



# R32 Rotary 60Hz Universal Outdoor FAHU 14.3 SEER2 Series Technical Manual



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# Part 1. General Information

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# 1. Model Names of Indoor/Outdoor Units

## 1.1 Indoor Units

Model name	Dimension(W×H×D) (inch)	Power supply
CWM17-18-15(402)	20-1/2"×15"×36-1/2"	208/230V-1Ph-60Hz
CWM17-24-15(403)	22"×19"×39-1/2"	208/230V-1Ph-60Hz
CWM17-30-15(404)	22"×19"×39-1/2"	208/230V-1Ph-60Hz
CWM17-36-15(405)	22"×19"×39-1/2"	208/230V-1Ph-60Hz

## 1.2 Outdoor Units

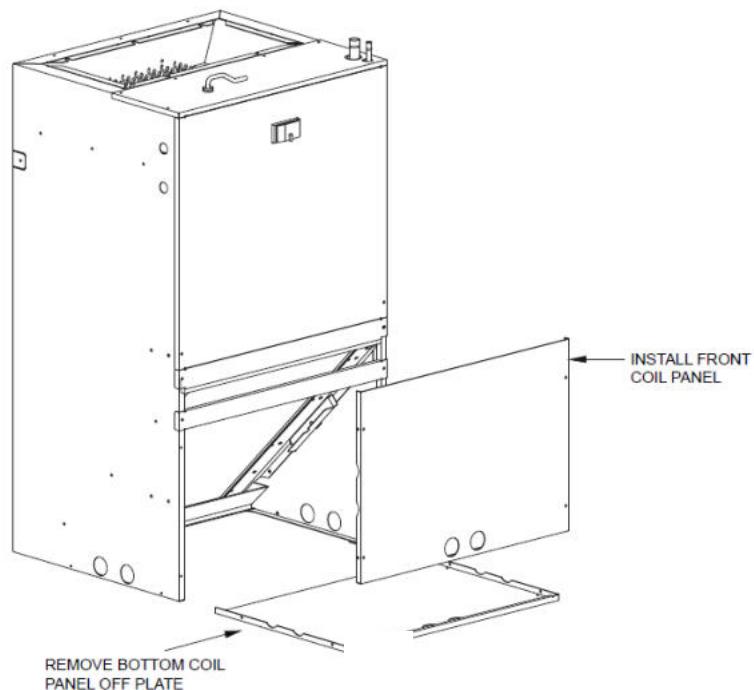
Model name	Dimension(W×H×D) (inch)	Power supply
BAR17-18-15(39T)	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
BAR17-24-15(39U)	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
BAR17-30-15(39V)	29-1/7×25×29-1/7	208/230V-1Ph-60Hz
BAR17-36-15(39W)	29-1/7×25×29-1/7	208/230V-1Ph-60Hz

## 2. External Appearance

		14.3 SEER2 TDU	
capacity	1.5/2/Ton	2.5/3 Ton	
pic			
14.3 SEER2 AHU			
capacity	1.5	2/2.5/3 Ton	
pic			

### 3. Features

- 3.1 Wide operation range.. Cooling:57-118°F
- 3.2 Well-known brand GMCC Rotary compressor, reliable quality.
- 3.3 Condenser coils constructed with copper tubing and enhanced golden fins.
- 3.4 Use PISTON as expansion device
- 3.5 DC fan motor provides selections of air flow to meet desired applications.
- 3.6 ECM fan motor for indoor unit, higher efficiency, lower noise, constant speed.
- 3.7 24V control, time delay relay, fan relay and transformer included.
- 3.8 R32 environment friendly refrigerant.
- 3.9 The indoor unit has a refrigerant leakage sensor, providing safer protection.
- 3.10 AHRI certification, ETL certification.
- 3.11 Refrigerant leakage sensor is configured to detect the refrigerant content in the air
- Intelligent oil return program to provide operating life
- 3.15 Detachable air filter for cleaning or renewal
- 3.16 DIFFERENT AIR SUPPLY BOTTOM RETURN



## Part 2. Indoor Unit

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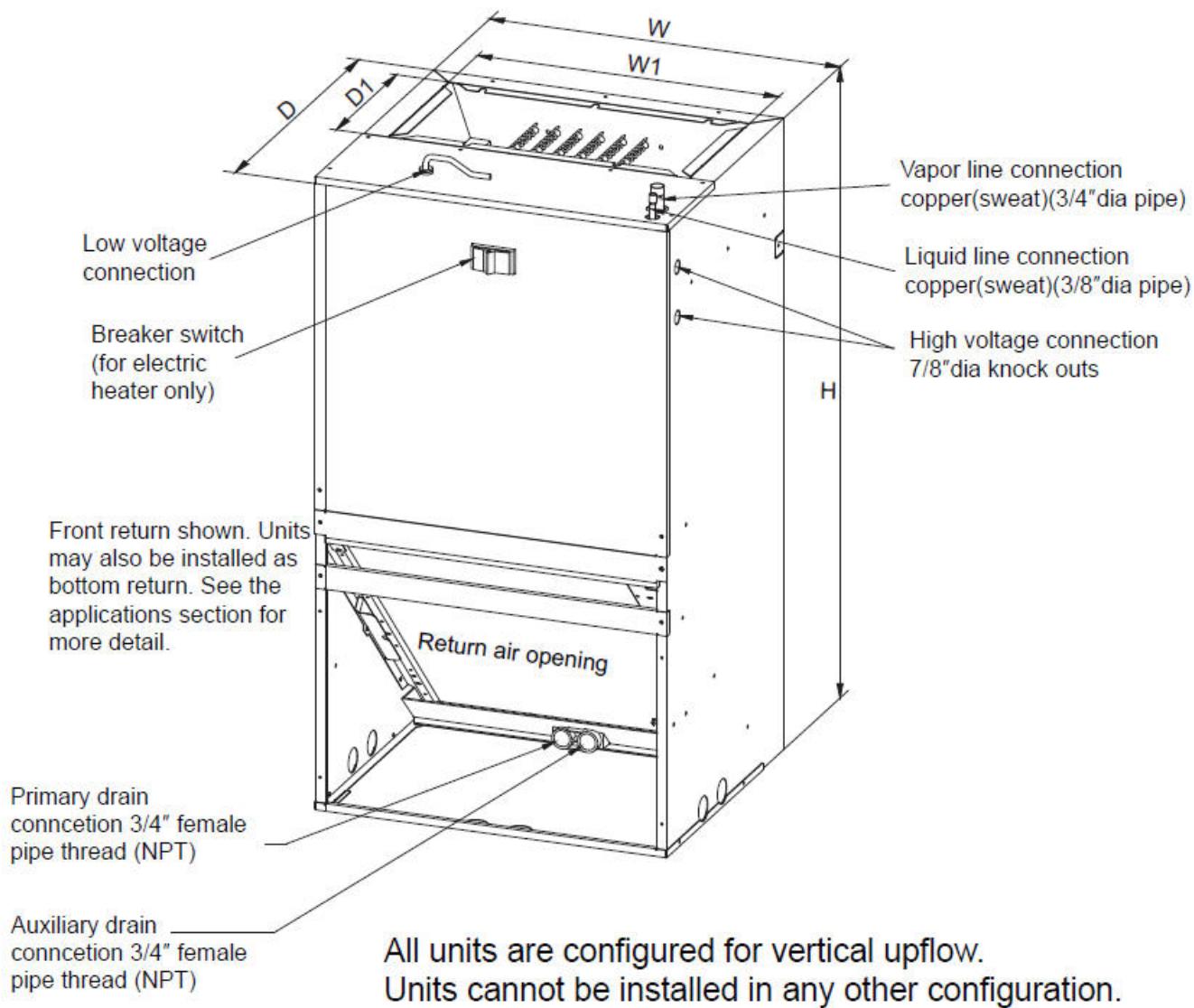
# 1.Specification

Model		CWM17-18-15	CWM17-24-15	CWM17-30-15	CWM17-36-15	
Cooling	Capacity	Btu/h	17000	23000	29000	
	EER2	Btu/h, W	11.7	11.7	11.7	
	SEER2	Btu/h, W	14.3	14.3	14.3	
Refer to Room Area	square feet		269	355	441	
	MCA	A	4	5	5	
	MOP	A	6	6	6	
Indoor fan motor	Type		ECM	ECM	ECM	
	Power supply		AC220-240V/50 60Hz	AC220-240V/50 60Hz	AC220-240V/50 60Hz	
	Model		DZJ-249F-12	DZJ-373F-12	DZJ-373F-12	
	rate current	A	2.6	3.8	3.8	
	Output	W	249	373	373	
	Speed	rpm	1050	1050	1050	
	Number of row		5	5	5	
Indoor coil	Fin spacing	in	1/16	1/16	1/16	
	Fin material		Hydrophilic	Hydrophilic	Hydrophilic	
	Tube outside diameter	in	Φ 0.276	Φ 0.276	Φ 0.276	
	Tube material		inner grooved	inner grooved	inner grooved	
Number of circuit			6	8	8	
Indoor air flow		CFM	623	864	1059	
Indoor noise level		dB(A)	51	51	53	
Throttling type			Piston	Piston	Piston	
Electric heater		kW	5/7.5kW	5/7.5/10kW	5/7.5/10kW	
Indoor dimension	Unit dimension(W*D*H)	in	20-1/2"×15"×36-1/2"	22"×19"×39-1/2"	22"×19"×39-1/2"	
		mm	520×381×927	559×483×1004	559×483×1004	
	Packing (WxDxH)	in	23-3/7"×17-1/2"×39-1/2"	24-1/2"×21-4/5"×42-1/10"	24-1/2"×21-4/5"×42-1/10"	
		mm	600×450×1005	630×565×1070	630×565×1070	
Net / Gross weight		kg	39.5	48.5	48.5	
		lbs	44.5	55	55	

## Notes:

1. Nominal cooling capacities are based on the following conditions:  
Indoor temp: 27°C DB, 19°CWB; Outdoor temp: 35°C DB; Equivalent ref. piping: 5m (horizontal)
2. Actual noise level may differ, depending on the room structure, etc., since these noise values are from an anechoic room.

