan blower.

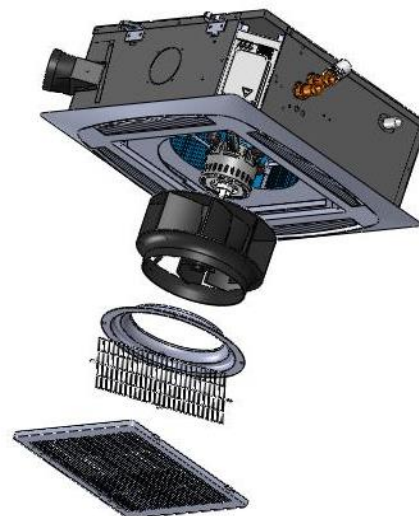


Figure 34

Step 5 : Remove the motor by undoing the 4 bolts and then disconnect the fan motor wire connector.

## B.7. Replacing Condensate Pump

Refer to Section B.3.2 for Step 1 - 2.

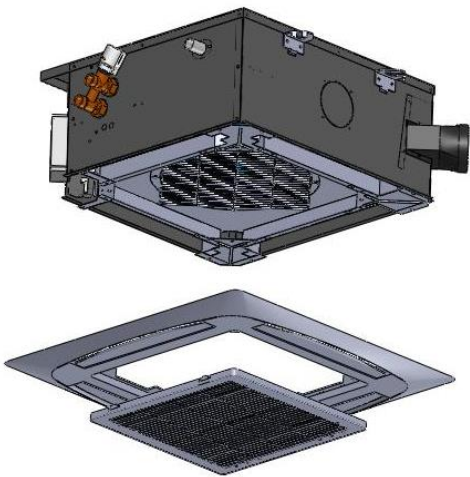


Figure 35  
Step 3: Remove front panel and disconnect stepping motor and IR receiver.

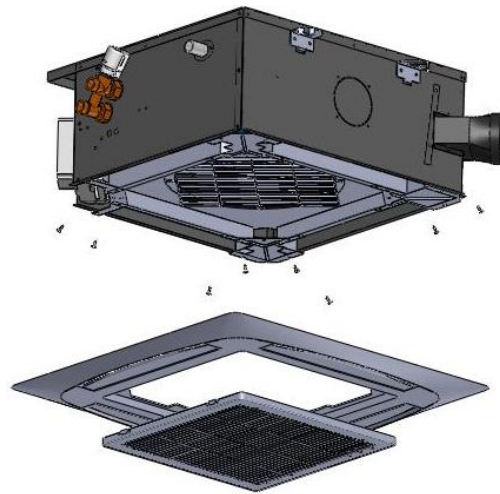


Figure 36  
Step 4: Remove the drain pan fixture by unscrewing the 8 screws as shown.

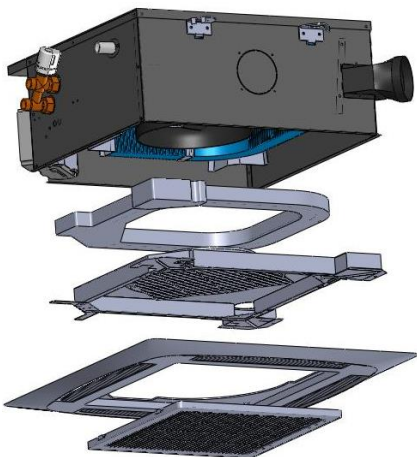


Figure 37  
Step 5: Remove the drain pan fixture and internal drain pan.

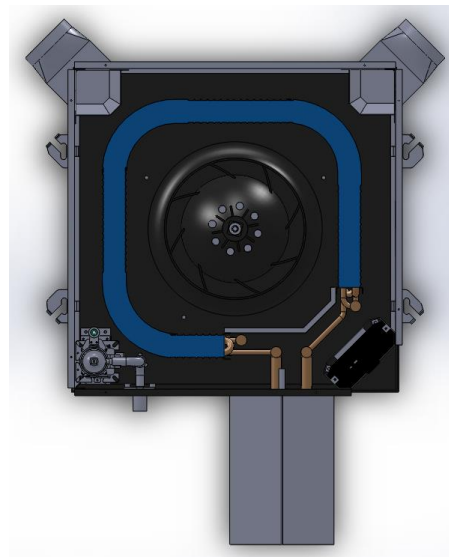


Figure 38  
Step 6: Remove the drain pump or valve.



## B.8. Replacing Control Box

Refer to Section B.3.2 for Step 1 - 3.

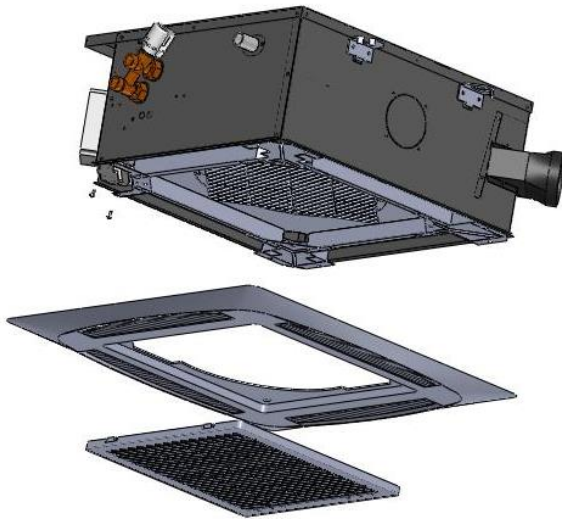


Figure 39

Step 4: Remove 2 screws from control box.

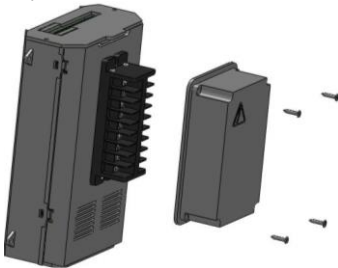


Figure 41

Step 5: Remove the terminal cover by unscrewing the 4 screws and unplugging the wiring on the terminal. Replace with a new control box.

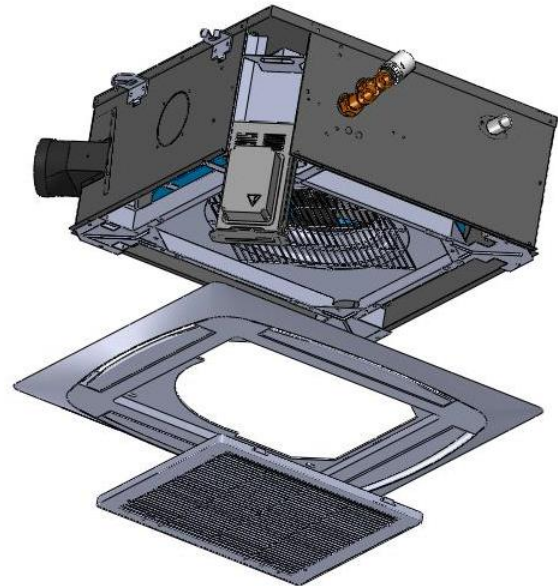


Figure 40

Step 5: Sliding out the control box.

## B.9. Install Electric Heater

To access the inner coil area to install the electric heater, please refer to Figure 35, Figure 36 and Figure 37 for Step 1 - 5.



Figure 42

Step 6: Snap in the insulated ring of the electric heater to the electric heater mounting shown above.

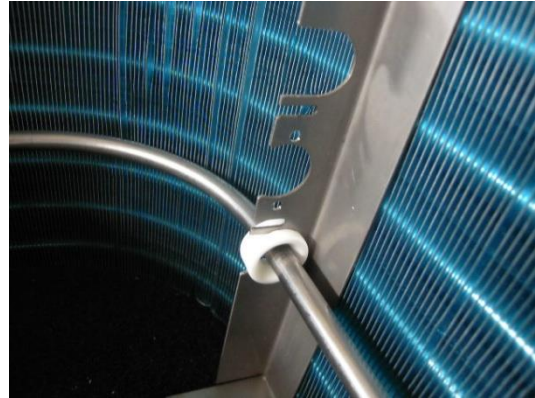


Figure 43

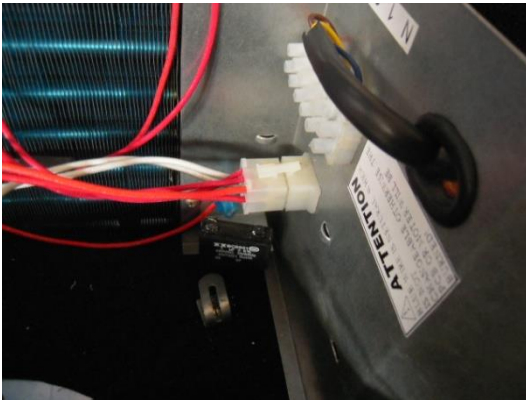


Figure 44

Step 7: Plug in the electric heater wiring to the connector shown above.

### Remark:

If PCG/PCH is installed to the EH, the EH is turned off when fan RPM is less than 300. Use the remote handset or wired wall pad to change fan speed to Medium or High speed.

## C. Control Specifications: SKUSA-NCGH-001-AECM

Used in all PCG/PCH [V/P] S unit configurations.

Complete function integrated controller, compatible with IR handset controller, wired wall-pad, serial networking for master-slave and MODBUS applications.

### Abbreviations

Ts = Setting temperature

Tr = Room air temperature

Ti1 = Chilled water coil temperature

Ti2 = Hot water coil temperature

AUX1 = Hot water free contact

AUX2 = Chilled water free contact

MTV1 = Chilled water valve

MTV2 = Hot water valve

### C.1. I/O Port Definitions

I/O		Code	2-Pipe	4-Pipe
Analogue Input	Return air sensor	AI1	Return air temperature (Tr)	
	2-pipe coil circuit sensor	AI2	Chilled / hot water coil circuit (Ti1)	Chilled water coil circuit (Ti1)
	Hot water sensor	AI3	N/A	Hot water coil circuit (Ti2)
Input	LED display / IR receiver	X-DIS 1	Digital communication port to LED display / IR receiver board.	
	Wired wall pad	TTL1	Digital communication port to wired wall-pad board.	
Digital input	Occupancy contact	ON/OFF	Window contacts: for remote ON/OFF (when DIPB SW1=1). Economy mode contacts: for remote activation of economy mode (when DIPB SW1=0).	
	Float switch	Float	Voltage-free (NC)	
	Electrical heater safety switch	EH	Voltage-free (NC). The contact is closed before the EH is turned on.	
Power input	Phase	L1	Power supply to the PCB and all the loads connected to the voltage outputs. Max length: 16.4ft.	
	Neutral	N1	Power supply to the PCB and all the loads connected to the voltage outputs. Max length: 16.4ft.	
	Earth	PE1	Power supply to the PCB and all the loads connected to the voltage outputs. Max length: 16.4ft.	
Voltage output	Fan 1	CN4	Fan 1 driver	
	Fan2	CN5	Fan 2 driver and motor connection port.	
	Valve1	MTV1	2-pipe coil circuit valve output – chilled / hot water valve. Voltage output (L)	4-pipe coil circuit valve output – chilled water valve. Voltage output (L)
	Valve2	MTV2	Reserved	4-pipe coil circuit valve output – hot water valve. Voltage output (L)
	Water pump	WP	Power supply to condensate pump Voltage output (L)	
	Voltage of electrical heater (Live)	L-EH	Voltage output (L), maximum 30A [See wiring diagram, cross check with supplier].	
	Stepping motor	CN1-2	Power supply to louver stepping motors Voltage output (L)	



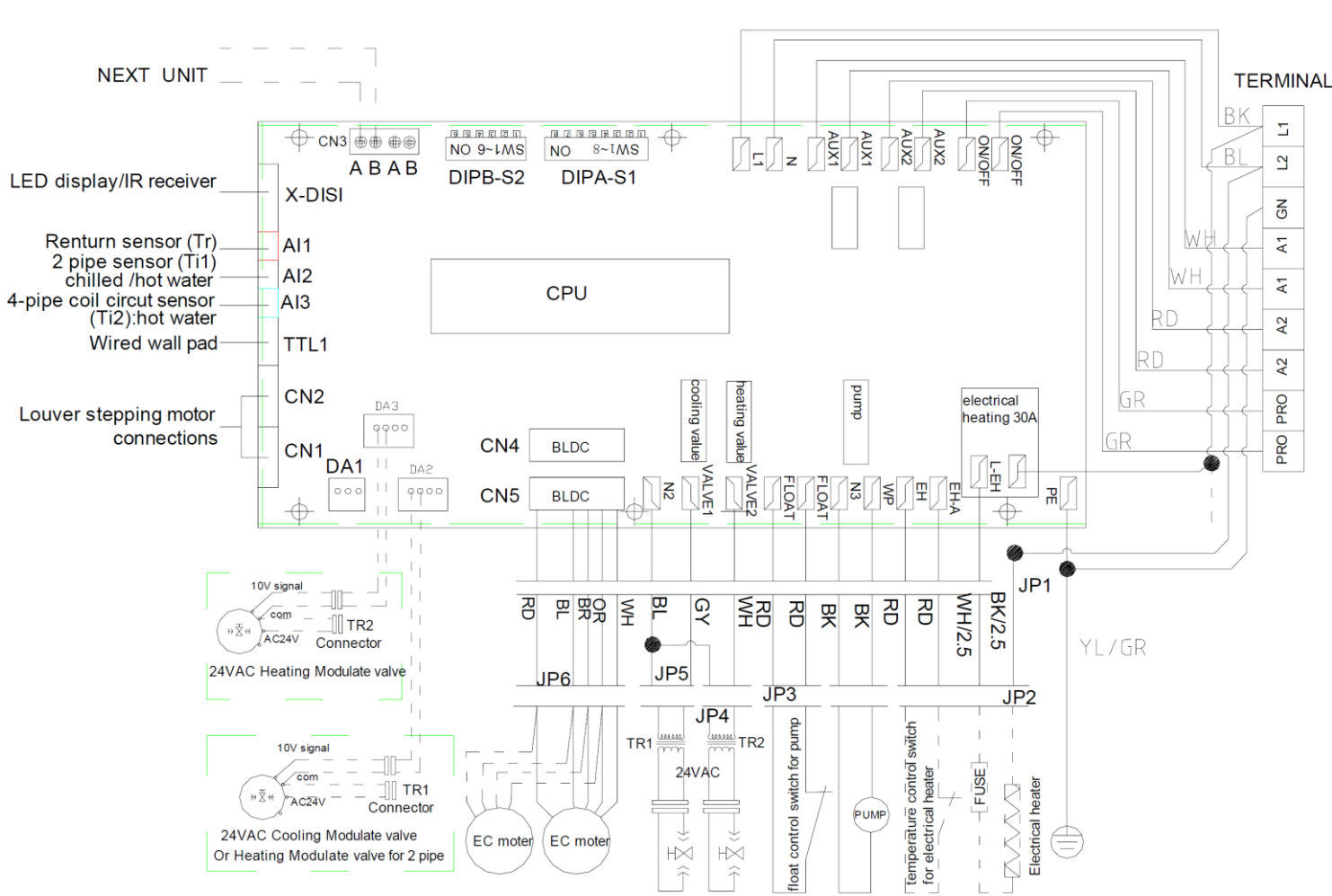
I/O	Code	2-Pipe			
Output	Auxiliary contact 2	AUX2	Cooling mode signal relay (NO). Voltage free contact. To ensure the sensitivity of the connection, please make sure max wiring length < 98.4ft.		
	Auxiliary contact 1	AUX1	Heating mode signal switch (NO). Voltage free contact. To ensure the sensitivity of the connection, please make sure max wiring length < 98.4ft.		
	Serial BUS port	CN3	Master-slave network serial connection OR MODBUS / local PC host network serial connection.		
	24VAC power input	DA1	24VAC external power supply (modulating valve applications only).		
	Modulating valve output 1	DA2	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">Connection to DC modulating valve on 2-pipe coil circuit - chilled / hot water.</td> <td style="width: 50%; padding: 2px;">Connection to DC modulating valve on 4-pipe coil circuit - chilled water.</td> </tr> </table>	Connection to DC modulating valve on 2-pipe coil circuit - chilled / hot water.	Connection to DC modulating valve on 4-pipe coil circuit - chilled water.
Connection to DC modulating valve on 2-pipe coil circuit - chilled / hot water.	Connection to DC modulating valve on 4-pipe coil circuit - chilled water.				
	Modulating valve output 2	DA3	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">N/A</td> <td style="width: 50%; padding: 2px;">Connection to DC modulating valve on 4-pipe coil circuit - hot water.</td> </tr> </table>	N/A	Connection to DC modulating valve on 4-pipe coil circuit - hot water.
N/A	Connection to DC modulating valve on 4-pipe coil circuit - hot water.				