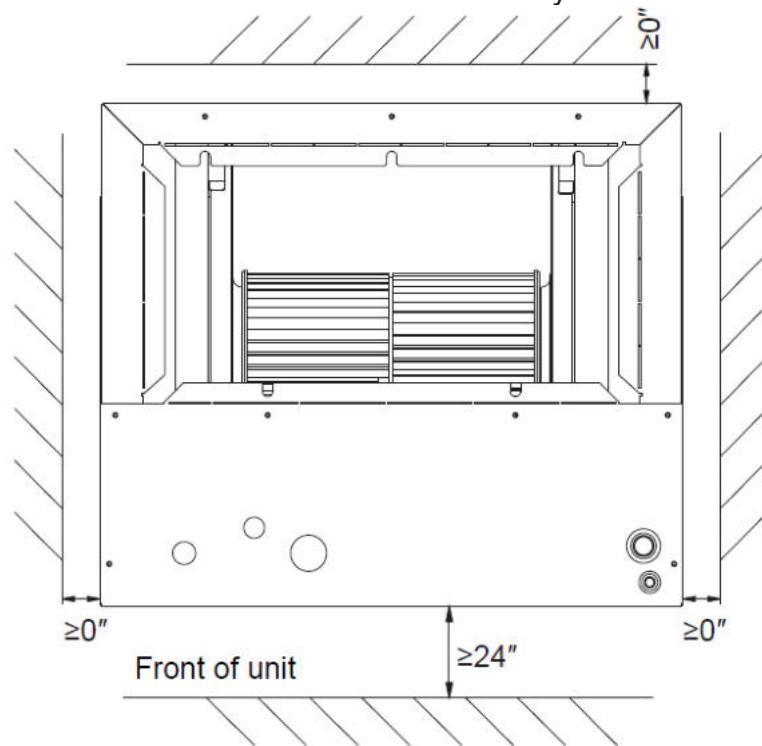
## 2. Dimension



Model Size	Dimensions inch (mm)					Unit Weight /Shipping Weight (kg(LBS))
	Unit Height "H" inch (mm)	Unit Width "W" inch (mm)	Unit Width "W1" inch (mm)	Unit Length "D" inch (mm)	Unit Length "D1" inch (mm)	
18	36-1/2 (928)	20-2/3 (526)	17-1/2 (446)	15 (381)	9-1/2 (242)	40.0/45.5 (88.2)/(100.3)
24	39-1/2 (1004)	22 (559)	18-4/5 (478)	19 (483)	9-1/2 (242)	48.5/55.0 (106.9)/(121.3)
30	39-1/2 (1004)	22 (559)	18-4/5 (478)	19 (483)	9-1/2 (242)	48.5/55.0 (106.9)/(121.3)
36	39-1/2 (1004)	22 (559)	18-4/5 (478)	19 (483)	9-1/2 (242)	48.5/55.0 (106.9)/(121.3)

### 3. Service Space

The distance between the air outlet or return air and the wall must be at least 40 inches, and the front of the indoor unit must be at least 25 inches away from the wall.



## 4. Installation

### Wall Mount

The air handler comes standard with an upper and lower wall mount bracket. Reference Figure 3.1 for more detail.

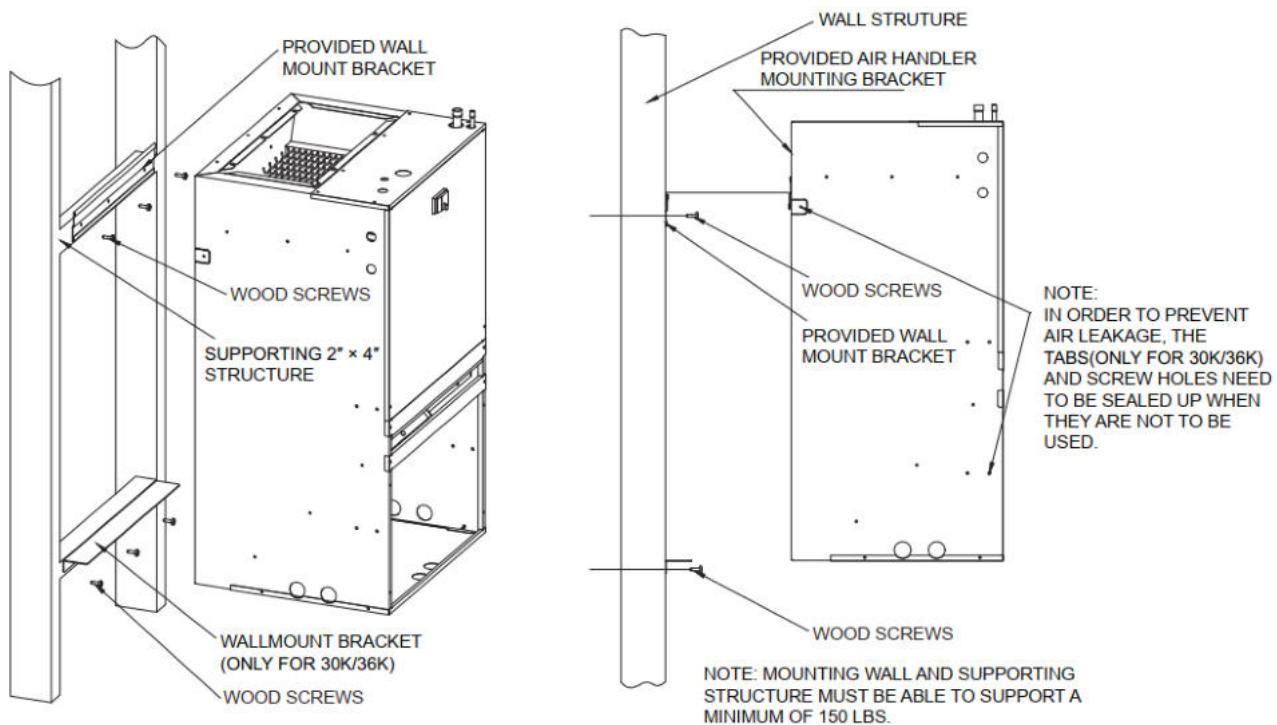
1. Remove lower wall mounting bracket from the back of the unit by removing one screw which attaches the bracket to the air handler. Note: Discard the screw after you have removed the wall mounting bracket.

2. Install bracket on the wall by using 3 wood screws (not provided). Make sure the bracket is level to provide proper drainage from the unit. Note: Do not attach the wall mounting bracket into un-supported dry wall. Make sure that the wood screws are going into a structure that can support a minimum load of 150 lb.

3. Lift the air handler above the wall mounting bracket and attach the unit to the installed bracket. Reference Figure 4.1.

4. Install the additional bottom plate for extra support for this type mounting (see Figure 4.1).

Note: The additional plate is shipped in the bottom of the shipping carton (only for 30/36k unit).

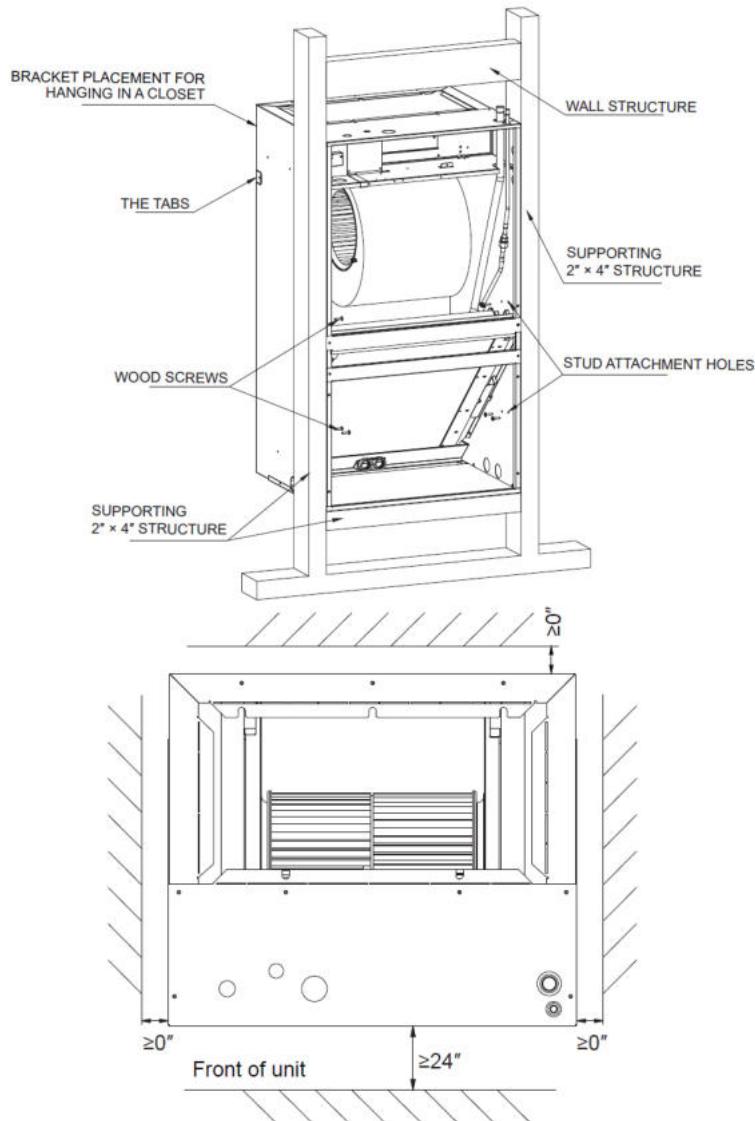


**FIGURE 4.1**

## Frame Mount

The air handler comes with 8 clearance holes (4 on each side). These holes are used to mount the air handler inside of a frame structure (see Figure 3.2). When mounting in this fashion, make sure that the wood screws are mounted from within the air handler and not outside of the unit. Install the screws from outside the unit and avoid damaging the coil. If the frame does not provide support in the front of the unit and additional support is needed, open the tabs and fix the unit to the frame or other support structure with screws (only for 30K/36K). Select a solid and level site to ensure proper installation of the frame mount. Verify that there is sufficient space for installation and maintenance. (See Figure 3.3) **IMPORTANT:** The (8) wood screws are not provided with the unit.

#12 x 1 1/2" wood screws are recommended. When the unit is installed on a wood frame, the screws should be used to fix the unit to the studs. If they are not used, the unit may fall or cause other damage. (See Figure 3.2) for frame mount installation.



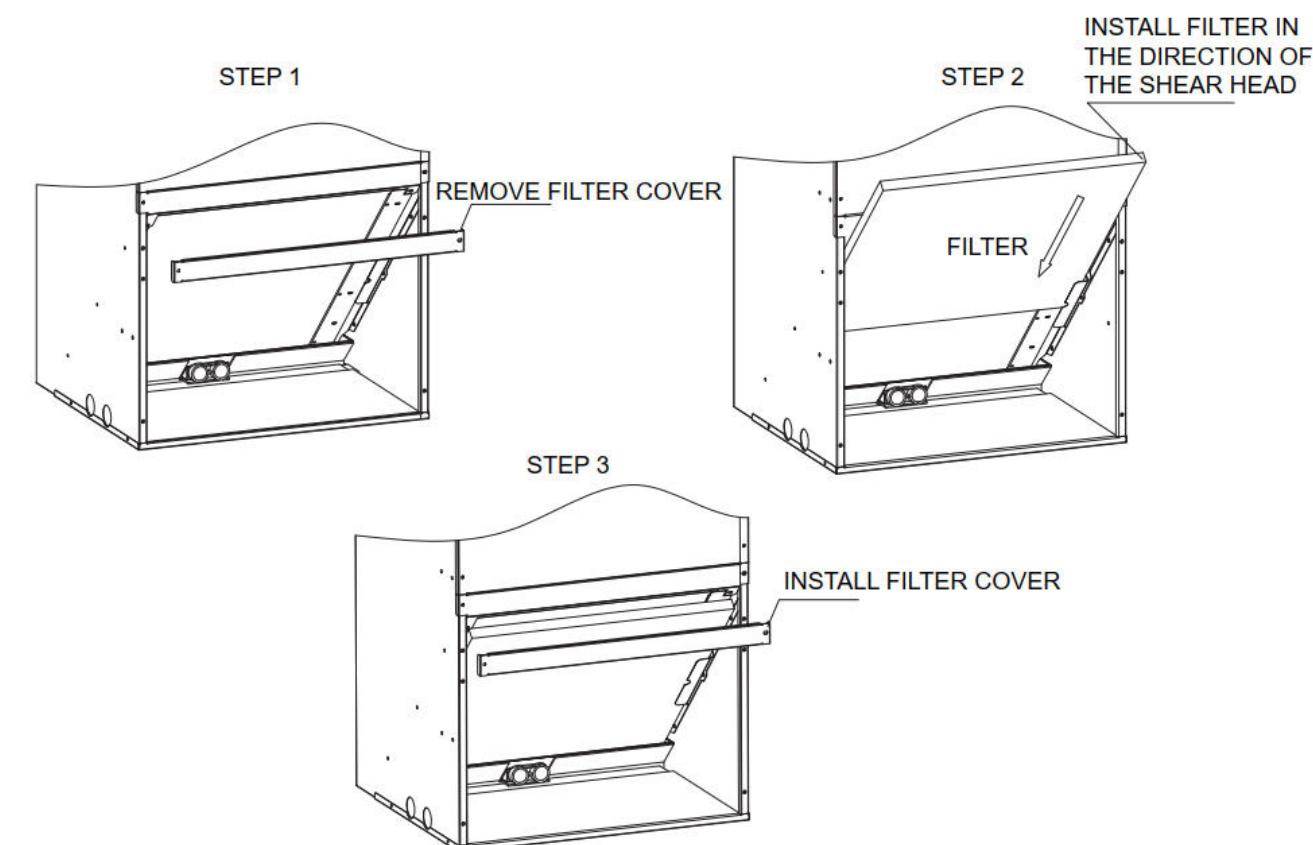
## 5. Air Filter (Not Factory Installed)

The filter is not included in the device and must be provided on site.

The size of external filters or other filtering devices must meet the maximum flow rate of 300ft/min or meet the recommended value of filter type.

The application and placement of filter is very important for airflow, which may affect the performance of heating and cooling system. Reduced airflow will shorten the life of the main components of the system, such as motors, components, thermal relays, evaporator coils or compressors. Therefore, we recommend that the return air duct system has only one filter position. For systems without return air filter grids, multiple filter grids can be installed at each return air opening.

If a high-efficiency filter screen or electronic air filtration system is used, it is very important that the air flow rate is not reduced. If the air flow decreases, the overall performance and efficiency of the device will decrease. It is strongly recommended to contact professional installation technicians to ensure the correct installation of such filtration systems.



Model	Filter size inches [mm]
18K	16×20[406×508]
24K/30K/36K	20×20[508×508]

- Manually remove the bolts and remove the filter cover, as shown in Figure 9.1.
- Hold the edge of the strainer and pull it out.
- Install a new filter so that the arrow on the filter screen is consistent with the airflow direction.
- If a reusable filter is used, please clean it according to the manufacturer's specifications before reinstalling it.
- The filter needs to meet UL 900

## 6. Electric heater

Heat kit model	AHU model	electric heat(kW) 208/230VAC	Current (A) 208/230VAC	MCA (A) 208/230VAC	MAX.Fuse or Breaker (HACR) Ampacity		Fan speed				
					208 VAC	230 VAC	1	2	3	4	5
CHE6W-05B	18K	3.8/4.6	18.27/19.96	25/30	40	45	●	●	●	●	●
CHE6W-08B		5.6/6.9	27.08/29.95	30/35	50	57	✗	✗	●	●	●
CHE6W-05B	24K	3.8/4.6	18.27/19.96	25/30	40	45	●	●	●	●	●
CHE6W-08B		5.6/6.9	27.08/29.95	30/35	50	57	✗	✗	●	●	●
CHE6W-10B		7.5/9.2	36.11/39.93	40/45	55	60	✗	✗	✗	●	●
CHE6W-05B	30K	3.8/4.6	18.27/19.96	25/30	40	45	●	●	●	●	●
CHE6W-08B		5.6/6.9	27.08/29.95	30/35	50	57	✗	●	●	●	●
CHE6W-10B		7.5/9.2	36.11/39.93	40/45	55	60	✗	✗	●	●	●
CHE6W-05B	36K	3.8/4.6	18.27/19.96	25/30	40	45	●	●	●	●	●
CHE6W-08B		5.6/6.9	27.08/29.95	30/35	50	57	✗	●	●	●	●
CHE6W-10B		7.5/9.2	36.11/39.93	40/45	55	60	✗	✗	●	●	●

- indicates availability, and ✗ indicates unavailability
- Ampacities for MCA and Fuse/breaker including the blower motor.
- The heat pump system needs specific airflow. Each ton of cooling requires 350 to 450 cubic feet (CFM) of air per minute, or nominally 400 CFM.

Heat kit model Market Model/ Factory Model	Description	18	24	30	36
CHE6W-05B	5 kW heating kit, single-pole circuit breaker	●	●	●	●
CHE6W-08B	7.5 kW heating kit, single-pole circuit breaker	●	●	●	●
CHE6W-10B	10 kW heating kit, single/double pole circuit breaker	✗	●	●	●

- indicates availability, and ✗ indicates unavailability

## 7. Airflow performance

The air flow data is based on the cooling performance of coil and without filter. Performance table, select the appropriate product.