## C.2. Wiring Diagram

SKUSA-NCGH-001-AECM, ~S Configuration: Full Control PCB:

# Unit wiring scheme

UW2



**DIPA-S1**

- SW1-5: set the unit address
- SW6 :set unit type .master or slave

**Mode Configuration**

- SW7=0;SW8=0; unit operates in cooling/heating
- SW7=0;SW8=1; unit operates in cooling/heating w/booster EH
- SW7=1;SW8=0 ; unit operates in cooling
- SW7=1;SW8=1; unit operates in cooling with primary EH

**DIPB-S2**

- SW1:Occupancy connect setting (see section 2.B.2)
- SW2: Unit configuration setting: 0=2pipe system;1=4-pipe system)
- SW3:on/off valve configuration:0= no valve 1=with valve (applicable to 2 pipe system only)
- SW4:preheat setting:0=36C;1=28C
- SW5:Fan1(CN4)configuration setting :0=Fan1 OFF;1=Fan1 ON .
- SW6:Fan2(CN5)configuration setting :0=Fan2 OFF;1=Fan1 ON .

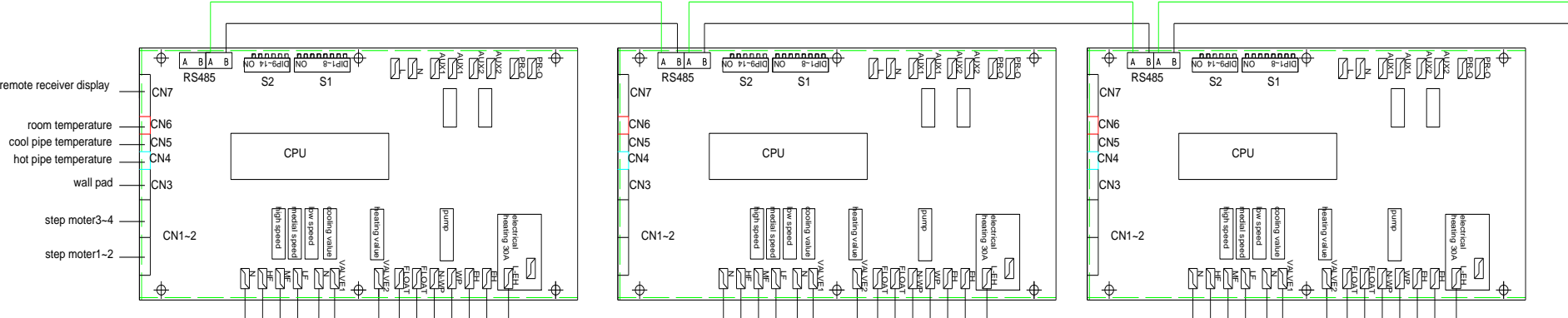
**L1 L2----**Power supply

- VALVE1: 24V on/off valve output (2pipe :cooling/heating ; (4pipe:cooling)
- VALVE2: 24V on/off valve output.; (4-pipe only:heating)
- WP: condensate pump output
- A1:Voltage free contact;ON:unit in heating mode.
- A2:Voltage free contact;ON:unit in cooling mode.
- PRO:Occupancy contact
- CN1~2:Stepping motor output.
- CN3:Serial BUS contact
- CN4:Fan motor 1 output
- CN5:Fan motor 2 output
- A11:Return air temperature sensor(Tr)
- A12:Indoor coil temperature sensor1 (Ti1)
- A13:Indoor coil temoeraturesensor 2 (Ti2)
- X-DISI-----LED receiver output
- DA1-24VAC input for modulating valves.
- DA2-modulating valve 1 output(0-10V modulating signal). (2-pipe:Cooling/Heating) (4-pipe:Cooling)
- DA3-modulating valve 1 output(0-10V modulating signal).(4-pipe only:heating)

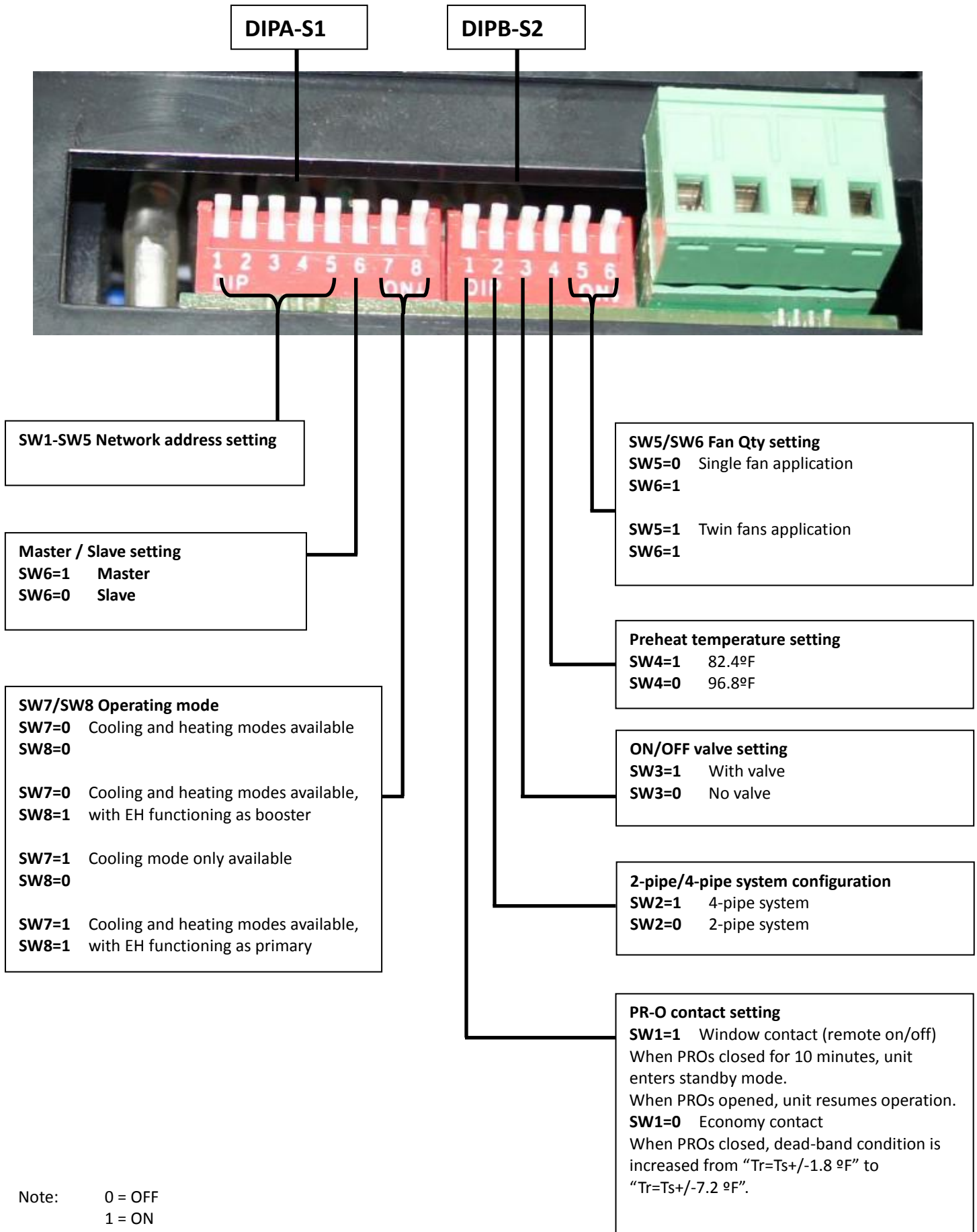
Master slave networking wiring diagram:

Master unit

TO slave unit



### C.3. Configuration Settings



## UNIT ON/OFF

There are 3 ways to turn the system on or off:

- a) By the ON/OFF button on the remote handset or wired wall pad.
- b) By the programmable timer on the handset or wired wall pad.
- c) By the manual control button on the unit.

## AUTO-RESTART

The system uses a non-volatile memory to save the present operation parameters when system is turned off or in case of system failure or cessation of power supply.

The restored parameter data-set depends on the type of user interface.

- a) Handset only user interface:

When the power on signal is received by the unit and no wired wall-pad is installed, the Mode, Fan Speed, Set temperature and Louver/Swing setting will be the same as the handset setting before the last power off.

- b) Wall-pad only OR wall-pad and handset user interface:

When the power on signal is received by the unit and a wired wall-pad is installed, the Mode, Fan Speed, Set temperature, Louver/Swing setting and Timer ON/OFF weekly program will be the same as the wall pad setting before the last power off.

## C.4. Control Logics For 2-Pipe System

### C.4.1. With Valve Configuration

#### COOL MODE

- a) MTV2, AUX1 and electric heater are always off.
- b) If  $T_r \geq T_s + 1.8^\circ\text{F}$  (or  $+ 7.2^\circ\text{F}$  if economy contact is activated), then cool operation is activated and MTV1 and AUX2 are turned on. Indoor fan runs at set speed.
- c) If  $T_r < T_s$ , cool operation is terminated and MTV1 and AUX2 are turned off. Then indoor fan runs at set speed.
- d) The range of  $T_s$  is  $60.8 - 86^\circ\text{F}$
- e) Indoor fan speed can be adjusted to low, medium, high and auto.
- f) When turned on, MTV1 requires 30 seconds before it is fully open.
- g) When turned off, MTV1 requires 120 seconds before it is fully closed.
- h) When the unit is turned off, the indoor fan will shut down after 5 seconds.

#### LOW TEMPERATURE PROTECTION OF INDOOR COIL

- a) If  $T_{i1} \leq 35.6^\circ\text{F}$  for 2 minutes, then MTV1 and AUX2 are turned off. If indoor fan is set for low speed, then it will run at medium speed. If it is set at medium or high speed, then it will keep running at the same speed.
- b) If  $T_{i1} \geq 41^\circ\text{F}$  for 2 minutes, then MTV1 and AUX2 are turned on. Indoor fan runs at set speed.

#### FAN MODE

- a) Indoor fan runs at the set speed while heater, MTV1, MTV2, AUX1 and AUX2 are turned off.
- b) Indoor fan speed can be adjusted to low, medium and high.

## HEAT MODE

### Heat mode without electrical heater

- a) MTV2, AUX2 and electric heater are always off.
- b) If  $Tr \leq Ts - 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated), then heat operation is activated and MTV1 and AUX1 are turned on. Indoor fan runs at the set speed.
- c) If  $Tr > Ts$ , then heat operation is terminated and MTV1 and AUX1 are turned off. Indoor fan runs at 200rpm.
- d) The range of  $Ts$  is  $60.8 - 86^{\circ}F$ .
- e) Indoor fan speed can be adjusted to low, medium, high and auto.
- f) When turned on, MTV1 requires 30 seconds before it is fully open.
- g) When turned off, MTV1 requires 120 seconds before it is fully closed.

### Heat mode with electrical heater as booster

- a) MTV2 and AUX2 are always off.
- b) If  $Tr \leq Ts - 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated), then heat operation is activated and MTV1 and AUX1 are turned on. Indoor fan runs at the set speed.
- c) If  $Tr > Ts$ , then heat operation is terminated and MTV1 and AUX1 are turned off. Indoor fan runs at 200rpm
- d) If  $Ti1 < 104^{\circ}F$ , then the electrical heater is turned on. If  $104^{\circ}F \leq Ti1 < 113^{\circ}F$ , then the electrical heater maintains its original state. If  $Ti1 \geq 113^{\circ}F$ , then the electrical heater is turned off.
- e) The range of  $Ts$  is  $60.8 - 86^{\circ}F$
- f) Indoor fan speed can be adjusted for low, medium, high and auto.
- g) When turned on, MTV1 requires 30 seconds before it is fully open.
- h) When turned off, MTV1 requires 120 seconds before it is fully closed.

### Heat mode with electrical heater as primary heat source

- a) MTV1, MTV2, and AUX2 are always off
- b) If  $Ti2 \leq 86^{\circ}F$  (or  $Ti2$  is damaged or disconnected), AND if  $Tr \leq Ts - 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated), then heat operation is activated and the electrical heater and AUX1 are turned on. Indoor fan runs at set speed.
- c) If  $Tr > Ts$ , then heat operation is terminated and the electrical heater and AUX 1 are turned off. Indoor fan runs at 200rpm.
- d) The range of  $Ts$  is  $60.8 - 86^{\circ}F$
- e) Indoor fan speed can be adjusted to low, medium, high and auto.

### Over-heat protection of indoor coil in heat mode

- a) If  $Ti1 \geq 167^{\circ}F$ , then MTV1, AUX2 and EH are turned off, then the indoor fan runs at high speed, even in standby mode.
- b) If  $Ti1 < 158^{\circ}F$ , then the unit will maintains its original state.
- c) If the indoor coil temperature sensor is damaged, then the protection mode will be overridden and the pre-heat and post-heat set times will be used instead.

## PRE-HEAT

### Pre-heat without electrical heater

- a) If  $T_{i1} < 96.8^{\circ}\text{F}$  [or  $< 82.4^{\circ}\text{F}$  is selected by DIPB-S2 position SW4], then MTV1 and AUX1 are turned on, indoor fan runs at 200rpm.
- b) If  $T_{i1} \geq 100.4^{\circ}\text{F}$  [or  $\geq 86^{\circ}\text{F}$  is selected by DIPB-S2 position SW4], then MTV1 and AUX1 are turned on, indoor fan runs at set speed.
- c) If the indoor coil temperature sensor is damaged, then the pre-heat time is set for 2 minutes. Indoor fan runs at set speed.

### Pre-heat with electrical heater

- a) If the indoor fan speed  $\geq 300\text{rpm}$ , then the electrical heater will turn on.

## POST-HEAT

### Post-heat without electrical heater

- a) If  $T_{i1} \geq 100.4^{\circ}\text{F}$ , then MTV1 and AUX 1 are off. then indoor fan continues to run at set speed.
- b) If  $96.8^{\circ}\text{F} \leq T_{i1} \leq 100.4^{\circ}\text{F}$ , then MTV1 and AUX1 are turned off. Indoor fan maintains its original state.
- c) If  $T_{i1} < 96.8^{\circ}\text{F}$ , then MTV1 and AUX1 are turned off. Indoor fan runs at 200rpm.
- d) If the indoor coil temperature sensor is damaged, then the post-heat time is set for 3 minutes. Indoor fan runs at set speed.

### Post-heat with electrical heater

- a) Indoor fan will run at 200rpm before the unit turns off for 20 seconds.

### Over-heat protection of indoor coil in post-heat

- a) If  $T_{i1} \geq 167^{\circ}\text{F}$ , then MTV1 and AUX1 are turned off. Indoor fan remains on and runs at high speed.
- b) If  $T_{i1} < 158^{\circ}\text{F}$ , then MTV1 and AUX1 are turned on. Indoor fan remains on and runs at set speed.
- c) If the indoor coil temperature sensor is damaged, then the protection mode will be overridden and the unit will work according to the pre-heat and post-heat program.

## DEHUMIDIFICATION MODE

- a) MTV2, AUX1 and heater are always off.
- b) If  $T_r \geq 77^{\circ}\text{F}$ , then MTV1 and AUX2 will be ON for 3 minutes, and then OFF for 4 minutes.
- c) If  $60.8^{\circ}\text{F} \leq T_r < 77^{\circ}\text{F}$ , then MTV1 and AUX2 will be ON for 3 minutes, and then OFF for 6 minutes.
- d) If  $T_r < 60.8^{\circ}\text{F}$ , then MTV1 and AUX2 will be turned off for 4 minutes.
- e) At the end of the above dehumidification cycle, the system will decide the next dehumidification control option. Indoor fan will run at low speed throughout the dehumidification process.

## AUTOMODE

### Auto cool/heat/heat with electric heater as booster

Every time the unit is turned on, MTV1 is on, AUX1, AUX2 and fan are off. MTV2 and heater are always off.

After 120sec, the subsequent operation mode is decided according to the following programs:

- a) If the coil temperature sensor ( $T_{i1}$ )  $\geq 96.8^{\circ}\text{F}$ , then MTV1, AUX1 and fan turn on or off according to HEAT mode.
- b) If  $T_{i1} < 96.8^{\circ}\text{F}$ , then MTV1, then AUX2 and fan turn on or off according to COOL mode.  
Unit remains in AUTO COOL or AUTO HEAT mode throughout the operating cycle until the user changes the mode manually or restarts the unit.

Should the  $T_{i1}$  sensor be damaged, auto mode will not function.

### Auto heat with electric heater as primary heat source / all configuration auto changeover

If the current running mode is auto cool mode, then the control logic will change over to auto heat mode when all the following conditions are met:

- a)  $T_s - T_r \geq 1.8^{\circ}\text{F}$  (or  $7.2^{\circ}\text{F}$  if economy contact is activated)
- b) MTV1 has stopped  $\geq 10$  min.

If the current running mode is auto heat mode, then the control logic will change over to auto cool mode when all the following conditions are met:

- a)  $T_r - T_s \geq 1.8^{\circ}\text{F}$  (or  $7.2^{\circ}\text{F}$  if economy contact is activated)
- b) MTV1 has stopped  $\geq 10$  min.

Note: Auto cool or auto heat operation are the same as cool or heat mode respectively.

## C.4.2. Without Valve Configuration

### COOL MODE

- a) Electric heater, AUX1, MTV1 and MTV2 are always off.
- b) If  $T_r \geq T_s + 1.8^{\circ}\text{F}$  (or  $+ 7.2^{\circ}\text{F}$  if economy contact is activated), then cool operation is activated and AUX2 is turned on. Indoor fan runs at set speed.
- c) If  $T_r < T_s$ , then cool operation is terminated and AUX2 is turned off. Indoor fan is turned off.
- d) The range of  $T_s$  is  $60.8 - 86^{\circ}\text{F}$
- e) Indoor fan speed can be adjusted to low, medium, high and auto.

Note: When the unit is turned off, the indoor fan shut down after 5 seconds.

### LOW TEMPERATURE PROTECTION OF INDOOR COIL

- a) If  $T_{i1} \leq 35.6^{\circ}\text{F}$  for 2 minutes, then AUX2 is turned off. If low speed is selected via user interface, then indoor fan runs at medium speed. If medium or high speed is selected via user interface, then indoor fan runs at set speed.
- b) If  $T_{i1} \geq 41^{\circ}\text{F}$  for 2 minutes, then AUX2 is turned on. Indoor fan runs at set speed.



## FAN MODE

- a) Indoor fan runs at the set speed while heater, AUX1, AUX2, MTV1 and MTV2 are turned off.
- b) Indoor fan speed can be adjusted to low, medium and high.

## HEAT MODE

### Heat mode without electrical heater

- a) MTV1, MTV2, AUX2 and heater are always off.
- b) If  $T_r \leq T_s - 1.8^\circ\text{F}$  (or  $- 7.2^\circ\text{F}$  if economy contact is activated), then heat operation is activated and AUX1 is turned on. Indoor fan runs at the set speed.
- c) If  $T_r > T_s$ , then heat operation is terminated and AUX1 is turned off. Indoor fan runs at 200rpm.
- d) The range of  $T_s$  is 60.8 - 86°F.
- e) Indoor fan speed can be adjusted to low, medium, high and auto.

### Heat mode with electrical heater as booster

- a) MTV1, MTV2 and AUX2 are always off.
- b) If  $T_r \leq T_s - 1.8^\circ\text{F}$  (or  $- 7.2^\circ\text{F}$  if economy contact is activated), then heat operation is activated and AUX1 is turned on. Indoor fan runs at the set speed.
- c) If  $T_r > T_s$ , then heat operation is terminated and AUX1 is turned off. Indoor fan runs at 200 rpm.
- d) If  $T_{i1} < 104^\circ\text{F}$ , then the electrical heater is turned on. If  $104^\circ\text{F} \leq T_{i1} < 113^\circ\text{F}$ , then the electrical heater maintains its original state. If  $T_{i1} \geq 113^\circ\text{F}$ , then the electrical heater is turned off.
- e) The range of  $T_s$  is 60.8 - 86°F.
- f) Indoor fan speed can be adjusted to low, medium, high and auto.

### Heat mode with electrical heater as primary heat source

- a) MTV1, MTV2 and AUX2 are off.
- b) If  $T_{i1} < 96.8^\circ\text{F}$  [or  $82.4^\circ\text{F}$  is selected by DIPB-S2 position SW4], then AUX1 is on while indoor fan remains off.
- c) If  $T_{i1} \geq 100.4^\circ\text{F}$  [or  $86^\circ\text{F}$  is selected by DIPB-S2 position SW4], then AUX1 is on while indoor fan runs at set speed.
- d) If the indoor coil temperature sensor is damaged, then the pre-heat time is set for 2 minutes. Indoor fan runs at set speed.

## PRE-HEAT

### Pre-heat with electrical heater

- a) Indoor fan will start after the electrical heater has been turned on for 10 sec.

## POST-HEAT

### Post-heat with and without electrical heater

- a) AUX1 is off. Electrical heater is turned off.
- b) Indoor fan will stop after the unit has been turned off for 20sec.

#### Over heat protection of indoor coil in post-heat

- a) If  $T_{i1} \geq 167^{\circ}\text{F}$ , then AUX1 is turned off, indoor fan remains on and runs at high speed.
- b) If  $T_{i1} < 158^{\circ}\text{F}$ , then AUX1 is turned on, indoor fan remains on and runs at set speed.
- c) If the indoor coil temperature sensor is damaged, then the protection mode will be overridden and the unit will work according to the pre-heat and post-heat program.

#### DEHUMIDIFICATION MODE

- a) MTV1, MTV2, AUX1 and heater are always off.
- b) If  $T_r \geq 77^{\circ}\text{F}$ , then indoor fan and AUX2 will be ON for 3 minutes, and then OFF for 4 minutes.
- c) If  $60.8^{\circ}\text{F} \leq T_r < 77^{\circ}\text{F}$ , then indoor fan and AUX2 will be ON for 3 minutes, and then OFF for 6 minutes.
- d) If  $T_r < 60.8^{\circ}\text{F}$ , then indoor fan and AUX2 will be turned off for 4 minutes.
- e) At the end of the above dehumidification cycle, the system will decide the next dehumidification control option. Indoor fan will run at low speed throughout the dehumidification process.

#### AUTOMODE

Not allowed.

## C.5. Control Logics For 4-Pipe System

Note: 4-pipe system must always be equipped with 2 valves.

### COOL MODE

- a) MTV2, AUX1 and Electrical Heater are always off.
- b) If  $Tr \geq Ts + 1.8^{\circ}F$  (or  $+ 7.2^{\circ}F$  if economy contact is activated), then cool operation is activated, MTV1 and AUX2 are turned on. Indoor fan runs at set speed.
- c) If  $Tr < Ts$ , then cool operation is terminated, MTV1 and AUX2 are turned off. Indoor fan runs at set speed.
- d) The range of  $Ts$  is  $60.8 - 86^{\circ}F$
- e) Indoor fan speed can be adjusted to low, medium, high and auto.
- f) When turned on, MTV1 requires 30 seconds before it is fully open.
- g) When turned off, MTV1 requires 120 seconds before it is fully closed.
- h) When the unit is turned off, the indoor fan will shut down after 5 seconds.

### LOW TEMPERATURE PROTECTION OF INDOOR COIL

- a) If  $Ti1 \leq 35.6^{\circ}F$  for 2 minutes, then MTV1 and AUX2 are turned off. If indoor fan is set for low speed, then it will run at medium speed. If it is set at medium or high speed, then it will keep running at the same speed.
- b) If  $Ti1 \geq 41^{\circ}F$  for 2 minutes, then MTV1 and AUX2 are turned on. Indoor fan runs at set speed.

### FAN MODE

- a) Indoor fan runs at the set speed while heater, MTV1, MTV2, AUX1 and AUX2 are turned off.
- b) Indoor fan speed can be adjusted to low, medium and high.

### HEAT MODE

#### *Without Electrical Heater*

- a) MTV1, AUX2 and are heater always off.
- b) If  $Tr \leq Ts - 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated), then heat operation is activated, MTV2 and AUX1 are turned on. Indoor fan runs at the set speed.
- c) If  $Tr > Ts$ , then heat operation is terminated, MTV2 and AUX1 are turned off. Indoor fan runs at 200rpm.
- d) The range of  $Ts$  is  $60.8 - 86^{\circ}F$ .
- e) Indoor fan speed can be adjusted to low, medium, high and auto.
- f) When turned on, MTV2 requires 30 seconds before it is fully open.
- g) When turned off, MTV2 requires 120 seconds before it is fully closed.

#### *With Electrical Heater as Booster*

- a) MTV1 and AUX2 are always off.
- b) If  $Tr \leq Ts - 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated), then heat operation is activated, MTV2 and AUX1 are turned on. Indoor fan runs at the set speed.
- c) If  $Tr > Ts$ , then heat operation is terminated, MTV2 and AUX1 are turned off. Indoor fan runs at 200rpm.
- d) If  $Ti2 < 104^{\circ}F$ , then the electrical heater is turned on. If  $104^{\circ}F \leq Ti2 < 113^{\circ}F$ , then the electrical heater maintains its original state. If  $Ti2 \geq 113^{\circ}F$ , then the electrical heater is turned off.
- e) The range of  $Ts$  is  $60.8 - 86^{\circ}F$
- f) Indoor fan speed can be adjusted to low, medium, high and auto.
- g) When turned on, MTV2 requires 30 seconds before it is fully open.
- h) When turned off, MTV2 requires 120 seconds before it is full closed.

## PRE-HEAT

### *Without Electrical Heater*

- a) If  $Ti2 < 96.8^{\circ}F$  [or  $82.4^{\circ}F$  depends on DIP setting], then MTV2 and AUX1 are on, indoor fan remains off.
- b) If  $Ti2 \geq 100.4^{\circ}F$  [or  $86^{\circ}F$  depends on DIP setting], then MTV2 and AUX1 are on, indoor fan runs at set speed.
- c) If indoor coil temperature sensor is damaged, then pre-heat time is set for 2 minutes and indoor fan runs at set speed.

### *With Electrical Heater*

- a) If indoor fan speed  $\geq 300$  rpm, then the electrical heater is turned on

## POST HEAT

### *Without Electrical Heater*

- a) If  $Ti2 \geq 100.4^{\circ}F$ , then MTV2 and AUX 1 are turned off. Indoor fan continues to run at set speed.
- b) If  $96.8^{\circ}F \leq Ti2 \leq 100.4^{\circ}F$ , then MTV2 and AUX1 are turned off. Indoor fan maintains its original state.
- c) If  $Ti2 < 96.8^{\circ}F$ , then MTV2 and AUX1 are turned off. Indoor fan runs at 200 rpm.
- d) If the indoor coil temperature coil is damaged, then post-heat time is set for 3 minutes. Indoor fan runs at set speed.

### *With Electrical Heater*

- a) Indoor fan will shut down after the unit has been turned off for 20 seconds.

## OVER HEAT PROTECTION OF INDOOR COIL

- a) If  $Ti2 \geq 167^{\circ}F$ , then MTV2 and AUX1 are turned off, indoor fan remains on and runs at high speed.
- b) If  $Ti2 < 158^{\circ}F$ , then MTV2 and AUX1 are turned on, indoor fan remains on and runs at set speed.
- c) If the indoor coil temperature sensor is damaged, then the protection mode will be overridden and the unit will work according to the pre-heat and post heat set times.

## DEHUMIDIFICATION MODE

- a) MTV2, AUX1 and heater are always off.
- b) If  $Tr \geq 77^{\circ}F$ , then MTV1 and AUX2 will be ON for 3 minutes, and then OFF for 4 minutes.
- c) If  $60.8^{\circ}F \leq Tr < 77^{\circ}F$ , then MTV1 and AUX2 will be ON for 3 minutes, and then OFF for 6 minutes.
- d) If  $Tr < 60.8^{\circ}F$ , then MTV1 and AUX2 will be turned off for 4 minutes.
- e) At the end of the above dehumidification cycle, the system will decide the next dehumidification control option. Indoor fan will run at low speed throughout the dehumidification process.

## AUTOMODE

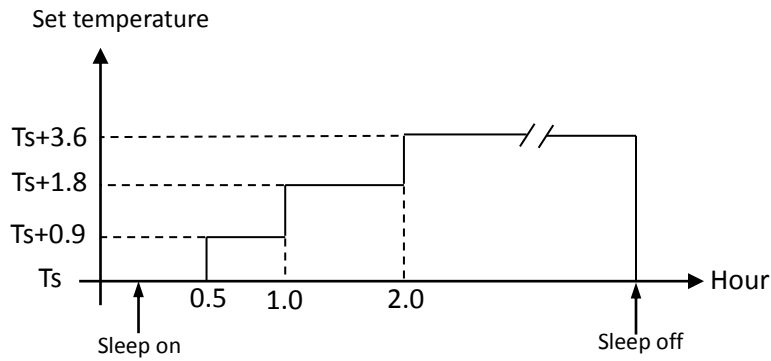
- a) If the current running mode is AUTO COOL mode, it will change over to AUTO HEAT mode when all the following conditions are met:
  - i.  $Ts - Tr \geq 1.8^{\circ}F$  (or  $- 7.2^{\circ}F$  if economy contact is activated)
  - ii. MTV1 has closed  $\geq 10$  min.
- b) If the current running mode is AUTO HEAT mode, it will change over to AUTO COOL mode when all the following conditions are met:
  - i.  $Tr - Ts \geq 1.8^{\circ}F$  (or  $+ 7.2^{\circ}F$  if economy contact is activated)
  - ii. MTV2 has closed  $\geq 10$  min.

Note: AUTO COOL or AUTO HEAT operations are the same as COOL or HEAT mode respectively.

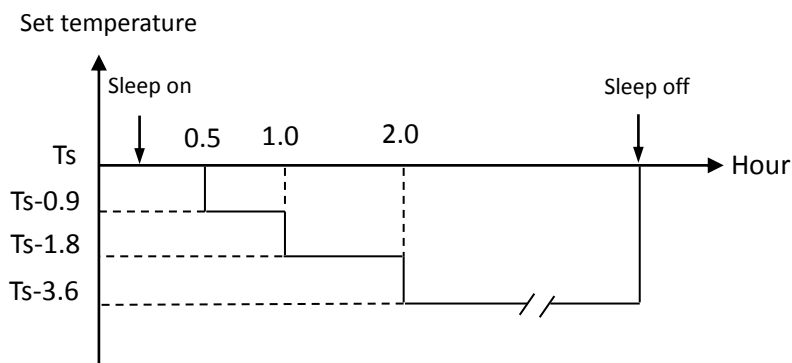
## C.6. Sleep Mode

- The sleep mode can only be set when the unit is in cool mode or heat mode.
- If the sleep mode is activated when the unit is in cool mode, then the indoor fan will run at low speed and  $T_s$  will increase by  $3.6^{\circ}\text{F}$  over 2 hours.
- If the sleep mode is activated when the unit is in heat mode, then the indoor fan will run at set speed and  $T_s$  will decrease by  $3.6^{\circ}\text{F}$  over 2 hours.
- Changing the mode of operation will cancel the sleep mode.

*The cool mode sleep profile is:*



*The heat mode sleep profile is:*

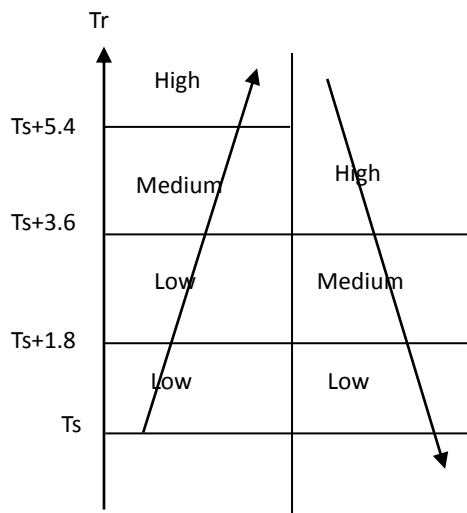


## C.7. Auto Fan Speed

### COOL MODE

Fan speed cannot change until it has run for more than 30 seconds.

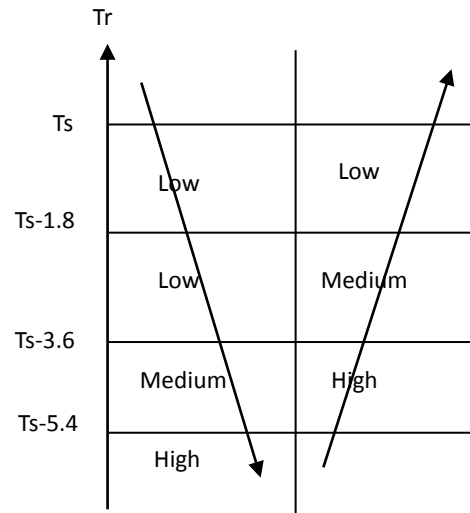
Fan speed is regulated according to the profile below.



### HEAT MODE

Fan speed cannot change until it has run for more than 30 seconds.

Fan speed is regulated according to the profile below.



After 30 seconds the fan speed is modulated according to the difference between the room temperature and the set temperature. The controller adjusts the motor signal input from 0 to 5VDC by PID calculation every 10 seconds. The air flow is adjusted from 15% to 100%.

## C.8. Modulating Valve Control Under Energy Saving Mode

If the modulating valve is used, the water flow is adjusted from 0 to 100% according to the room temperature and set temperature. The controller adjusts the modulating valve signal input from 0 to 10VDC by PID calculation every 10 seconds.

## C.9. Swing / Louver

For remote handset operation

Whenever indoor fan is running, louver can swing or stop at the desired position.

Louver angle: 0~100°, opens clockwise with widest angle at 100°.

Swing angle: 35~100°, opens clockwise to 68°. Below are the 4 fixed positions which can be set from wireless LCD handset.

Position	Angle against vertical
1	35°
2	57°
3	83°
4	100°

For wired wall pad operation

Louver angle: 0~100°, opens clockwise with widest angle at 100°.

Swing angle: 35~100°, opens clockwise to 68°. User may stop louver at any desired position between 35~100°.

## C.10. Buzzer

If a command is received by the air conditioner, the master unit will respond with 2 beeps for each setting, while the slave unit will respond with 1 beep.

## C.11. Auto Restart

The system uses non-volatile memory to save the present operation parameters when system is turned off or in case of system failure or cessation of power supply. Operation parameters are mode, set temperature, swing louver's position, and the fan speed. When power supply resumes or the system is switched on again, the same operations as previously set will function.

## C.12. On/Off Switch On The Front Panel

- This is a tactile switch to select Cool→Heat→Off operation mode.
- In COOL mode, the set temperature of the system is 75.2°F with auto fan speed and swing. There are no timer and sleep modes.
- In HEAT mode, the set temperature of the system is 75.2°F with auto fan speed and swing. There are no timer and sleep modes.
- Master unit that does not use a wall pad will globally broadcast.