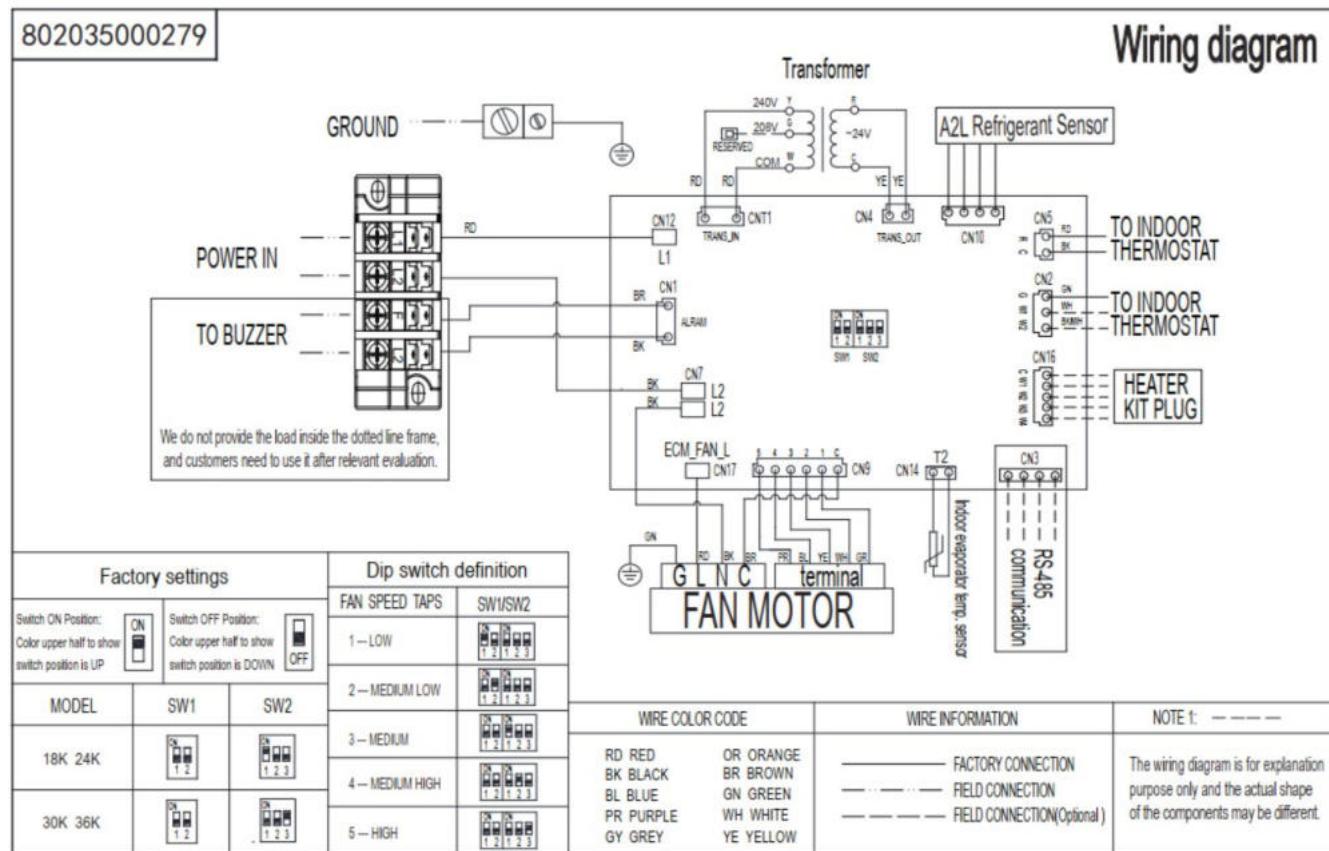
External static pressure ESP should be kept within the minimum and maximum limits shown in the following table to ensure the normal operation of cooling, heating, and electric heating.

Model size of air processor	Motor speed		SCFM						
			External Static Pressure-Inch Water Column [kPa]						
			0[0]	0.1[.02]	0.2[.05]	0.3[.07]	0.4[.10]	0.5[.12]	0.6[.15]
18K	Tap (5)	SCFM	917	898	853	821	789	761	730
		Watts	179	182	189	195	200	205	210
	Tap (4)	SCFM	872	837	804	770	737	709	679
		Watts	156	161	165	171	176	181	186
	Tap (3)	SCFM	814	776	739	705	671	639	606
		Watts	128	133	138	143	147	151	156
	Tap (2)	SCFM	708	664	622	580	542	496	432
		Watts	93	97	102	105	110	114	121
	Tap (1)	SCFM	633	585	538	494	438	382	340
		Watts	69	73	77	81	85	91	98
24K	Tap (5)	SCFM	1318	1282	1241	1205	1165	1113	1071
		Watts	268	276	282	289	296	304	311
	Tap (4)	SCFM	1230	1192	1151	1110	1055	1013	971
		Watts	223	230	236	243	250	257	263
	Tap (3)	SCFM	1129	1071	1025	976	933	886	840
		Watts	172	178	184	191	197	203	209
	Tap (2)	SCFM	1039	976	926	876	826	779	718
		Watts	136	142	147	153	159	165	172
	Tap (1)	SCFM	894	836	781	725	668	595	524
		Watts	98	103	108	112	118	124	129
30K	Tap (5)	SCFM	1318	1282	1241	1205	1165	1113	1071
		Watts	268	276	282	289	296	304	311
	Tap (4)	SCFM	1230	1192	1151	1110	1055	1013	971
		Watts	223	230	236	243	250	257	263
	Tap (3)	SCFM	1129	1071	1025	976	933	886	840
		Watts	172	178	184	191	197	203	209
	Tap (2)	SCFM	1039	976	926	876	826	779	718
		Watts	136	142	147	153	159	165	172
	Tap (1)	SCFM	894	836	781	725	668	595	524
		Watts	98	103	108	112	118	124	129
36K	Tap (5)	SCFM	1318	1282	1241	1205	1165	1113	1071
		Watts	268	276	282	289	296	304	311
	Tap (4)	SCFM	1230	1192	1151	1110	1055	1013	971
		Watts	223	230	236	243	250	257	263
	Tap (3)	SCFM	1129	1071	1025	976	933	886	840
		Watts	172	178	184	191	197	203	209
	Tap (2)	SCFM	1039	976	926	876	826	779	718
		Watts	136	142	147	153	159	165	172
	Tap (1)	SCFM	894	836	781	725	668	595	524
		Watts	98	103	108	112	118	124	129

The highlighted area indicates the airflow within the required range of 300-450cfm/ton.

## 8.Wiring Diagrams

18-36K AHU



## 9.Electric Characteristics

Model	Indoor Units					
	Hz	Voltage	Min.	Max.	MCA	MOP
18K	60	208-230V	187V	253V	4.0	6.0
24K	60	208-230V	187V	253V	5.0	6.0
30K	60	208-230V	187V	253V	5.0	6.0
36K	60	208-230V	187V	253V	5.0	6.0

## 10.The Specification of Wiring

**Note:**

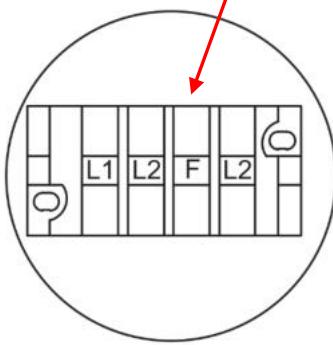
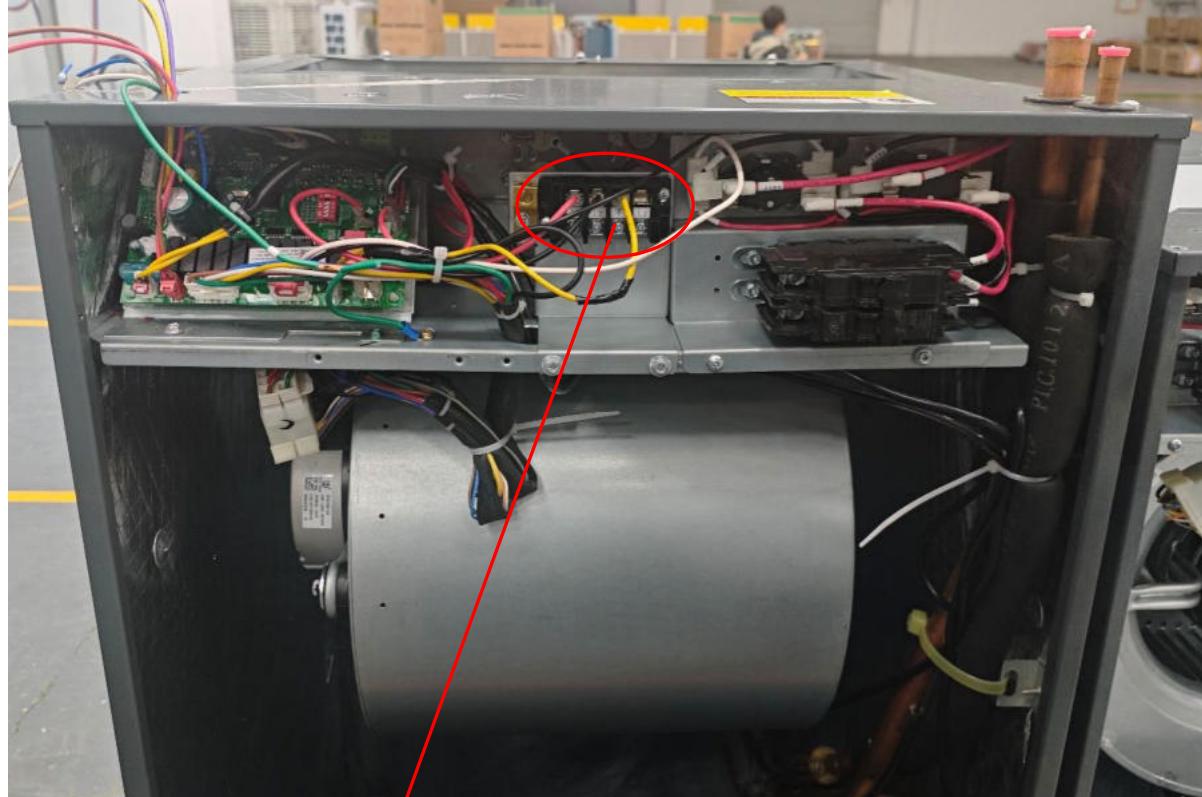
The cross-section areas of wires or lines should not be less than the corresponding ones listed in the table below; Besides, if the power wires is quite long from the unit, please choose the windings with larger cross-section guarantee the normal power supply.

Model	Indoor power wire /Diameter (AWG)	24V Signal wire Diameter (AWG)	Outdoor power wire /Diameter (AWG)
18K	3*16	18	3*14
24K	3*16	18	3*14
30K	3*16	18	3*12
36K	3*16	18	3*12

## 11. Field Wiring

1. To avoid the electrical shock, please connect the air conditioner with the ground lug.
2. The main power plug in the air conditioner has been joined with the ground wiring, please don't change it freely.
3. The power socket is used as the air conditioner specially.
4. Don't pull the power wiring hard.
5. When connecting the air conditioner with the ground, observe the local codes.
6. If necessary, use the power fuse or the circuit breaker or the corresponding scale ampere.

### power supply wiring



During installation, a buzzer or alarm light needs to be installed and connected to the terminal of AHU F/L2. When the AHU detects refrigerant leakage, F/L2 will output 220V voltage. Therefore, the buzzer will receive the signal and respond in time. When the refrigerant concentration reaches the threshold, the indoor airflow will run at the highest gear and the outdoor unit will stop.

## Thermostat wiring

Wiring for 3H and 2C thermostat

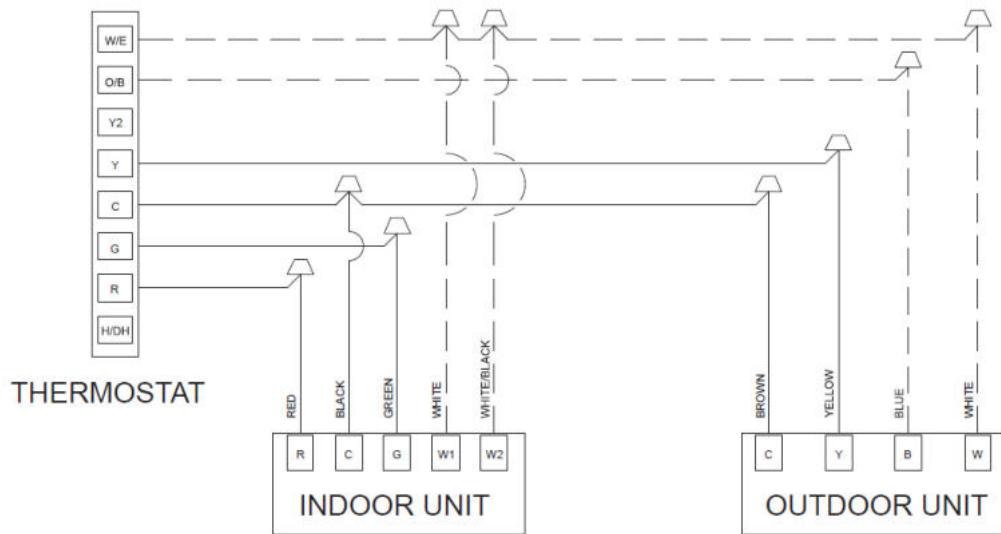


Figure 11.2 Control Wiring

Wiring for 4H and 2C thermostat

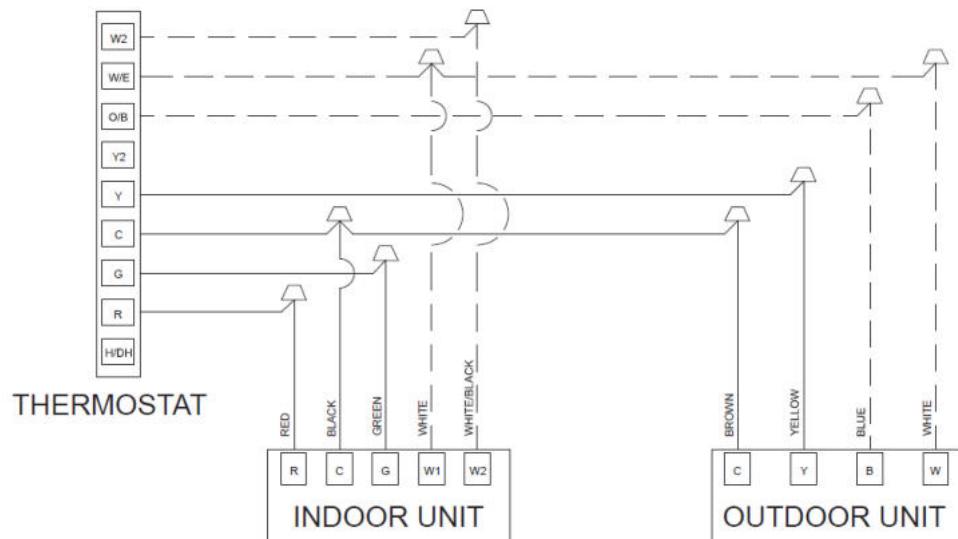


Figure 11.3 Control Wiring

Wiring for 3H and 1C thermostat

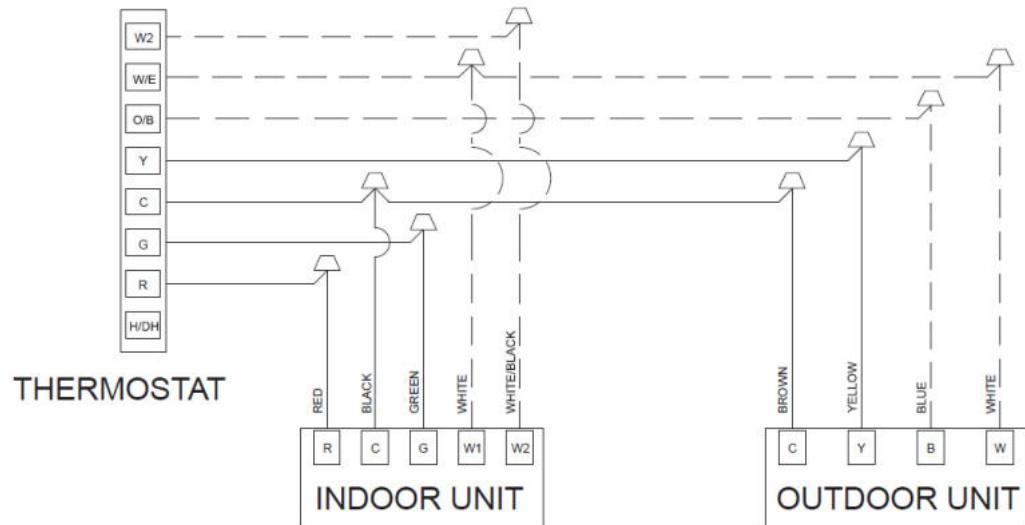


Figure 11.4 Control Wiring

Wiring for 2H and 2C thermostat

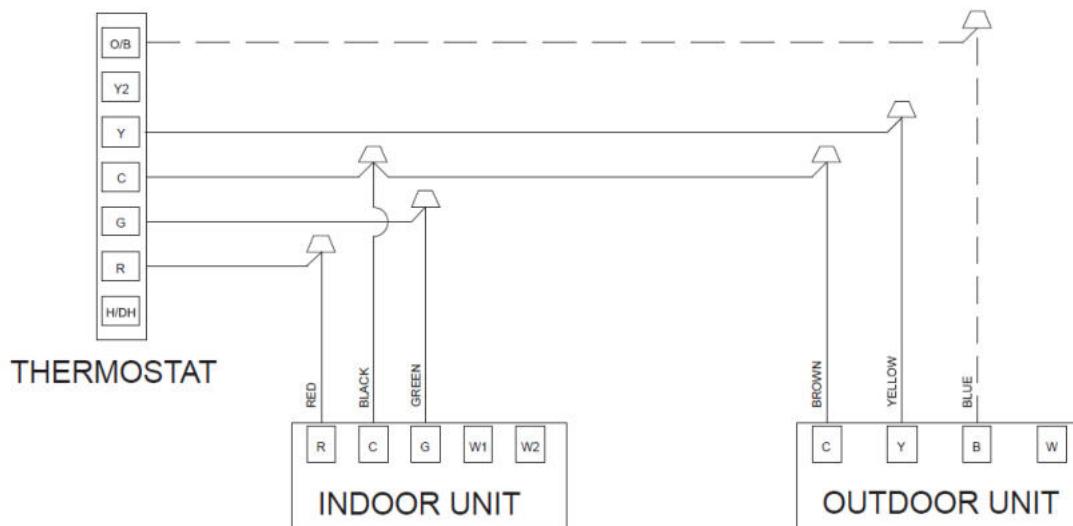


Figure 11.5 Control Wiring

Wiring for 1H and 1C thermostat

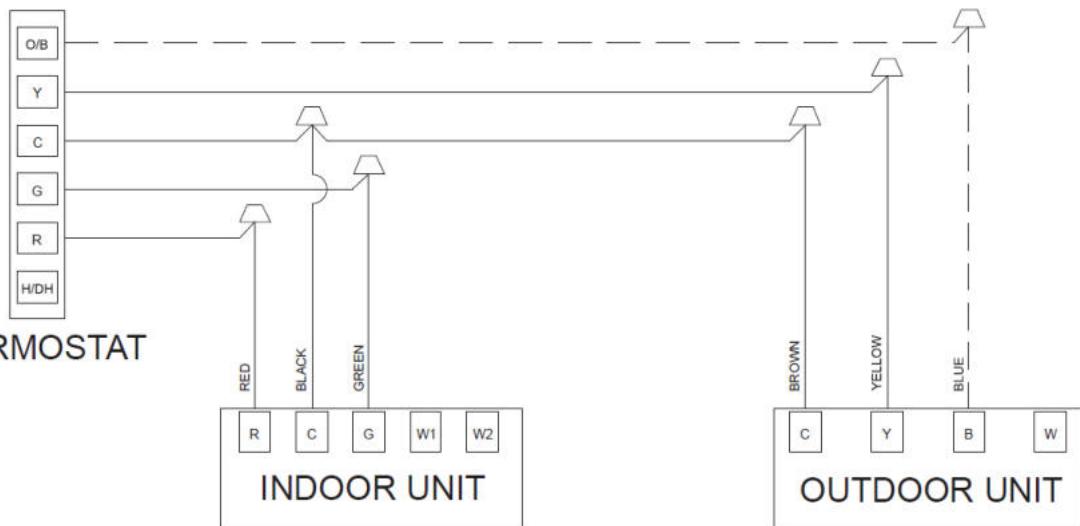


Figure 11.6 Control Wiring

Wiring for 2H and 1C thermostat

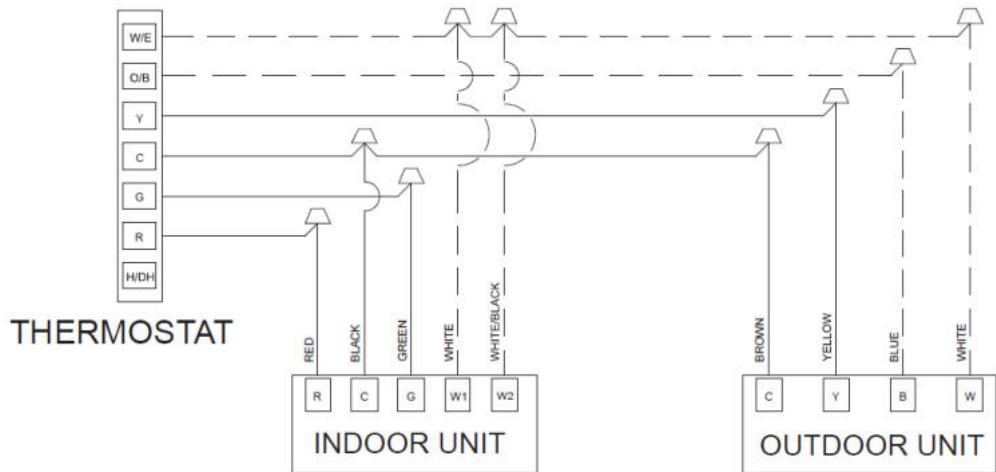