### **NOTE**

*When button pressing is effective, the master unit buzzer will beep twice and the slave unit will beep once.*

## C.13. Drain Pump

- Drain pump turns ON if the thermostat cuts in activates during cooling or dehumidification cycle. It remains on for at least 5 minutes after the thermostat cuts out activates. During mode change from cooling to non cooling mode, water pump will turn on for a minimum of 5 minutes.

### **WARNING!**

*If the system is turned off at the circuit breaker (or main power supply), the drain pump will not work.*

## C.14. Float Switch

Float-switch opens before unit is turned on.

If the float switch (N/C) is opened before the unit is turned on, then MTV1 is turned off. The drain pump and indoor fan will operate. After float switch is closed, MTV1 is turned on.

Float switch is opened, when unit is turned on.

If the float switch is opened continuously  $\geq 5$  seconds, then the drain pump will work and MTV1 will remain off. After the float switch is closed, the drain pump will run for an additional 5 minutes. If the float switch is opened for 10 minutes continuously, then MTV1 will remain off. The indoor fan runs at set speed and the system reports an error.

Float switch is opened, when unit is turned off.

If the float switch is opened, then the drain pump will work. After the float switch is closed, the drain pump will run for an additional 5 minutes. If the float switch is opened for 10 minutes continuously, then the system reports an error.

## C.15. Electric Heater Safety Switch

- Before the electrical heater is turned on, the EH safety switch must be closed and the fan RPM be more than 300RPM. If this contact is opened for  $\geq 1$  second or the fan RPM is less than 300RPM, the heater will be turned off immediately and report an error. Once the contact is returned to close position  $\geq 60$  seconds, reset the error and the heater will start again.
- When EH safety switch is opened  $\geq 3$  times within 60 minutes, the heater is not allowed to start anymore. Turn off the unit to reset the fault, provided that the switch has returned to the closed position.



## C.16. LED Indication and Error Description



SKUSA-NCGH-001-AECM		
Fan speed setting	LED indication	Condition
High speed	Red LED On	Normal
Medium speed	Yellow LED On	Normal
Low speed	Green LED On	Normal

For all units - Green LED			
Error Description	Blink	Reason	Remedy
Electrical heater failure	Green LED blinks 1 times, stops 3 secs	<i>Only for unit with EH.</i> EH safety switch is opened.	<ol style="list-style-type: none"> <li>1. Change fan speed to high.</li> <li>2. Replace the damaged EH safety switch.</li> </ol>
Indoor coil sensor 2 failure	Green LED blinks 2 times, stops 3 secs	Ti2 sensor unplugged or damaged.	<ol style="list-style-type: none"> <li>1. Check if Ti2 plug is connected or not.</li> <li>2. Check if sensor's resistance is correct or not.</li> </ol>
Return air sensor failure	Green LED blinks 3 times, stops 3 secs	Room sensor unplugged or damaged.	<ol style="list-style-type: none"> <li>1. Check if Tr plug is connected or not.</li> <li>2. Check if sensor's resistance is correct or not.</li> </ol>
Indoor coil sensor 1 failure	Green LED blinks 4 times, stops 3 secs	Ti1 sensor unplugged or damaged.	<ol style="list-style-type: none"> <li>1. Check if Ti1 plug is connected or not.</li> <li>2. Check if sensor's resistance is correct or not.</li> </ol>
Indoor coil low temperature protection	Green LED blinks 5 times, stops 3 secs	Water temperature is lower than 37.4°F.	Check the water temperature.
Indoor coil over heat protection	Green LED blinks 6 times, stops 3 secs	Water temperature is higher than 158°F.	Check the water temperature
Water pump failure	Green LED blinks 7 times, stops 3 secs	Float switch is opened.	<ol style="list-style-type: none"> <li>1. Check if the condensate water pipe is connected or not.</li> <li>2. Check if the pump is functioning or not.</li> </ol>
EC motor failure	Green LED blinks 9 times, stops 3 secs	No EC motor feedback	<ol style="list-style-type: none"> <li>1. Check DIPB-SW5 and SW6 setting.</li> <li>2. Check the EC motor.</li> </ol>

## C.17. LED indication on Master/Slave connection

For master unit indicating defect status of all slave units. Error message can be found in LED lights on master unit.

Master unit LED		
Unit No.	Blink	Remedy
Unit 2 failure	RED LED blinks 2 times, stop 3 sec	Check unit 2 communication plug and fix it
Unit 3 failure	RED LED blinks 3 times, stop 3 sec	Check unit 3 communication plug and fix it
Unit 4 failure	RED LED blinks 4 times, stop 3 sec	Check unit 4 communication plug and fix it
Unit 5 failure	RED LED blinks 5 times, stop 3 sec	Check unit 5 communication plug and fix it
Unit 6 failure	RED LED blinks 6 times, stop 3 sec	Check unit 6 communication plug and fix it
Unit 7 failure	RED LED blinks 7 times, stop 3 sec	Check unit 7 communication plug and fix it
Unit 8 failure	RED LED blinks 8 times, stop 3 sec	Check unit 8 communication plug and fix it
Unit 9 failure	RED LED blinks 9 times, stop 3 sec	Check unit 9 communication plug and fix it
Unit 10 failure	RED LED blinks 10 times, stop 3 sec	Check unit 10 communication plug and fix it
Unit 11 failure	RED LED blinks 11 times, stop 3 sec	Check unit 11 communication plug and fix it
Unit 12 failure	RED LED blinks 12 times, stop 3 sec	Check unit 12 communication plug and fix it
Unit 13 failure	RED LED blinks 13 times, stop 3 sec	Check unit 13 communication plug and fix it
Unit 14 failure	RED LED blinks 14 times, stop 3 sec	Check unit 14 communication plug and fix it
Unit 15 failure	RED LED blinks 15 times, stop 3 sec	Check unit 15 communication plug and fix it
Unit 16 failure	RED LED blinks 16 times, stop 3 sec	Check unit 16 communication plug and fix it
Unit 17 failure	RED LED blinks 17 times, stop 3 sec	Check unit 17 communication plug and fix it
Unit 18 failure	RED LED blinks 18 times, stop 3 sec	Check unit 18 communication plug and fix it
Unit 19 failure	RED LED blinks 19 times, stop 3 sec	Check unit 19 communication plug and fix it
Unit 20 failure	RED LED blinks 20 times, stop 3 sec	Check unit 20 communication plug and fix it
Unit 21 failure	RED LED blinks 21 times, stop 3 sec	Check unit 21 communication plug and fix it
Unit 22 failure	RED LED blinks 22 times, stop 3 sec	Check unit 22 communication plug and fix it
Unit 23 failure	RED LED blinks 23 times, stop 3 sec	Check unit 23 communication plug and fix it
Unit 24 failure	RED LED blinks 24 times, stop 3 sec	Check unit 24 communication plug and fix it
Unit 25 failure	RED LED blinks 25 times, stop 3 sec	Check unit 25 communication plug and fix it
Unit 26 failure	RED LED blinks 26 times, stop 3 sec	Check unit 26 communication plug and fix it
Unit 27 failure	RED LED blinks 27 times, stop 3 sec	Check unit 27 communication plug and fix it
Unit 28 failure	RED LED blinks 28 times, stop 3 sec	Check unit 28 communication plug and fix it
Unit 29 failure	RED LED blinks 29 times, stop 3 sec	Check unit 29 communication plug and fix it
Unit 30 failure	RED LED blinks 30 times, stop 3 sec	Check unit 30 communication plug and fix it
Unit 31 failure	RED LED blinks 31 times, stop 3 sec	Check unit 31 communication plug and fix it
Unit 32 failure	RED LED blinks 32 times, stop 3 sec	Check unit 32 communication plug and fix it

## D. Networking System

### D.1. Master-Slave Network

The control PCB can be set either as a master unit or slave unit.

#### MASTER UNIT FUNCTION

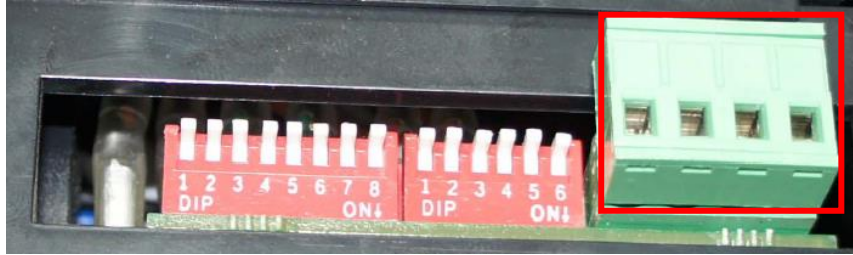
- a) The master unit sends data regarding its setting to the slave unit.
- b) The master unit settings are Unit ON/OFF, Mode, Fan Speed, Timer, Clock, Set Temperature, Swing Function, and Sleep Function for handset operation.
- c) The master unit settings are Unit ON/OFF, Mode, Fan Speed, Timer, Clock, Set Temperature, Swing Function, and Sleep Function for wall pad operation.

#### SLAVE UNIT FUNCTION

- a) The slave unit receives data regarding its settings from the master unit.
- b) The slave unit is allowed to change to a locally desired setting by local controller as long as there are no subsequent changes to the settings of the master unit.
- c) The slave units can be set individually for timer on/off function by handset or wall pad. The handset cannot override the wall pad timer and clock setting.

D.1.1. Master – Slave Network Setup

- 1) Disconnect the communication plug from the SKUSA-NCGH-001-AECM



- 2) Communication plug

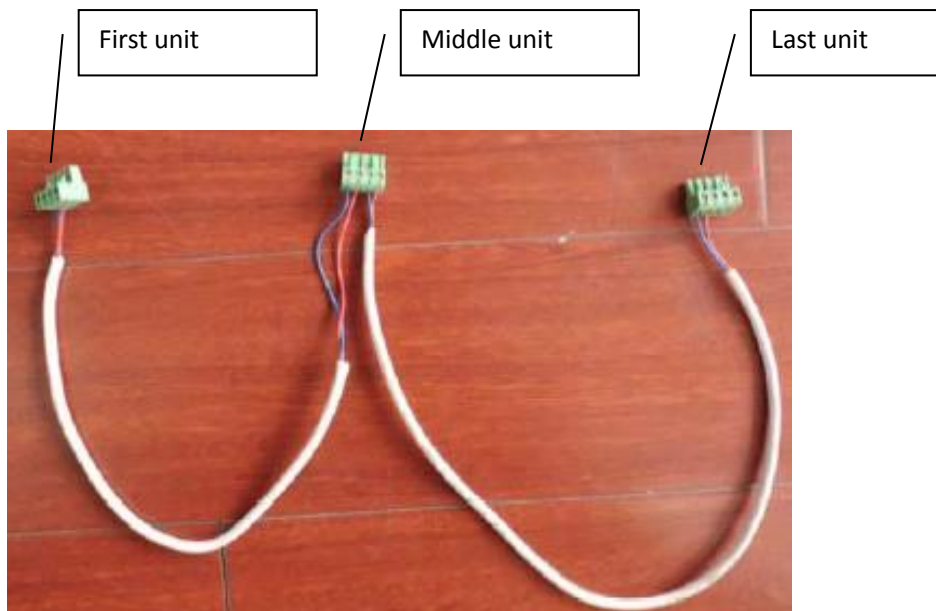
A, B, A, B is printed on the main PCB. When you connect the wires, please ensure connection of A to A and B to B.

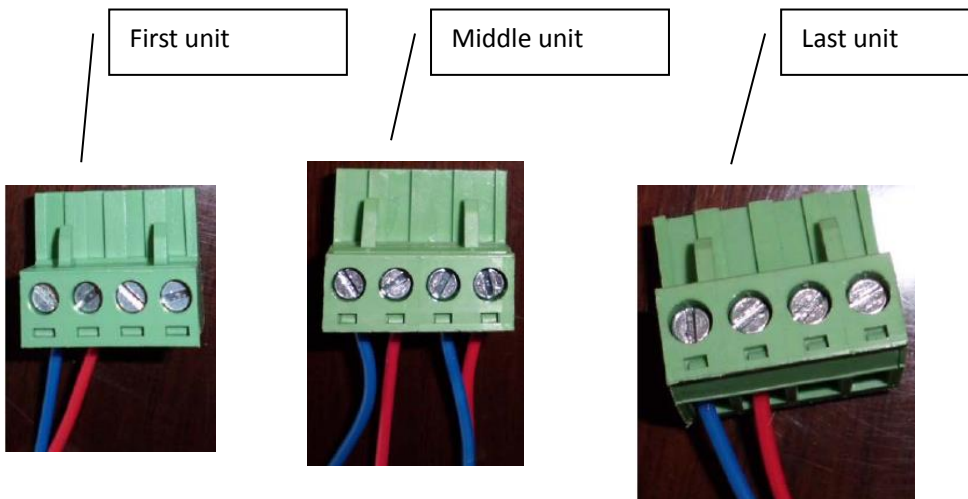


- 3) Connection wire

- 3.1) If the total length of wire is more than 3280.9ft, please use shielded wire in order to protect the signal transmission.

- 3.2) Complete wire connection

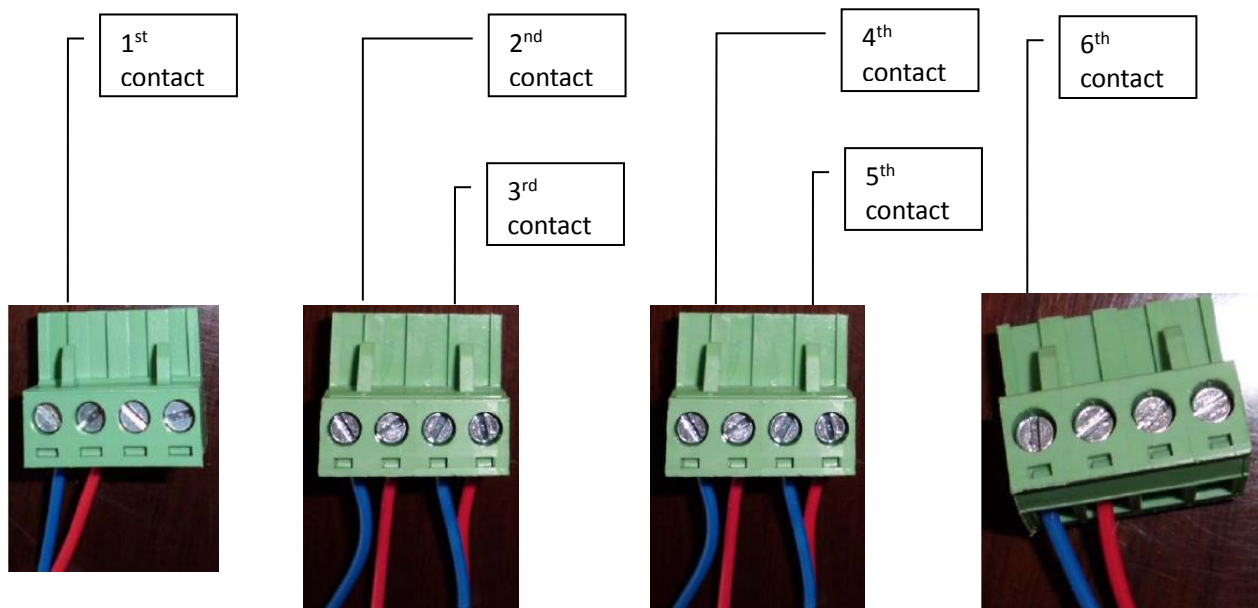




### 3.3) Wire connection check

3.3.1) After the wire connection is completed, please check the wire colours correspond.

3.3.2) Check the wire contact by using a multimeter.



3.3.3) Check 1 and 2, 3 and 4, 5 and 6 to be sure the connections are correct.

3.3.4) If the resistance between two wire contacts is too high, please check and reconnect the wire contacts.

4) Reconnect the communication plug to the control box

**Using Remote Control Handset to Set Master Control Unit:**

- a) Connect all the units PCBs according to the wire color and type of connector.
- b) Select the master unit by setting DIPA-S1 SW6 to ON (=1) in the PCB.
- c) Ensure the DIPA-S1 SW6 is set to OFF (=0) in the PCB on each slave unit.
- d) Switch on the units by connecting the main power supply.
- e) Using the handset, set the operation parameters for the Master unit which will automatically send the settings to the slave unit.
- f) Master unit will beep twice confirming receipt of commands while Slave unit will beep once.

**Using Wall pad to Set Master Control Unit:**

- a) Connect all the units PCBs according to the wire color and type of connector.
- b) Select the master unit by setting DIPA-S1 SW6 to ON (=1) in the PCB.
- c) Ensure the DIPA-S1 SW6 is set to OFF (=0) in the PCB on each slave unit.
- d) Provide each slave unit an addressable code by configuring SW1 – SW5 of DIPA-S1 according to the DIP switch setting table.
- e) Switch on the units by connecting the main power supply.
- f) Using the wall pad, set the operation parameters for the Master unit which will send the setting to the slave units based on Global-control communication or Addressable communication methods.
- g) Master unit will beep twice confirming receipt of commands while Slave unit will beep once.