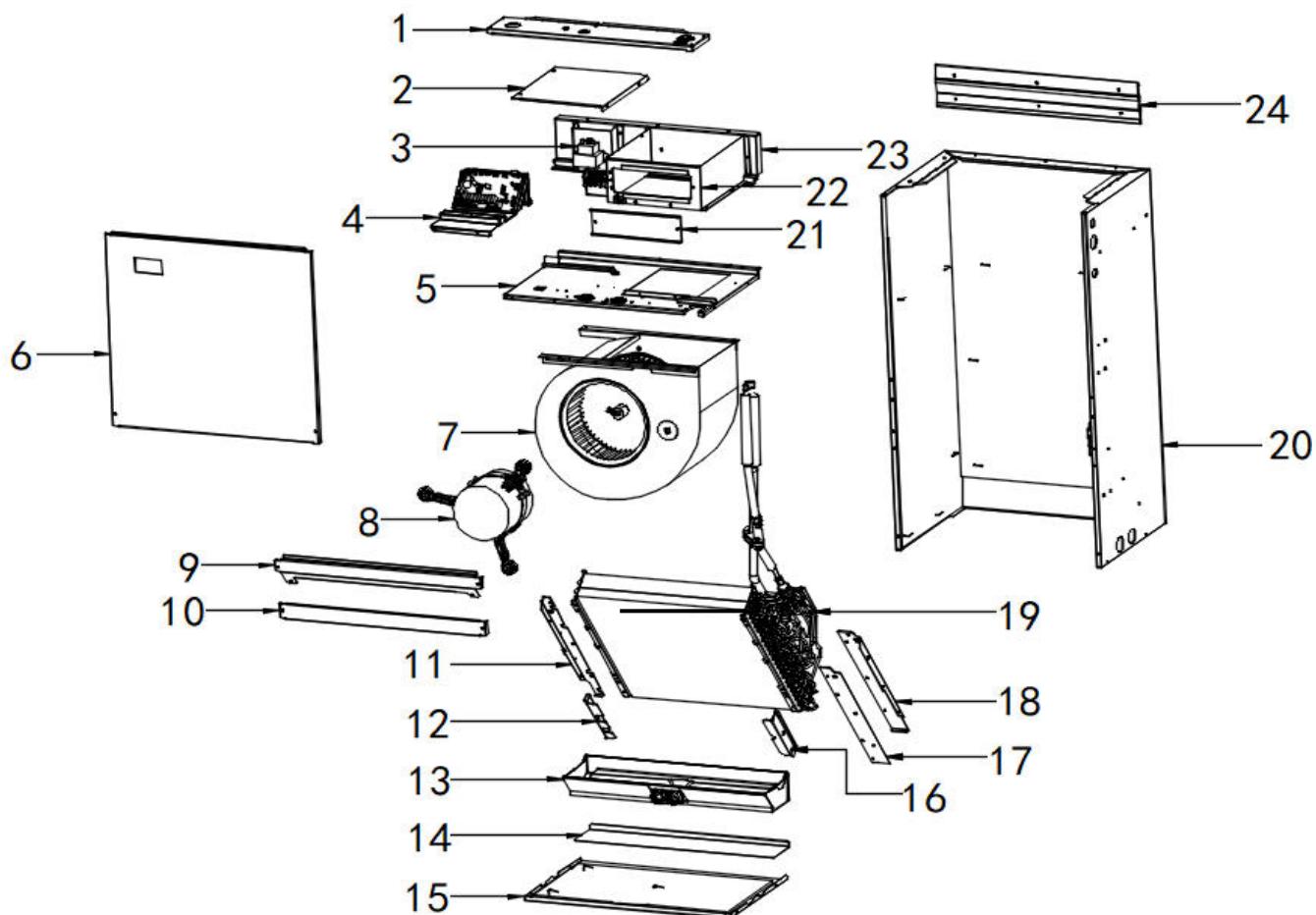


Figure 11.7 Control Wiring

## 12.Exploded View



No.	Part Name	Quantity	No.	Part Name	Quantity
1	Control box cover assembly	1	14	Water tray support plate	1
2	Control box cover	1	15	Bottom plate sponge assembly	1
3	Transformers	1	16	Filter cover	1
4	Indoor electric control box assembly	1	17	Evaporator connecting plate	1
4.1	Indoor main control panel components	1	18	Evaporator front fixing plate	1
4.2	Electric control mounting plate	1	19	Evaporator parts	1
5	Wind wheel fixing plate assembly	1	19.1	Evaporator input pipe assembly	1
6	Front panel sponge assembly	1	19.2	Evaporator output pipe assembly	1
7	Wind wheel assembly (left type)	1	20	Rear panel sponge assembly	1
8	Brushless DC motor	1	20.1	leakage sensor	1
9	Evaporator support plate assembly	1	21	Fixed block	1
10	Evaporator connecting plate assembly	1	22	Air duct front side plate	1
11	Evaporator rear fixing plate	1	23	Wind wheel fixing block	1
12	Filter cover	1	24	Indoor unit mounting plate	2
13	Water tray assembly	1			