**MASTER-SLAVE CONTROL**

The control PCB can receive data from both wireless LCD handset and wired wall pad.

## D.1.2. Master-Slave Communication Method

There are two modes for Master-slave structure.

### Global Control communication

The Master unit will broadcast the settings to all slave units. During normal operation, slave units can receive commands from its local wireless handset and wall pad control panel. Upon reception of master global commands, all slave unit settings will be replaced by the master settings.

### Addressable communication

The Master controller must be the LCD wall pad. Slave unit parameters are set as usual. Upon receiving the control commands from a master, the addressed slave unit settings will be replaced by the master settings.

DIPA-S1 address setting: ON=1, OFF=0.

DIPA-S1 SW6	DIPA-S1 SW5	DIPA-S1 SW4	DIPA-S1 SW3	DIPA-S1 SW2	DIPA-S1 SW1	Unit No.	Remark
1	0	0	0	0	0	01	Master
0	0	0	0	0	1	02	Slave
0	0	0	0	1	0	03	Slave
0	0	0	0	1	1	04	Slave
0	0	0	1	0	0	05	Slave
0	0	0	1	0	1	06	Slave
0	0	0	1	1	0	07	Slave
0	0	0	1	1	1	08	Slave
0	0	1	0	0	0	09	Slave
0	0	1	0	0	1	10	Slave
0	0	1	0	1	0	11	Slave
0	0	1	0	1	1	12	Slave
0	0	1	1	0	0	13	Slave
0	0	1	1	0	1	14	Slave
0	0	1	1	1	0	15	Slave
0	0	1	1	1	1	16	Slave
0	1	0	0	0	0	17	Slave
0	1	0	0	0	1	18	Slave
0	1	0	0	1	0	19	Slave
0	1	0	0	1	1	20	Slave
0	1	0	1	0	0	21	Slave
0	1	0	1	0	1	22	Slave
0	1	0	1	1	0	23	Slave
0	1	0	1	1	1	24	Slave
0	1	1	0	0	0	25	Slave
0	1	1	0	0	1	26	Slave
0	1	1	0	1	0	27	Slave
0	1	1	0	1	1	28	Slave
0	1	1	1	0	0	29	Slave
0	1	1	1	0	1	30	Slave
0	1	1	1	1	0	31	Slave
0	1	1	1	1	1	32	Slave

If master unit is equipped with wireless handset only, it can only use Global-Control communication method. If it is equipped with wall pad, it can use both communication methods.

## D.2. Open Modbus protocol

Transfer Mode: RTU, BAUD Rate: 9600bps, 8 data bit, 1 stop bit, None parity bit

The communications require a delay of 80ms between reading an answer and sending the next command. All temperature is equal to reading data\*10 accuracy: 0.18 °F.

### Supported Functions:

Function Code	Function Description
01(01H)	Read Coils
02(02H)	Read Discrete Inputs
03(03H)	Read Holding Registers
04(04H)	Read Input Registers
05(05H)	Write Single Coil
06(06H)	Write Single Register
15(0FH)	Write Multiple Coils
16(10H)	Write Multiple Registers
255(FFH)	Extended Commands which is used to test

### Valid Error code table:

Error code	Description	Definition
01 (01H)	Invalid commands	Received commands beyond valid commands
02 (02H)	Invalid data address	Data addresses beyond valid data address
03 (03H)	Invalid data	Data beyond definition range
04 (04H)	Write data not successful	Write data did not succeed



**Coils table:**

Description	Address	Type*	Remark
Unit ON/OFF	100000	R/W	
Sleep mode	100001	R/W	
Louver swing	100002	R/W	
Reserved	100003		
Reserved	100004		
Reserved	100005		
Reserved	100006		
Reserved	100007		
Reserved	100008		
Reserved	100009		
Reserved	100010		
Reserved	100011		
Reserved	100012		
Reserved	100013		
Reserved	100014		
Reserved	100015		

\* R = read only, W = write only, R/W = read and write.

**Discrete table:**

Description	Address	Type*	Remark
MTV1	200000	R	
MTV2	200001	R	
AUX1	200002	R	
AUX2	200003	R	
Condensate pump	200004	R	
Electrical heater	200005	R	
Wired wall pad	200006	R	
PRO	200007	R	
Float switch	200008	R	
Reserved	200009	R	
EH protection switch	200010	R	
Internal actually running and unit Unit ON/OFF	200011	R	Testing purpose only.

\* R = read only, W = write only, R/W = read and write.

**Holding Register table:**

Description	Address	Type*	Remark
Mode setting	300000	R/W	Cooling mode = 01(H) Humidify mode = 02(H) Fan mode = 04(H) Heating mode = 08(H) Auto mode = 10(H)
Fan speed setting	300001	R/W	Low speed = 04(H) Medium speed = 02(H) High speed = 01(H) Auto fan speed = 07(H)
Louver swing setting	300002	R/W	Position 1 = 01(H) Position 2 = 02(H) Position 3 = 03(H) Position 4 = 04(H) Auto = 0F(H) Stop = 00(H)
Setting temperature	300003	R/W	60.8~86°F (actual*10 format)
Address setting	300004	R	Set by dip-switch, reading only
Reset	300005	W	=0x33 reset error
Week	300006	W	Calibration wired wall pad and set timer function
Hour	300007	W	Calibration wired wall pad and set timer function
Minute	300008	W	Calibration wired wall pad and set timer function
Second	300009	W	Calibration wired wall pad and set timer function
Hours in Timer on	300010	R/W	Timer ON
Minute in Timer on	300011	R/W	Timer ON
Hours in Timer off	300012	R/W	Timer OFF
Minute in Timer off	300013	R/W	Timer OFF
Icon of Timer ON or OFF	300014	R/W	BIT0 = Icon of Timer ON BIT1 = Icon of Timer OFF 1 = enable 0 = disable
Super low speed rpm	310000	R/W	200~1500
Low speed rpm	310001	R/W	200~1500
Medium speed rpm	310002	R/W	200~1500
High speed rpm	310003	R/W	200~1500
RPM setting	310004	R/W	0~2000 (used to test , 0 = disable)
Temperature sampling time	310005	R/W	2~100, default:5S
Factor of auto fan speed	310006	R/W	2~150, default:20
Factor of modulating valve	310007	R/W	2~250, default:150

\* R = read only, W = write only, R/W = read and write.

**Input Register table:**

Description	Address	Type*	Remark
Dip switch 1 status	400000	R	
Dip switch 2 status	400001	R	
Room temperature sensor	400002	R	
Ti1 temperature sensor	400003	R	
Ti2 temperature sensor	400004	R	
Error code	400005	R	Bit0 = Room temperature sensor error Bit1 = Ti1 temperature sensor error Bit2 = Ti2 temperature sensor error Bit3 = Float switch error Bit4 = Indoor coil low temperature protection Bit5 = Indoor coil over heat protection Bit6 = Reserved Bit7 = Electrical heater failure Bit8 = Motor1 Error Bit9 = Motor2 Error Bit10 = System parameters error Bit11 = Reserved Bit12 = Reserved Bit13 = Reserved Bit14 = Reserved Bit15 = Reserved
Fan speed status	400006	R	Low = 04(H) Medium = 02(H) High = 01(H)
Mode status	400007	R	Cooling mode = 01(H) Dehumidify mode = 02(H) Fan mode = 04(H) Heating = 08(H)
Setting temperature status	400008	R	Testing only
Room temperature in wall pad status	400009	R	
Room temperature in main PCB status	400010	R	
Unit type	400011	R	4-pipe = 03, 2-pipe = 02 This setting is configured by dip switch
EC motor 1# RPM	400012	R	
EC motor 2# RPM	400013	R	

\* R = read only, W = write only, R/W = read and write.

## E. Control Specifications: SKUSA-NCGH-002/003-AECM

Used in all PCG/PCH [V/P] **W** unit configurations.

Limited function controller, compatible with 24VAC wired thermostat controller, with zone control functionality.

- **SKUSA-NCGH-002-AECM** is used for PCG/PCH without electrical heater.
- **SKUSA-NCGH-003-AECM** is used for PCG/PCH with electrical heater.

### E.1. Features

- Condensate management with valve protection and NC alarm contact.
- Integrated fan relays for zone control applications.
- ON/OFF thermostat input and low-voltage modulating fan speed input flexibility.
- Simple error diagnostic and LED error display.

Ti1 = Chilled water coil temperature

### E.2. I/O Port Definitions

I/O		Code	2-Pipe	4-Pipe
Analogue input	Coil temperature sensor	AI1	Cooling / heating coil sensor (Ti1)	Cooling only coil sensor (Ti1)
Voltage input	High fan speed	H	24VAC input signals from wired thermostat	
	Medium fan speed	M		
	Low fan speed	L		
	Phase	L	External 220VAC or 115VAC power supply connection to the PCB. Max length: 16.4ft	
	Neutral	N		
	Earth	GND		
	Auto ON/OFF	AUTO	230VAC input signal from wired thermostat, activates modulating control mode	
Signal Input	Modulating signal	+/-	Low voltage modulating signal input (standard 0~5VDC; optional 0~10VDC)	
Digital input	Programming interface	TTL	Low voltage digital signal input for board programming	
	Float switch	Float	Voltage-free (NC)	
Voltage output	Water pump	WP	Voltage output (L)	
	EC motor	CN4	5-wire connection with 230VAC power supply to EC motor and 0-5VDC modulating signal output	
	Stepping motor	CN1-2	Low-voltage output	
Digital output	LED display	X-DIS	Low-voltage output	
Voltage-free output	Alarm		Voltage-free alarm contact: (a) Standard configuration is (NC).	

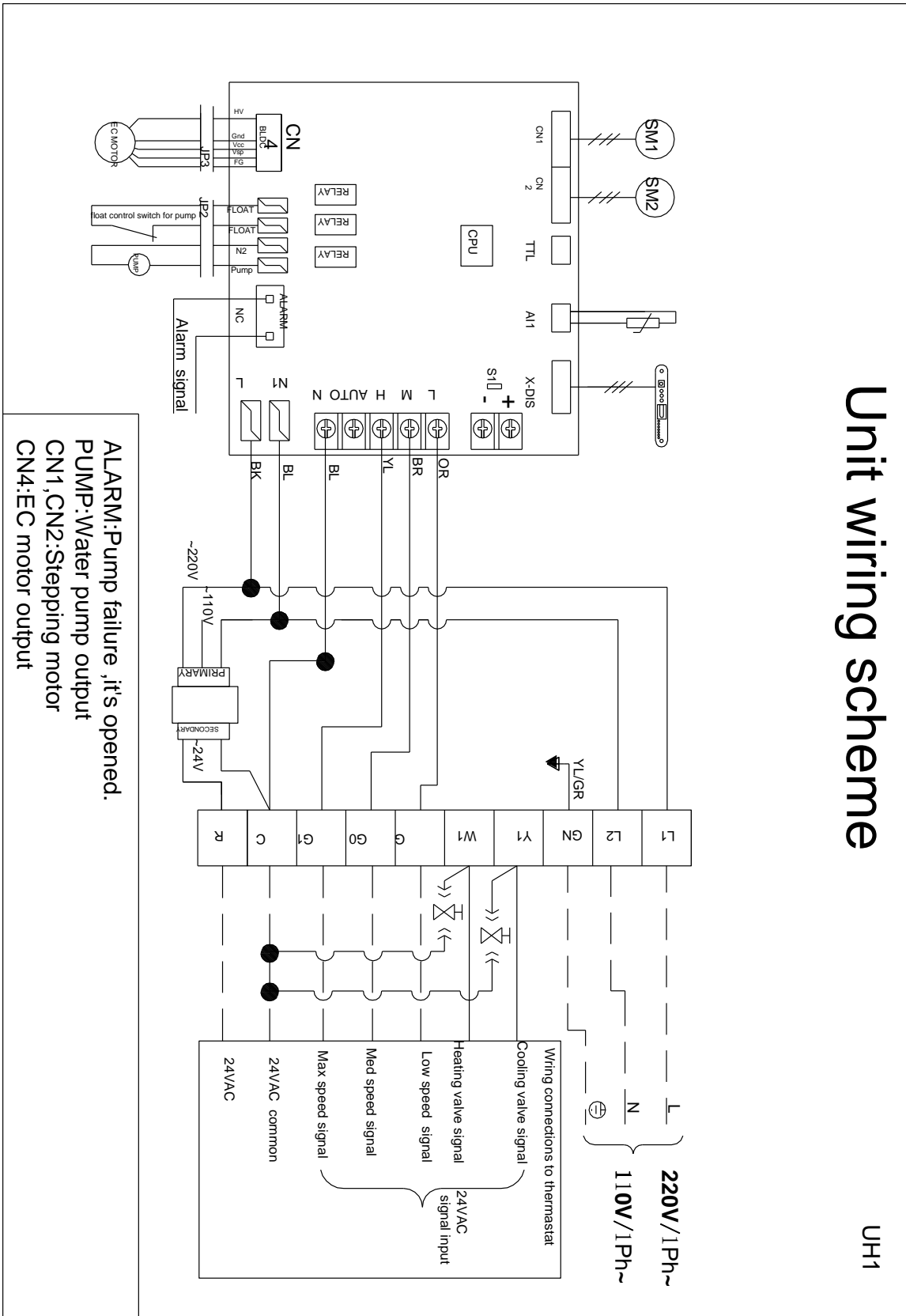
### E.3. Onboard configuration

The PCB can be configured for different modulating signal inputs.

Refer to jumper configuration table below.

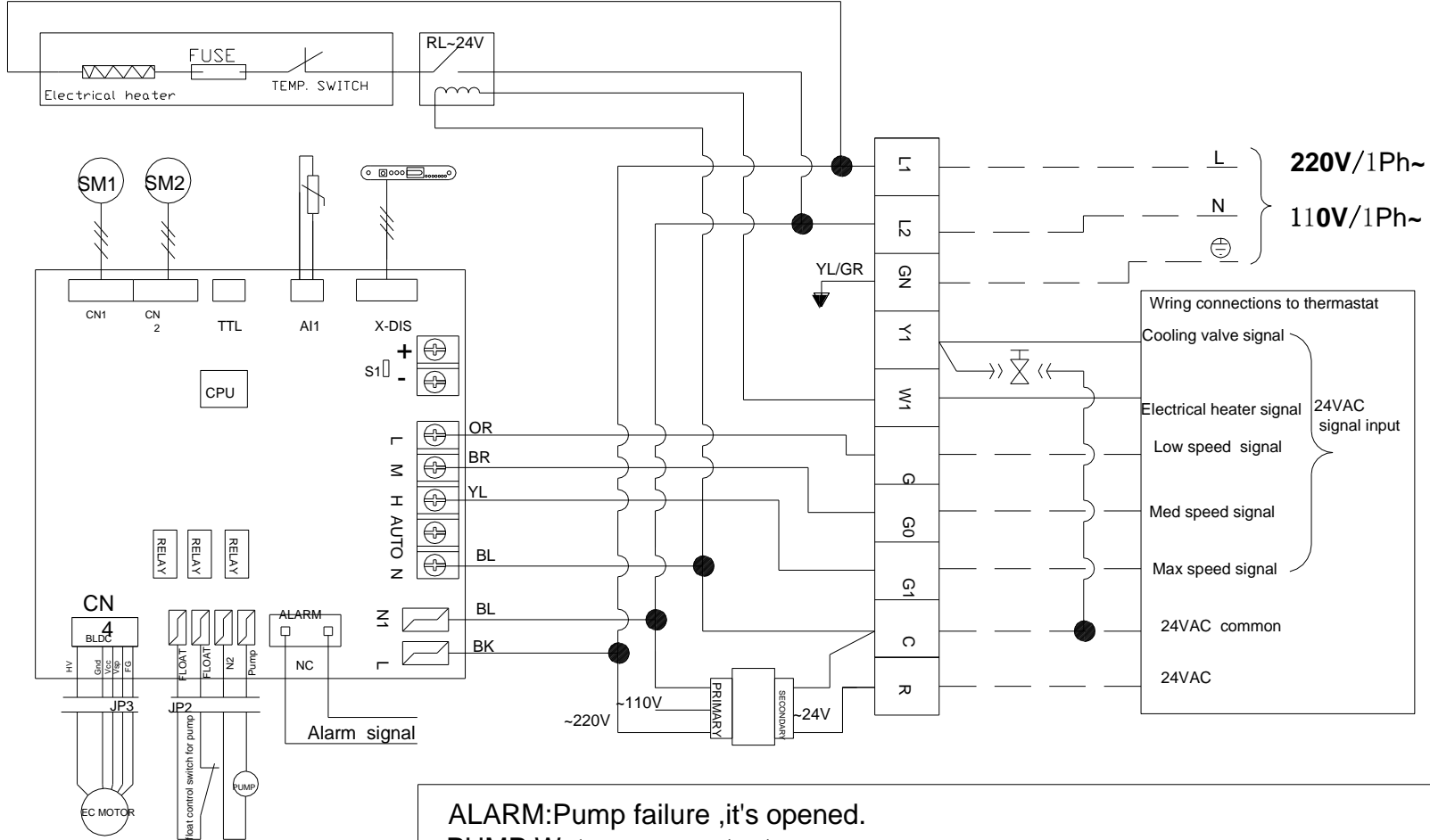
<b>Code</b>	<b>State</b>	<b>Description</b>
S1	Open	PCB configured for 0~5VDC modulating signal input.
S1	Closed	PCB configured for 0~10VDC modulating signal input.
S3	N/A	Reserved
S4	N/A	Reserved

E.4. Wiring Diagrams  
E.4.1. SKUSA-NCGH-002-AECM



# Unit wiring scheme

UH1

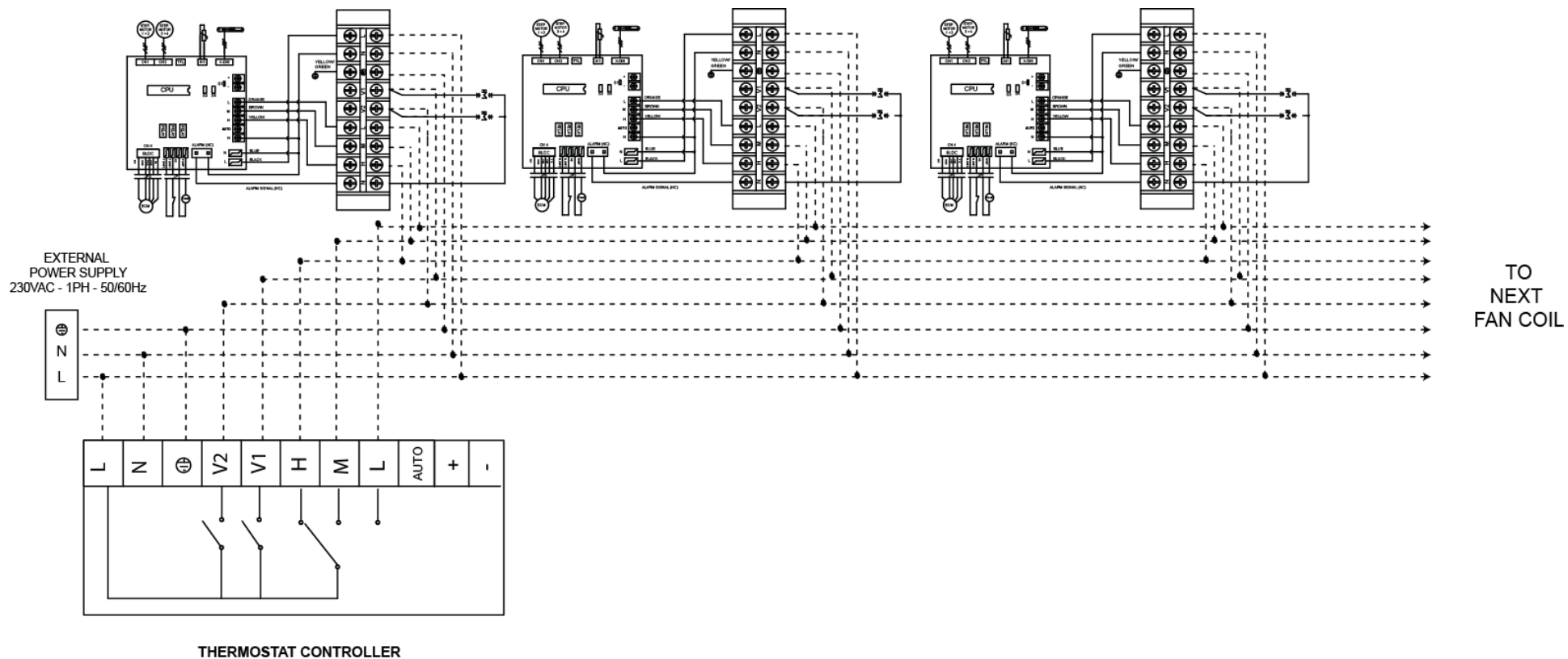


ALARM: Pump failure ,it's opened.  
 PUMP: Water pump output  
 CN1, CN2: Stepping motor  
 CN4: EC motor output

SKUSA-NCGH-003-AECM

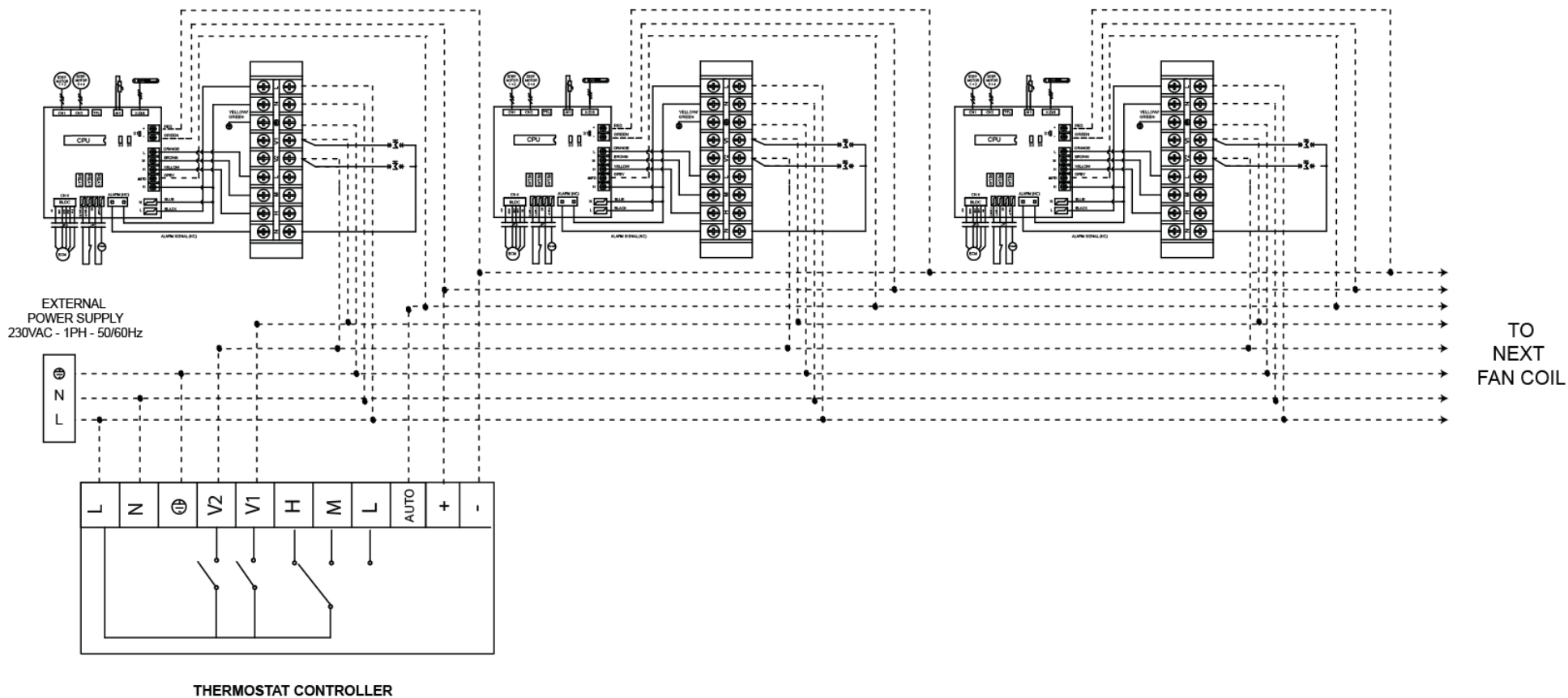
E.4.2.

E.4.3. Zone control wiring diagram 1 (ON/OFF thermostat)





E.4.4. Zone control wiring diagram 2 (Modulating signal thermostat)



## E.5. Control logic specification

### E.5.1. Unit power ON/OFF

- i. The unit is turned ON when any of the fan speed inputs (H/M/L) are ON, OR Auto ON/OFF signal input is ON.
- ii. The unit is turned OFF only if all of the fan speed inputs (H/M/L) are OFF AND Auto ON/OFF signal input is OFF.

### E.5.2. Alarm protection and error display

- i. If the float switch is open for 5 minutes, then the (NC) voltage-free alarm contact shall be open, and the (NO) voltage free alarm contact shall be closed.
- ii. If the float switch is open for 10 minutes, the LED display reports a condensate management failure (see section LED Indication and Error Description below).

### E.5.3. Drain-pump run management

- i. When the unit turns ON:
  - a) if  $Ti1 < 59^{\circ}F$ , the drain pump turns ON.
  - b) If  $Ti1 \geq 59^{\circ}F$ , the drain pump turns OFF.
- ii. When the unit turns OFF and the drain pump is ON:  
the drain pump will remain ON for 5 minutes, before the drain pump turns OFF.
- iii. At any time:
  - a) if the float switch is OPEN, the drain pump will turn ON.
  - b) if the float switch is OPEN and then CLOSES, the drain pump will remain ON for 5 minutes, and then turn OFF.

### E.5.4. Swing and louver control

- i. When the unit is OFF, the louvers are closed (angle at  $100^{\circ}$  against vertical).
- ii. When the unit turns ON, the louvers open (angle at  $87^{\circ}$  against the horizontal).
- iii. When the unit turns OFF, the louver returns to a closed position ( $100^{\circ}$  against the vertical).

### E.5.5. Modulating signal input

- i. When the "Auto ON/OFF" 230VAC input is ON, the fan motor rpm speed shall be modulated by the "+/-" low voltage modulating signal input.
- ii. The standard configuration is for 0~5VDC modulating signal input.
- iii. The optional configuration is for 0~10VDC modulating signal. To set the PCB to the optional configuration, the S1 jumper must be closed.

## E.6. LED Indication and Error Description

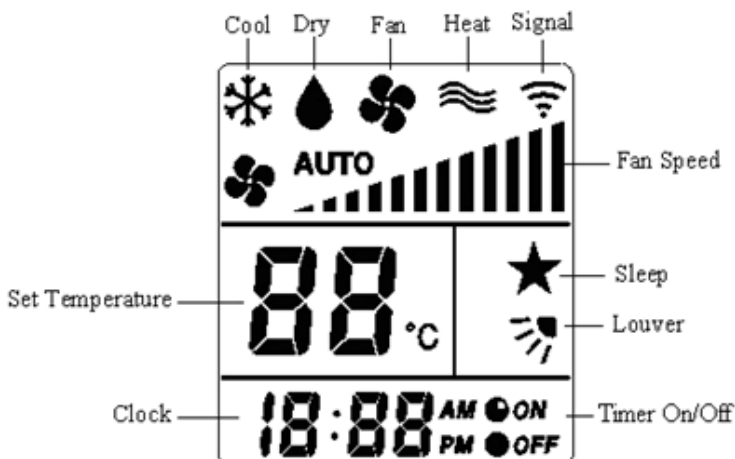
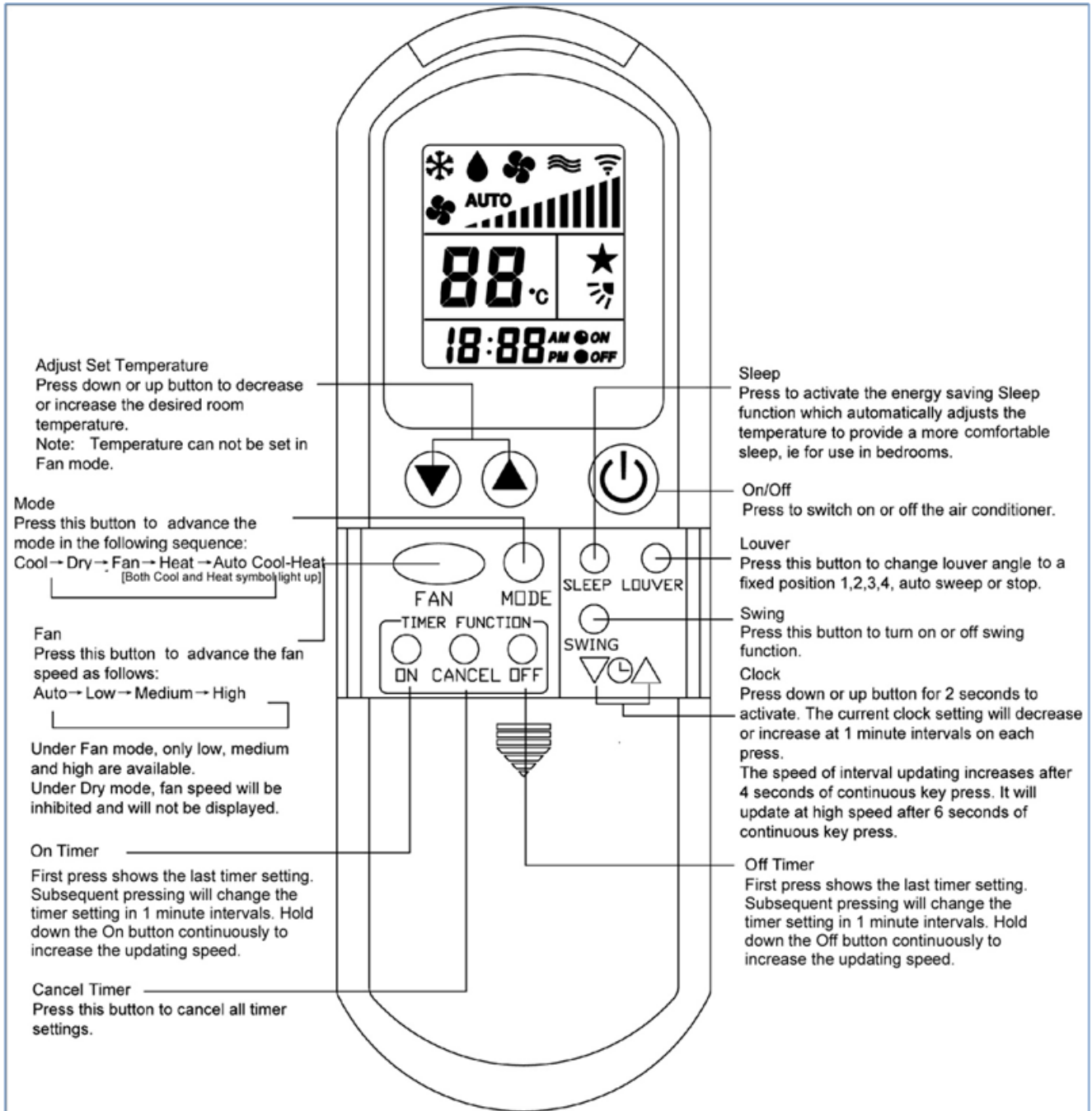


SKUSA-NCGH-002/003-AECM		
Fan speed setting	LED indication	Condition
High speed	Red LED On	Normal
Medium speed	Yellow LED On	Normal
Low speed	Green LED On	Normal

For all units - Green LED blinks			
Item	Blink	Reason	Remedy
Indoor coil sensor 1 failure	Green LED blinks 4 times, stops 3 secs	Ti1 sensor connection is not good or damaged.	<ol style="list-style-type: none"> <li>1. Check if Ti1 plug is connected or not.</li> <li>2. Check if sensor's resistor is correct or not.</li> </ol>
Water pump failure	Green LED blinks 7 times, stops 3 secs	Float switch is opened..	<ol style="list-style-type: none"> <li>1. Check if the condensate water pipe is connected or not.</li> <li>2. Check if the pump is functioning or not.</li> </ol>
EC motor failure	Green LED blinks 9 times, stops 3 secs	No EC motor feedback	<ol style="list-style-type: none"> <li>1. Check DIPB-SW5 and SW6 setting.</li> <li>2. Check the EC motor</li> </ol>

## F. User Interface

### F.1. Remote Handset

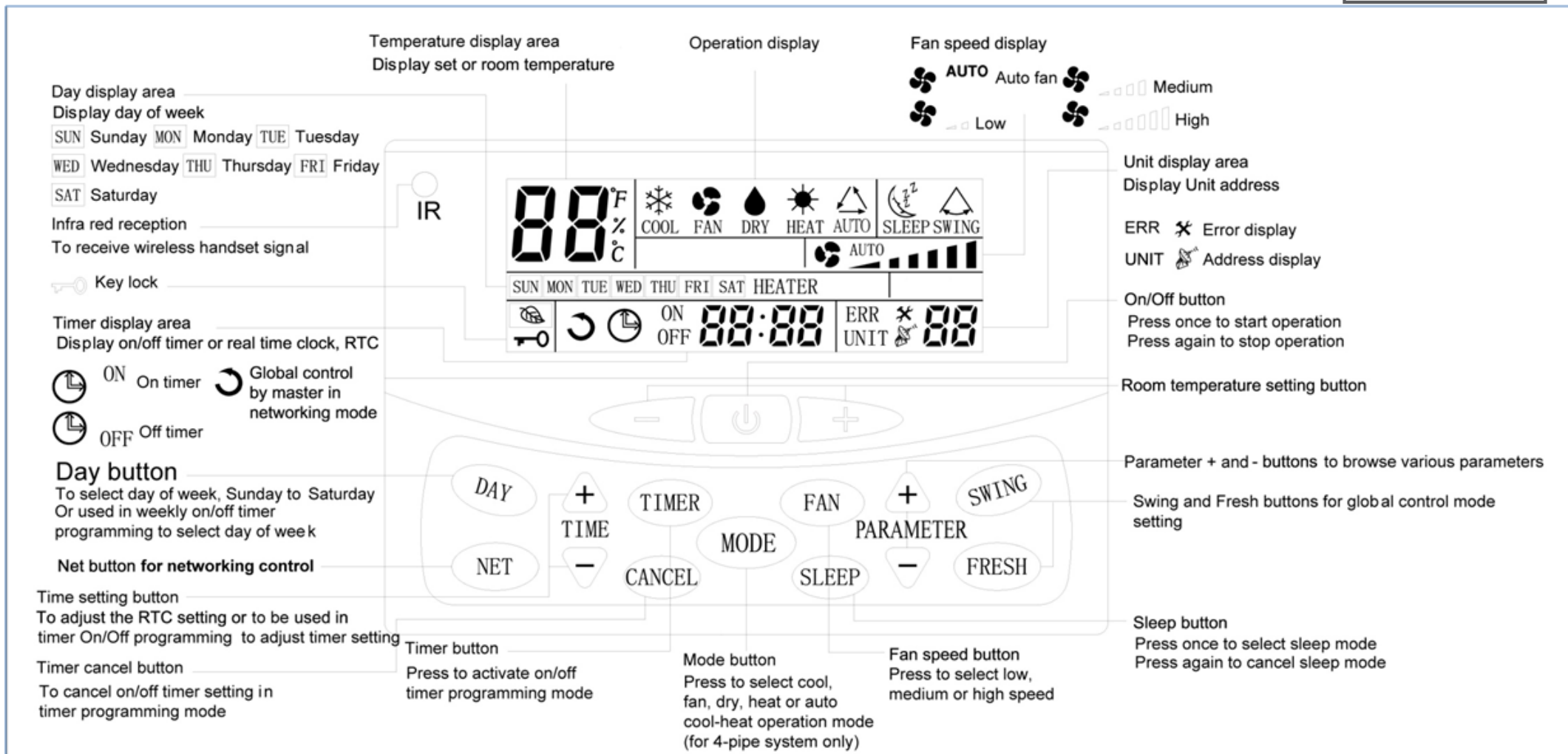


#### Attention

When unit with handset is the master unit, settings are automatically sent to the slave unit; Auto Cool-Heat operation will be applicable in 4-pipe system only.