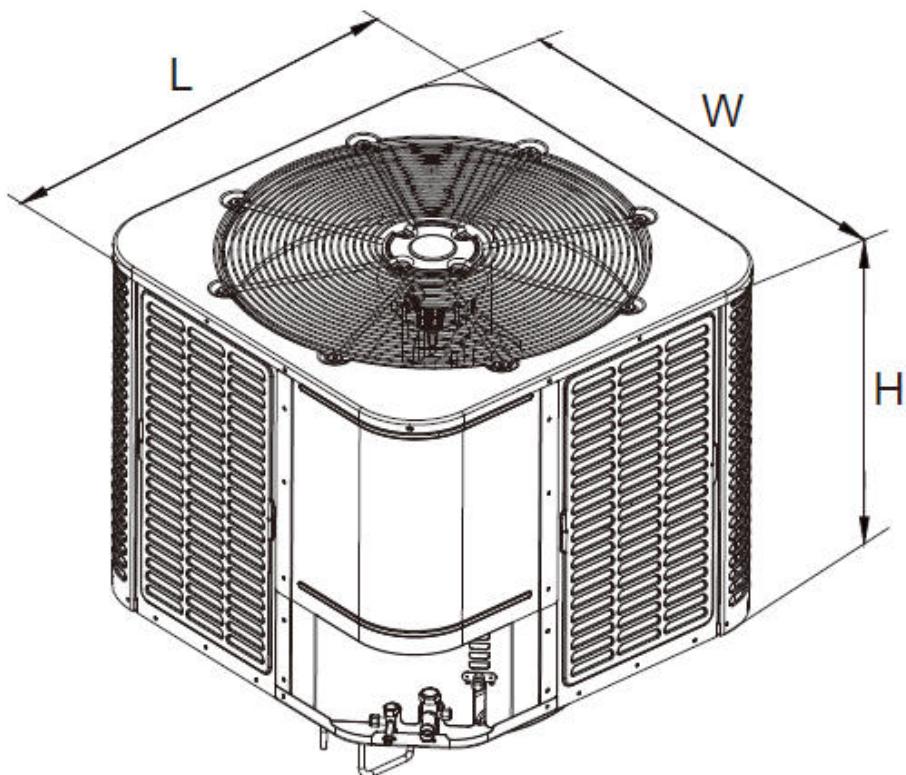
## Part 3 Outdoor Unit

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# 1. Specification

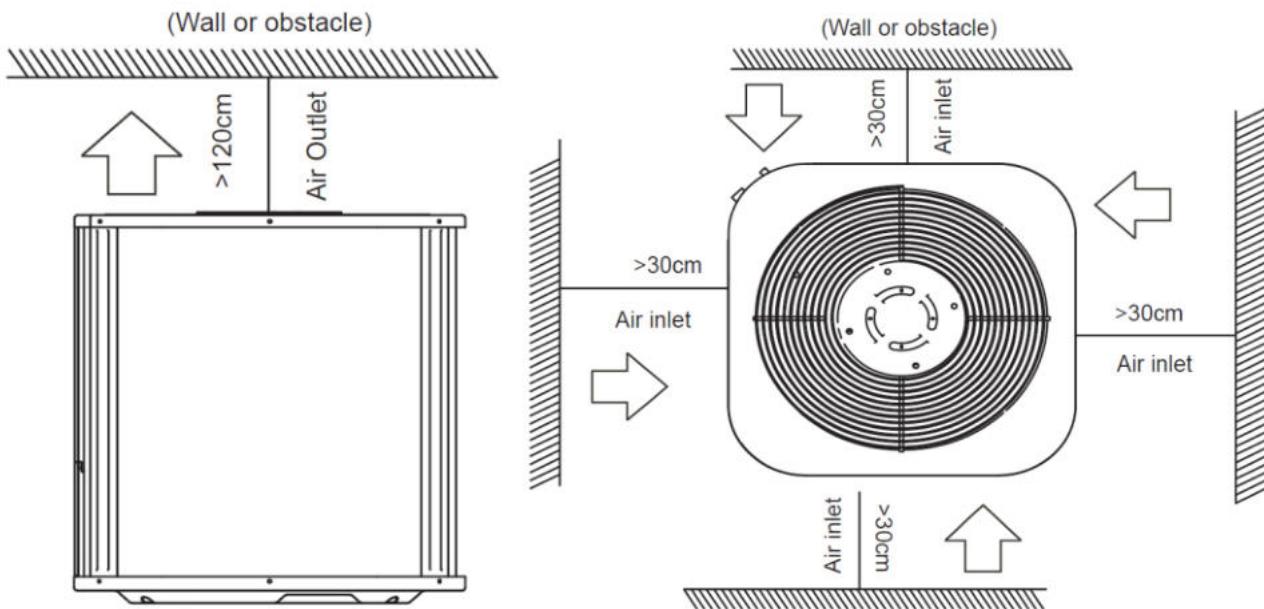
Model		BAR17-18-15	BAR17-24-15	BAR17-30-15	BAR17-36-15
Outdoor power supply	V/Ph/Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz
Cooling	Capacity Btu/h	17600	22800	28000	33000
	EER2	11.7	11.7	11.7	11.7
	SEER2	14.3	14.3	14.3	14.3
Refer to Room Area	square feet	277.00	362.00	441.00	516.00
MCA	A	12	16	18	22
MOP	A	15	25	25	35
Compressor	Brand	GMCC	GMCC	GMCC	GMCC
	Type	Rotary	Rotary	Rotary	Rotary
	Capacity	Btu/h	19073	25863	24771
	Input	W	1290.00	1740.00	2485.00
	Rated current(RLA)	A	7.80	11.00	12.10
	Locked rotor Amp(LRA)	A	39.00	55.00	58.00
Outdoor fan motor	Brand	BROAD-OCEAN	BROAD-OCEAN	BROAD-OCEAN	BROAD-OCEAN
	Model	DRN-310-120-10	DRN-310-120-10	DRN-310-200-10-3	DRN-310-200-10-3
	Rate current	A	1.50	1.50	2.40
	Input	W	157	157	253
	Output	W	120	120	200
	Speed	rpm	1050	1050	1100
Outdoor fan blade	Dimension	mm	Φ450×120×Φ12.7	Φ450×120×Φ12.7	Φ595×115×Φ12.7
	Number of row		2	2	2
	Fin spacing	in	0.059	0.059	0.059
Outdoor coil	Fin material		Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin
	Tube outside diameter	in	Φ 0.276	Φ 0.276	Φ 0.276
	Tube material		Inner Grooved	Inner Grooved	Inner Grooved
	Coil length x height x width	in	55.00×23.15×1.05	55.00×23.15×1.05	84.09×23.15×1.05
	Number of circuit		5	5	7
Throttling type			Piston	Piston	Piston
Outdoor dimension	Unit (WxHxD)	in	21.4/5×25×21.4/5	21.4/5×25×21.4/5	29.1/7×25×29.1/7
		mm	554×635×554	554×635×554	740×635×740
	Packing (WxHxD)	in	22.3/5×26×22.3/5	22.3/5×26×22.3/5	30×26×30
		mm	575×660×575	575×660×575	760×660×760
	Net / Gross weight	kg	50/52.5	50/52.5	63/66.5
		lbs	111/116	111/116	139/147
Refrigerant	Type		R32	R32	R32
Refrigerant pipe	Liquid side	in	Φ3/8	Φ3/8	Φ3/8
	Gas side	in	Φ5/8	Φ5/8	Φ5/8
	Max. refrigerant pipe length	ft	131	131	131
	Max. difference in level	ft	65	65	65
Design pressure	MPa		4.0/1.3	4.0/1.3	4.0/1.3
Max pressure	MPa		4.80	4.80	4.80
Operation temp range	Cooling	°F	57-118	57-118	57-118