“Swing” function is not applicable.

F.2. Wired Wall Pad





**Attention**

- Wall pad will recognize the main board model automatically whether it is 2-pipe or 4-pipe system.
- Auto Cool-Heat operation is applicable in 4-pipe system only.  
When the wall pad is installed, the wall-pad temperature sensor automatically overrides the default return air sensor (attached to the unit's return air grille).

## F.2.1. Wall Pad Operation Guidelines


### a) Clock display and setting

System has an accurate internal real time clock used for time indication and timer ON/OFF function. Clock display

area indicates internal time clock which can be set by  or  button.














### b) Day display and setting

The wall pad has a day display function which is used for day indication and timer ON/OFF function. Day display icon








indicates current day. Press  button to set day.



### c) Timer ON/OFF setting



If the master unit is in global control mode and the ON/OFF timer setting is selected, the master unit will command the whole network to be on or off. Otherwise the ON/OFF timer is effective for the local unit only. The system supports individual ON/OFF timer settings for each day of the week.



- Press  button once,  and **ON** symbol blinking indicates ON timer programming mode. The day display area indicates which day the timer is being set for. If there is no preset ON timer, the timer display area shows , otherwise the previous setting will be shown. Press  or  button to change the ON timer setting. Press  key to cancel the current ON timer setting and the timer display area will show . Press  button to change the day the ON timer is to be programmed for.
- Press  button again,  and **OFF** symbol blinking indicates OFF timer programming mode. The setting method is the same as the ON timer setting above.
- Press  button again, to exit the ON/OFF timer setting function.
- Should there be any ON or OFF timer settings programmed,  will light up. Should there be any unexecuted ON or OFF timer settings for the current day, its corresponding **ON** or **OFF** icon will light up.
- Hold down  button for 3 seconds to cancel all timer settings.

### d) Timer set by master unit is as follows:



- Press  button to enter into networking control mode. Unit area blinking indicates the slave unit under control. Press  or  to select the desired slave unit. Units that are off will be skipped automatically.
- Press  button once to enter into ON timer programming mode. Press  button to select the required day of the week. Master unit will then retrieve the setting from the selected slave unit and the timer display area will show "rEAd". The ON timer setting will be shown upon reading the data successfully. Press  or  button to change the ON timer setting of the slave unit.

- Press  button again to enter into OFF timer programming mode. Press  button to select the required day of the week. Master unit will then retrieve the setting from the selected slave unit and timer the display area will show “rEAd”. The OFF timer setting will be shown upon reading the data successfully.





Press  or  button to change the OFF timer setting of the slave unit.

- Upon completion of changing timer settings for the selected day, press  button again to exit timer programming mode. The settings will then upload to the selected slave unit. The next day of the week settings can be done only upon completion of sending data to the slave units. (Repeat steps 1~4 if setting is required for the next day of the week).
- In Global control mode:
  - Pressing Master  button for 3 seconds will cancel all timer settings in all slave units.
  - Timer settings will be broadcast to all slave units.

**e) Clock synchronization by master unit is as follows:**

Press  and  buttons for 3 seconds to activate clock synchronization to all slave units. Master wall pad will respond with a beeping sound.


**f) Key lock**

In order to prevent unauthorized access to the system setting, a key lock function is provided. Hold down  and  for 3 seconds to activate key lock,  symbol lights up. Repeat the same to exit key lock. Only  button is applicable in key lock mode.



**g) Swing**

Not applicable.


**h) Sleep**

Press  button to activate or deactivate sleep setting. The Sleep function is valid in cool or heat modes only.

**i) Temperature setting**

Press  or  to enter into temperature setting mode, temperature display area blinks indicating the current set temperature. Press the above buttons to adjust the set temperature.

**j) Mode setting**

Press  button to change the operation mode.

**k) Fan speed setting**

Press  button to change the fan speed. Only low speed is available for dehumidification mode.

**l) On/Off control**

Press to start or stop the unit.

**m) Networking Master - Slave Control (only master unit wall pad can control other units on the network)**

- Press button to enter into networking control mode. Unit address blinking indicates the slave unit under control. Press or to select the desired slave unit; Units that are off will be bypassed automatically. Parameters that can be controlled are on/off, timer weekly program, set temperature, mode, fan speed, swing and sleep. Parameter operation methods are the same as above. Press button again to exit networking control mode.
- Hold down and buttons for 3 seconds to enter into global control mode, lights up. Repeat the same to exit global control mode. In global control mode, the settings of the master unit will be broadcast to all the slave units.

**n) Unit operation parameters browsing**

Hold down and buttons for 3 seconds to enter into operation parameters browsing mode. Unit's display area shows the slave unit under browsing. Slave unit selection method is the same as in networking control above. Press or to browse various parameters as follow:

Wall pad display temperature area	Wall pad display time area
C0	Return air temperature displayed
C1	Indoor coil temperature displayed
C2	DIP switch setting displayed
C3	Indoor coil 2 temperature

Press button to exit.

**o) Error indication**

When faulty slave unit is detected, the Master unit's display area shows the faulty unit address, the time area shows the error code and the wall pad backlight changes to the color red . Should there be multiple units having problems, addresses and error codes will be shown one after another.

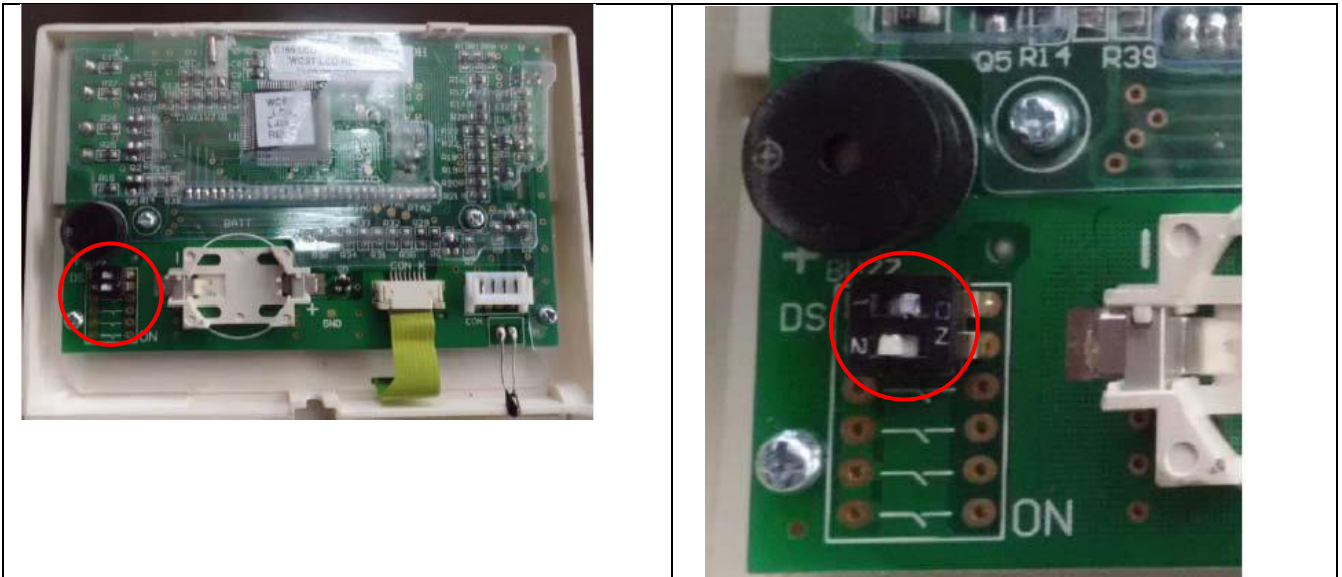
Error code definition:

Error	Error code
Electrical heater faulty	E1
Indoor coil sensor 2 faulty	E2
Return air sensor faulty	E3
Indoor coil sensor 1 faulty	E4
Indoor coil low temperature protection	E5
Indoor coil over heat protection	E6
Float switch alarm	E7
Local communication error	E8



F.2.2. EC unit RPM setting

- 1) Turn OFF the unit.
- 2) Open wall pad's back cover, where two DIP switches can be seen.
- 3) Turn the DIP switch 1 to "ON" position.



4) Wired wall pad LCD will display the following;



This is the speed level setting.  
d0 means low speed  
d1 means medium speed  
d2 means high speed  
Press PARAMETER + / - button to select.

This is the motor RPM setting.  
Press TEMP. + / - button to increase the RPM setting by 10RPM step.

5) After finishing the RPM setting, turn the DIP switch 1 to "OFF" position. The Wired wall pad display will resume its normal appearance.

Table for RPM setting for each models:

Model	High	Medium	Low
PCG-04	570	450	250
PCG-08	800	560	250
PCG-09	570	450	250
PCG-16	800	560	250
PCH-12	780	540	350
PCH-20	930	650	400

## G. Sensor Resistance R-T Conversion Table

Resistance : R (77°F) = 10KΩ ± 1%

Beta Constant : B (25/85) = 3977 ± 1%

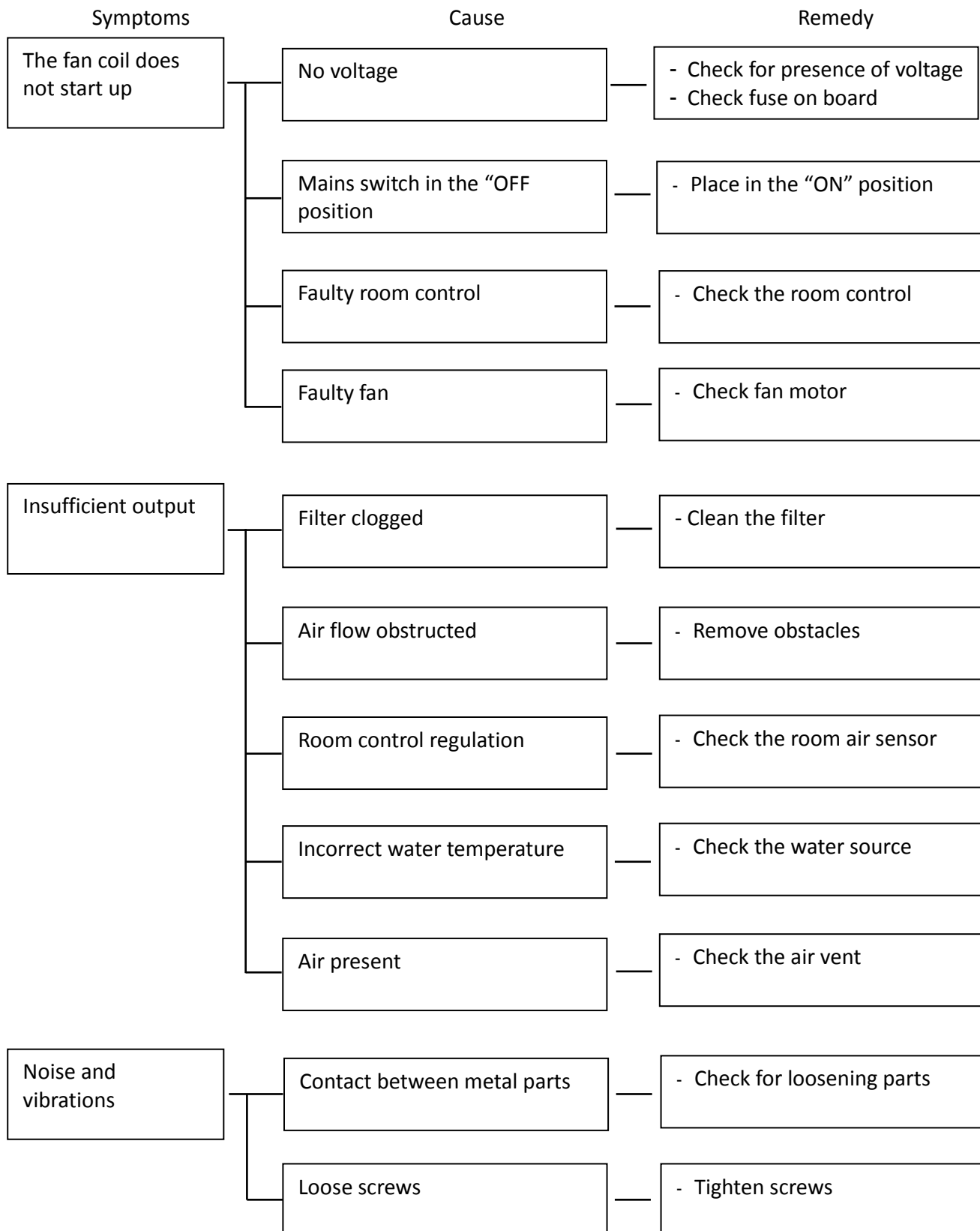
T (°F)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)	T (°F)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)
-22	174	182.7	191.8	39.2	26.11	26.9	27.71
-20.2	163.4	171.5	179.9	41	24.85	25.59	26.34
-18.4	153.6	161.1	168.9	42.8	23.65	24.35	25.05
-16.6	144.4	151.3	158.5	44.6	22.52	23.17	23.83
-14.8	135.8	142.2	148.9	46.4	21.45	22.06	22.68
-13	127.8	133.8	140	48.2	20.44	21.01	21.59
-11.2	120.3	125.8	131.6	50	19.48	20.02	20.55
-9.4	113.3	118.4	123.8	51.8	18.58	19.7	19.58
-7.6	106.7	111.5	116.5	53.6	17.71	18.18	18.65
-5.8	100.6	105.1	109.7	55.4	16.9	17.33	17.77
-4	94.9	99.03	103.3	57.2	16.12	16.53	16.94
-2.2	89.51	93.39	97.41	59	15.39	15.77	16.16
-0.4	84.5	88.11	91.85	60.8	14.69	15.05	15.41
1.4	79.8	83.17	86.64	62.6	14.03	14.37	14.7
3.2	75.39	78.53	81.76	64.4	13.41	13.72	14.03
5	71.26	74.18	77.19	66.2	12.81	13.1	13.4
6.8	67.37	70.1	72.9	68	12.24	12.52	12.79
8.6	63.73	66.26	68.88	69.8	11.7	11.96	12.22
10.4	60.3	62.67	65.1	71.6	11.19	11.43	11.67
12.2	57.08	59.28	61.55	73.4	10.71	10.93	11.15
14	54.05	56.1	58.22	75.2	10.24	10.45	10.66
15.8	51.19	53.12	55.08	77	9.8	10	10.2
17.6	48.51	50.3	52.14	78.8	9.374	9.57	9.765
19.4	45.98	47.66	49.37	80.6	8.969	9.16	9.351
21.2	43.61	45.17	46.77	82.4	8.584	8.77	8.957
23	41.36	42.82	44.31	84.2	8.218	8.4	8.582
24.8	39.25	40.61	42	86	7.869	8.047	8.225
26.6	37.26	38.53	39.83	87.8	7.537	7.71	7.885
28.4	35.38	36.56	37.78	89.6	7.221	7.39	7.56
30.2	33.6	34.71	35.85	91.4	6.92	7.085	7.251
32	31.93	32.97	34.02	93.2	6.633	6.794	6.956
33.8	30.35	31.32	32.3	95	6.36	6.517	6.675
35.6	28.85	29.76	30.68	96.8	6.099	6.252	6.407
37.4	27.44	28.29	29.15	98.6	5.85	6	6.151

Resistance :R (77°F) = 10KΩ ± 1%

Beta Constant : B (25/85) = 3977 ± 1%

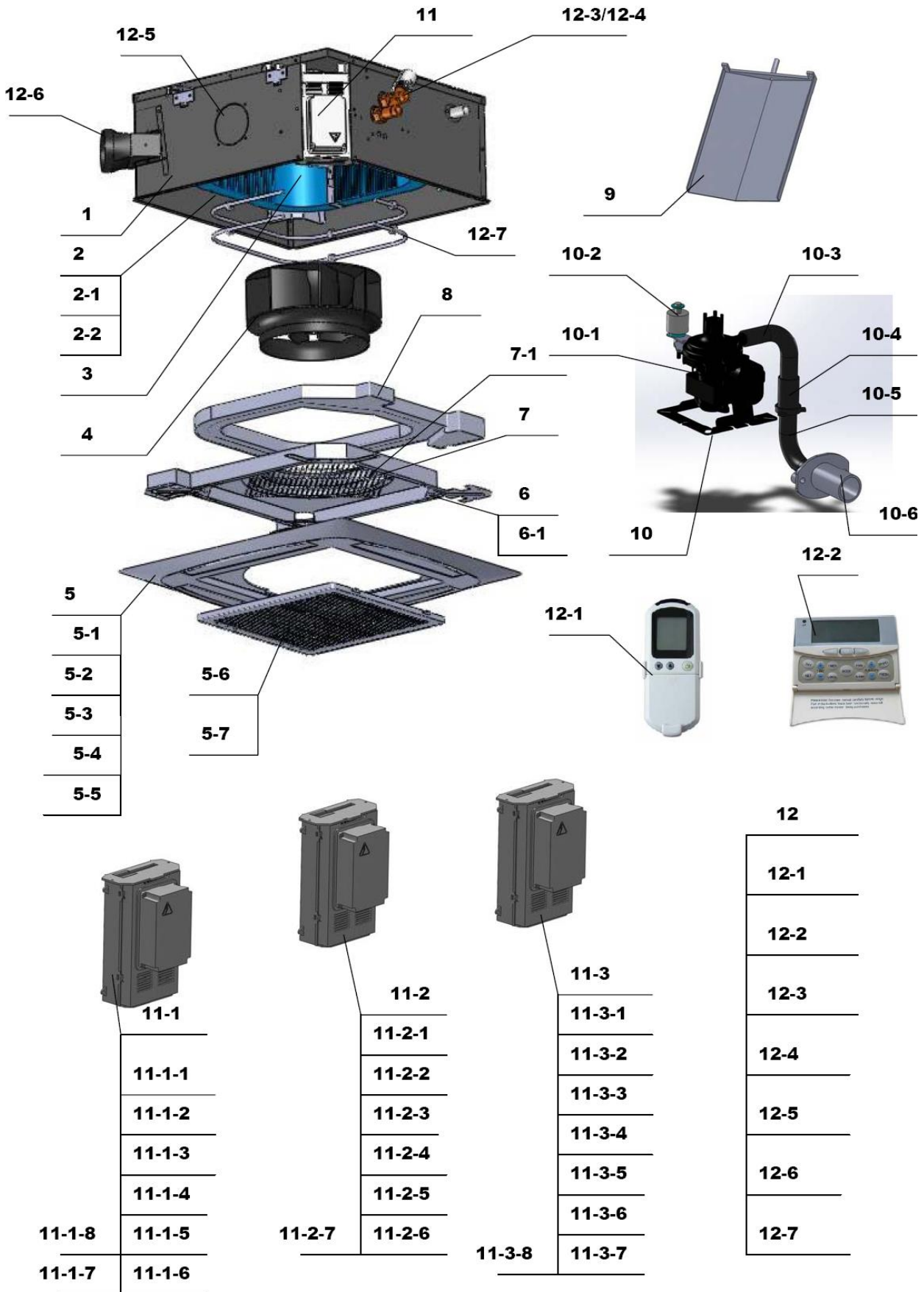
T (°F)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)	T (°F)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)
100.4	5.614	5.759	5.907	167	1.417	1.474	1.532
102.2	5.387	5.53	5.673	168.8	1.37	1.426	1.482
104	5.172	5.31	5.451	170.6	1.326	1.379	1.434
105.8	4.966	5.101	5.238	172.4	1.282	1.335	1.389
107.6	4.769	4.901	5.034	174.2	1.241	1.292	1.344
109.4	4.582	4.71	4.84	176	1.201	1.25	1.302
111.2	4.402	4.527	4.654	177.8	1.162	1.211	1.261
113	4.231	4.353	4.477	179.6	1.125	1.172	1.221
114.8	4.067	4.186	4.307	181.4	1.089	1.135	1.183
116.6	3.911	4.027	4.144	183.2	1.055	1.1	1.146
118.4	3.761	3.874	3.989	185	1.021	1.065	1.111
120.2	3.618	3.728	3.84	186.8	0.9891	1.032	1.077
122	3.481	3.588	3.697	188.6	0.9582	1	1.044
123.8	3.35	3.454	3.561	190.4	0.9284	0.9697	1.012
125.6	3.225	3.326	3.43	192.2	0.8998	0.9401	0.9818
127.4	3.105	3.204	3.305	194	0.8721	0.9115	0.9522
129.2	2.99	3.086	3.185	195.8	0.8455	0.8839	0.9237
131	2.88	2.974	3.07	197.6	0.8198	0.8573	0.8961
132.8	2.774	2.866	2.959	199.4	0.795	0.8316	0.8696
134.6	2.673	2.762	2.854	201.2	0.7711	0.8069	0.8439
136.4	2.576	2.663	2.752	203	0.748	0.783	0.8192
138.2	2.483	2.568	2.655	204.8	0.7258	0.7599	0.7953
140	2.394	2.477	2.562	206.6	0.7043	0.7376	0.7722
141.8	2.309	2.39	2.472	208.4	0.6836	0.7161	0.7499
143.6	2.227	2.306	2.386	210.2	0.6635	0.6953	0.7283
145.4	2.149	2.225	2.304	212	0.6442	0.6752	0.7075
147.2	2.073	2.148	2.224	213.8	0.6255	0.6558	0.6874
149	2.001	2.074	2.148	215.6	0.6075	0.6371	0.6679
150.8	1.931	2.002	2.075	217.4	0.59	0.619	0.6491
152.6	1.865	1.934	2.005	219.2	0.5732	0.6015	0.631
154.4	1.801	1.868	1.937	221	0.5569	0.5846	0.6134
156.2	1.739	1.805	1.872				
158	1.68	1.744	1.81				
159.8	1.623	1.686	1.75				
161.6	1.569	1.63	1.692				
163.4	1.516	1.576	1.637				
165.2	1.466	1.524	1.583				

## H. Troubleshooting Guide



# I. Exploded Diagrams & Sub-assembly Descriptions

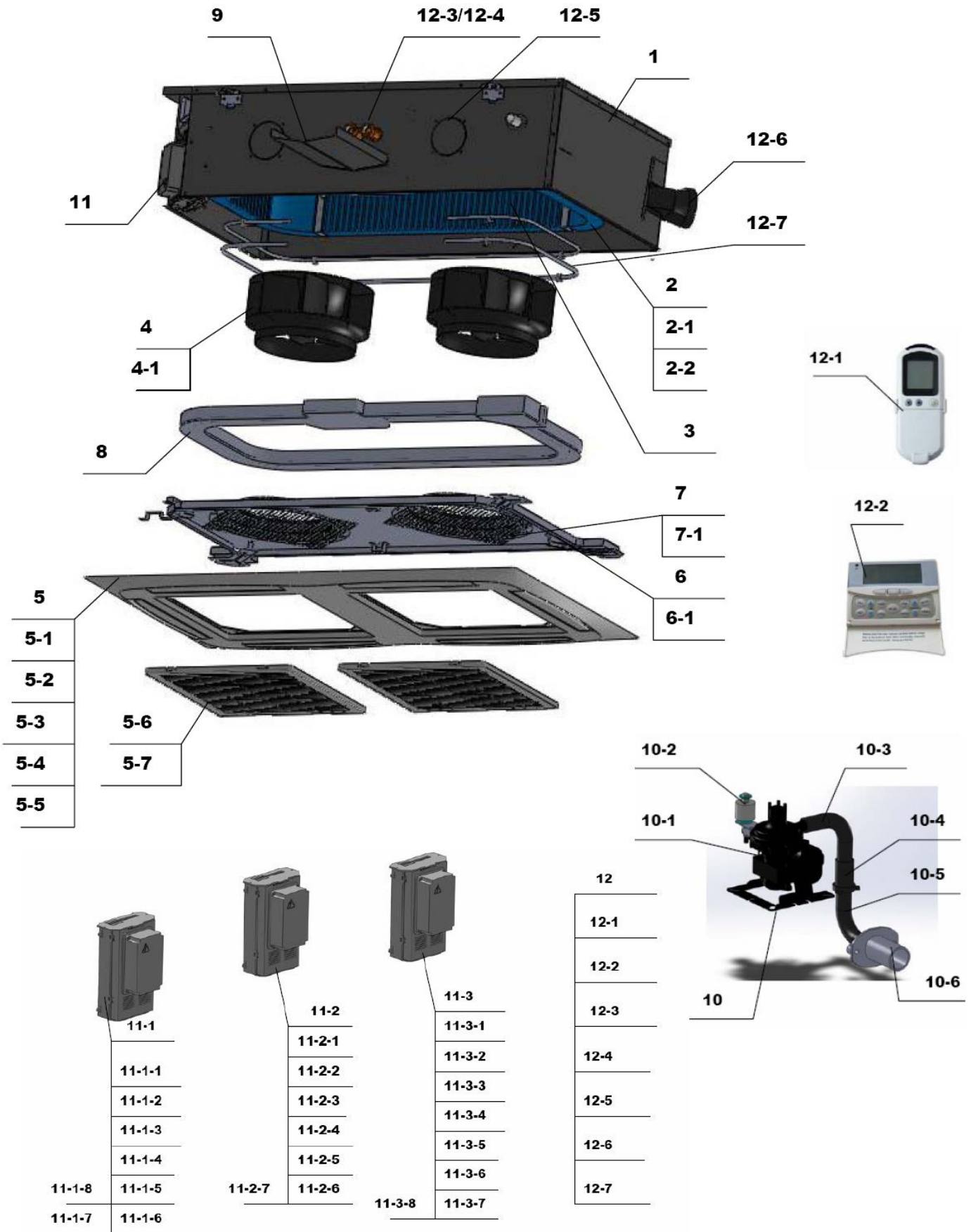
## I.1. Exploded View for Single Fan Model



I.1.1. Spare Parts Of Single Fan Model

Item	Description	QTY	Item	Description	QTY
1	Casing	1	6	Mounting fixture	1
2	Coil	1	6-1	Room sensor	1
2-1	Chilled water coil sensor	1	7	Finger guard	1
2-2	Hot water coil sensor	1	7-1	Venturi	1
3	EC Motor	1	8	Drain pan	1
4	Fan blower	1	9	External drain pan	1
5	Front panel	1	10	Pump system	1
5-1	Front cover	1	10-1	Pump	1
5-2	Louver	4	10-2	Flow switch	1
5-3	IR receiver	1	10-3	Pump pipe-1	1
5-4	Stepping motor	2	10-4	Check valve	1
5-5	Stepping motor	2	10-5	Pump pipe-2	1
5-6	Grille	1	10-6	Drainage head	1
5-7	Filter	1			

## I.2. Exploded View for Twin Fan Model





### I.2.1. Spare Parts Of Twin Fan Model

Item	Description	QTY	Item	Description	QTY
1	Casing	1	6	Mounting fixture	1
2	Coil	1	6-1	Room sensor	1
2-1	Chilled water coil sensor	1	7	Finger guard	2
2-2	Hot water coil sensor	1	7-1	Venturi	2
3	EC Motor	2	8	Drain pan	1
4	Fan blower	2	9	External drain pan	1
5	Front panel	1	10	Pump system	1
5-1	Front cover	1	10-1	Pump	1
5-2	Louver	6	10-2	Flow switch	1
5-3	IR receiver	1	10-3	Pump pipe-1	1
5-4	Stepping motor	2	10-4	Check valve	1
5-5	Stepping motor	2	10-5	Pump pipe-2	1
5-6	Grille	2	10-6	Drainage head	1
5-7	Filter	2			

### I.3. Optional Parts

11-Plug-and-play control box			
Item	Code	Description	QTY
11-1	SKUSA-NCGH-001-AECM	Plug-and-play control box	1
11-1-1	SK04-ST-KM(H)-001-02	Communication plug HMCST-CJ	1
11-1-2	SK04-ST-KM(H)-EC-003	EC main PCB DCST-SP	1
11-1-3	SK06-KMH-002	Control box base FP-KM4(6)-H-601	1
11-1-4	SK06-KMH-003	Control box cover FP-KM4(6)-H-602	1
11-1-5	SK06-KMH-004	Terminal cover FP-KM4(6)-H-603	1
11-1-6	SK06-KMH-005	Wires protection hole FP-KM4(6)-H-603/1	1
11-1-7	SK08-TB-010	Terminal block JX0-B9-1	1
11-1-8	SK10-EC-XS-ST-KMH-001	Wires cable DCST-KM4(6)H	1

11-2	SKUSA-NCGH-002-AECM	Plug-and-play control box	1
11-2-1	SK04-ST-KM(H)-EC-004	EC MINI PCB STMB-EC-SP	1
11-2-2	SK06-KMH-002	Control box base FP-KM4(6)-H-601	1
11-2-3	SK06-KMH-003	Control box cover FP-KM4(6)-H-602	1
11-2-4	SK06-KMH-004	Terminal cover FP-KM4(6)-H-603	1
11-2-5	SK06-KMH-005	Wires protection hole FP-KM4(6)-H-603/1	1
11-2-6	SK08-TB-010	Terminal block JX0-B9-1	1
11-2-7	SK10-EC-XS-ST-KMH-002	Wires STMB-EC-KM4(6)H	1
Item	Code	Description	QTY
11-3	SKUSA-NCGH-003-AECM	Plug-and-play control box	1
11-3-1	SK04-ST-KM(H)-EC-004	EC MINI PCB STMB-EC-SP	1
11-3-2	SK06-KMH-002	Control box base FP-KM4(6)-H-601	1
11-3-3	SK06-KMH-003	Control box cover FP-KM4(6)-H-602	1
11-3-4	SK06-KMH-004	Terminal cover FP-KM4(6)-H-603	1
11-3-5	SK06-KMH-005	Wires protection hole FP-KM4(6)-H-603/1	1
11-3-6	SK08-TB-010	Terminal block JX0-B9-1	1
11-3-7	SK08-DQPJ-004	Relay 30A JQF-105F-4	1
11-3-8	SK10-EC-XS-ST-KMH-007	Wires STMB-EC-KM4(6)H	1



#### I.4. Accessories

<b>12-Accessories</b>			
<b>Item</b>	<b>Code</b>	<b>Description</b>	<b>QTY</b>
12-1	SK-DFPS-A-002.1	Infra-red handset and wall-holder	1
12-2	SK-DFPS-A-002.2	Wired wall-pad controller	1
12-3	SKUSA-DFPS-A-003d	1 pc 2-way valve with 3/4" inch connectors and ON/OFF thermoelectric actuator (24V)	1
12-4	SKUSA-DFPS-A-003c	1 pc 3-way bypass valve with 3/4" inch connectors and ON/OFF thermoelectric actuator (24V)	1
12-5	SK-NCGH-009a	ABS flange for branch duct connection	1
12-6	SK-NCGH-009b	ABS flange for fresh air duct connection	1
12-7	SK-NCGH-006-03-04	1 kW 220V(3,400 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-04	1
12-7	SK-NCGH-006-06-08	2 kW 220V (6,800 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-08	1
12-7	SK-NCGH-006-G09	3 kW 220V (10,200 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-09	1
12-7	SK-NCGH-006-G12-16	3 kW 220V (10,200 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-12/16	1
12-7	SK-NCGH-006-H09-12	3 kW 220V (10,200 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCH-12	1
12-7	SK-NCGH-006-H16-20	4 kW 220V (13,700 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCH-20	1
12-7	SKUSA-NCGH-006-03-04	0.5 kW 110V (1,700 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-04	1
12-7	SKUSA-NCGH-006-06-08	1 kW 110V (3,400 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-08	1
12-7	SKUSA-NCGH-006-G09	1.5 kW 110V (5,100 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-09	1
12-7	SKUSA-NCGH-006-G12-16	1.5 kW 110V (5,100 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCG-12/16	1
12-7	SKUSA-NCGH-006-H09-12	1.5 kW 110V (5,100 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCH-12	1
12-7	SKUSA-NCGH-006-H16-20	2 kW 110V (6,800 BTU/H) PTC electric heater with 2-stage safety cut-out which is used for PCH-20	1