## 2. Dimensions

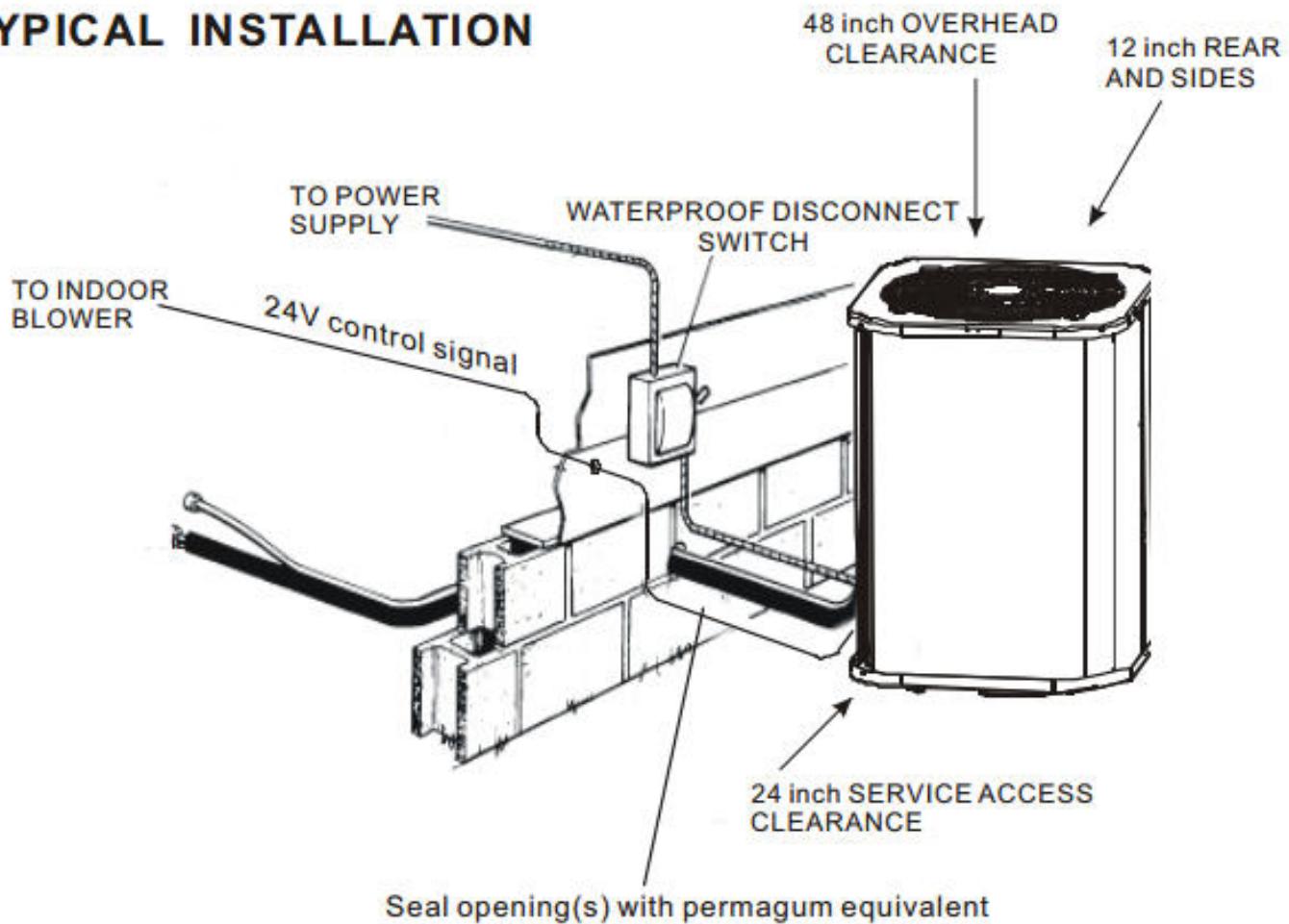


model	H×W×L (inches)
18K/24K	25 × 21-4/5 × 21-4/5
30K/36K	25 × 29-1/7 × 29-1/7

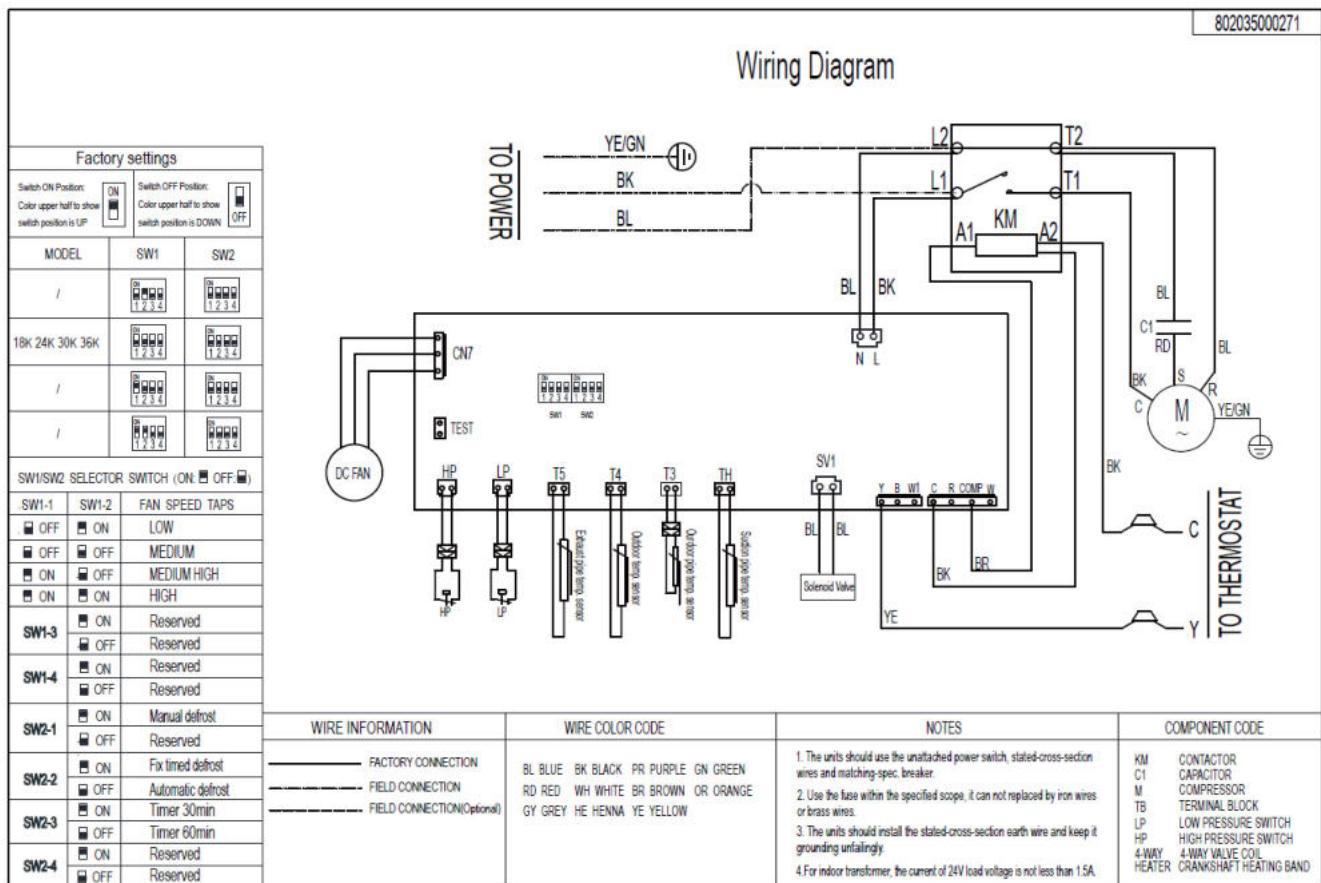
### 3. Service Space



### TYPICAL INSTALLATION



## 4. Wiring Diagrams.



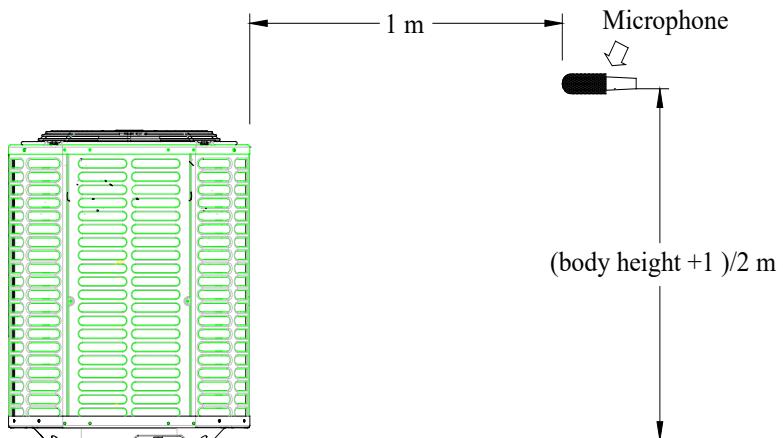
## 5. Electric Characteristics

Model	Outdoor Unit					
	Hz	Voltage	Min.	Max.	MCA	MOP
18K	60	208~230V	187V	253V	12	15
24K	60	208~230V	187V	253V	16	25
30K	60	208~230V	187V	253V	18	25
36K	60	208~230V	187V	253V	22	35

## 6. Operation Limits

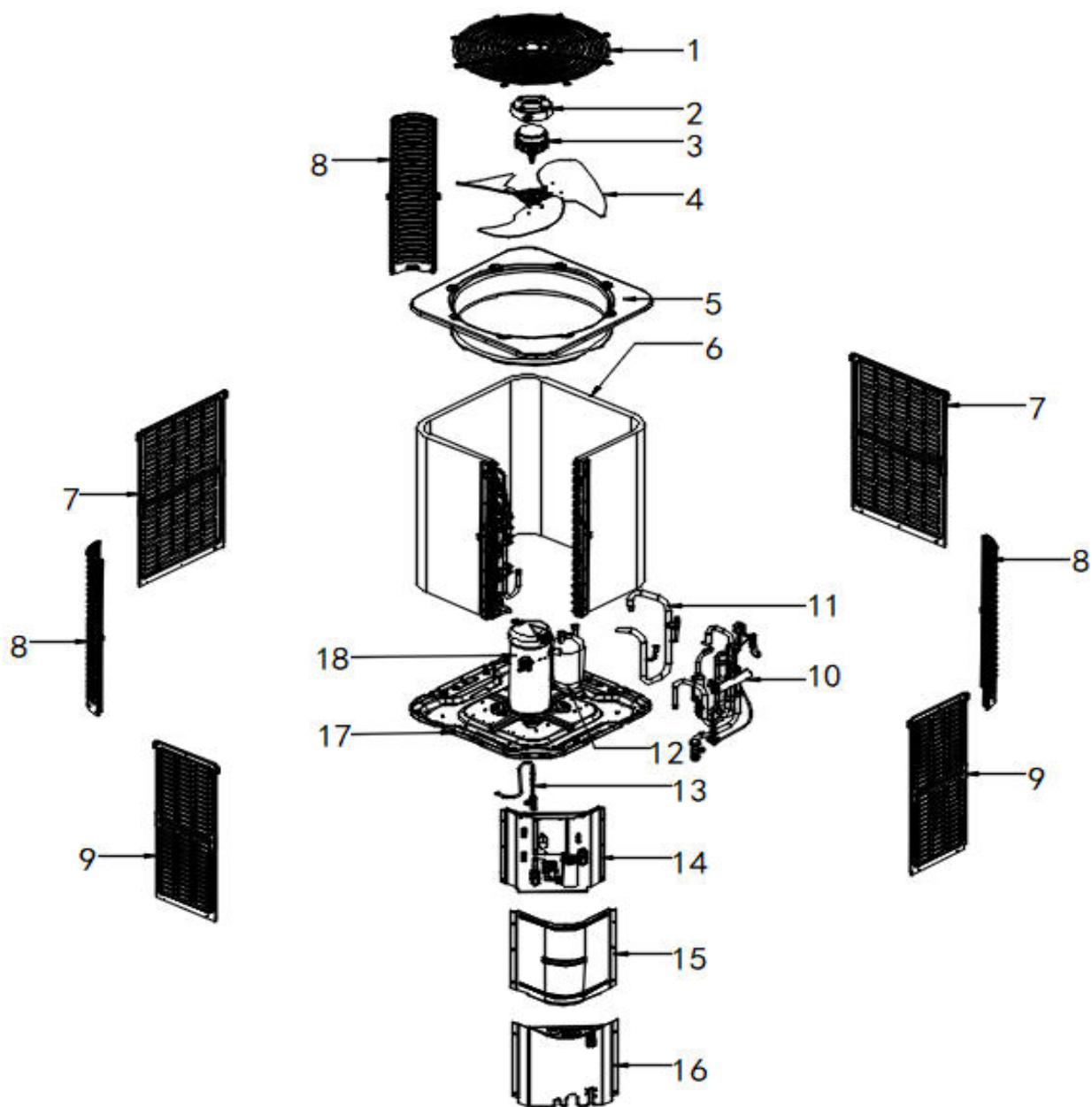
Operation mode	Outdoor temperature(°F)	Room temperature(°F)
Cooling operation	57—118	61—90

## 7. Sound Levels



Note: Sound level is measured at a point 1 m in front of the unit, at a height of (Unit body height +1)/2 m.

## 8.Exploded View



No .	Part Name	Quanti ty	No.	Part Name	Quanti ty
1	Cover net	1	14	electric control box components	1
2	DC Motor Mount	1	14.1	Electronic control board	1
3	Outdoor motor	1	13.2	High pressure switch	1
4	Axial-flow fan	1	13.3	Low pressure switch	1
5	Top cover assembly	1	13.4	Condenser temperature sensor (T3)	1
6	Condenser assembly	1	13.5	Ambient temperature sensor (T4)	1
6.1	Condenser inlet pipe assembly	1	13.6	Exhaust temperature sensor (T5)	1
6.2	Condenser output pipe assembly	1	13.7	Return temperature sensor (TH)	1
7	Rear side-panel	2	13.8	Solenoid valve	1

## R32 60Hz 20 SEER Universal Outdoor Series Technical Manual

8	Support board	3	13.9	AC contactor	1
9	Left side-panel	2	13.1 0	Compressor capacitor	1
10	Four way valve assembly	1	15	Top panel	1
11	Suction air pipe weld assembly	1	16	Bottom side panel	1
12	Gas-liquid separator	1	17	Chassis assembly	1
13	High pressure valve assembly	1	18	Compressor	1

## 9.Troubleshooting

### 9.1 Error code

#### Indoor unit

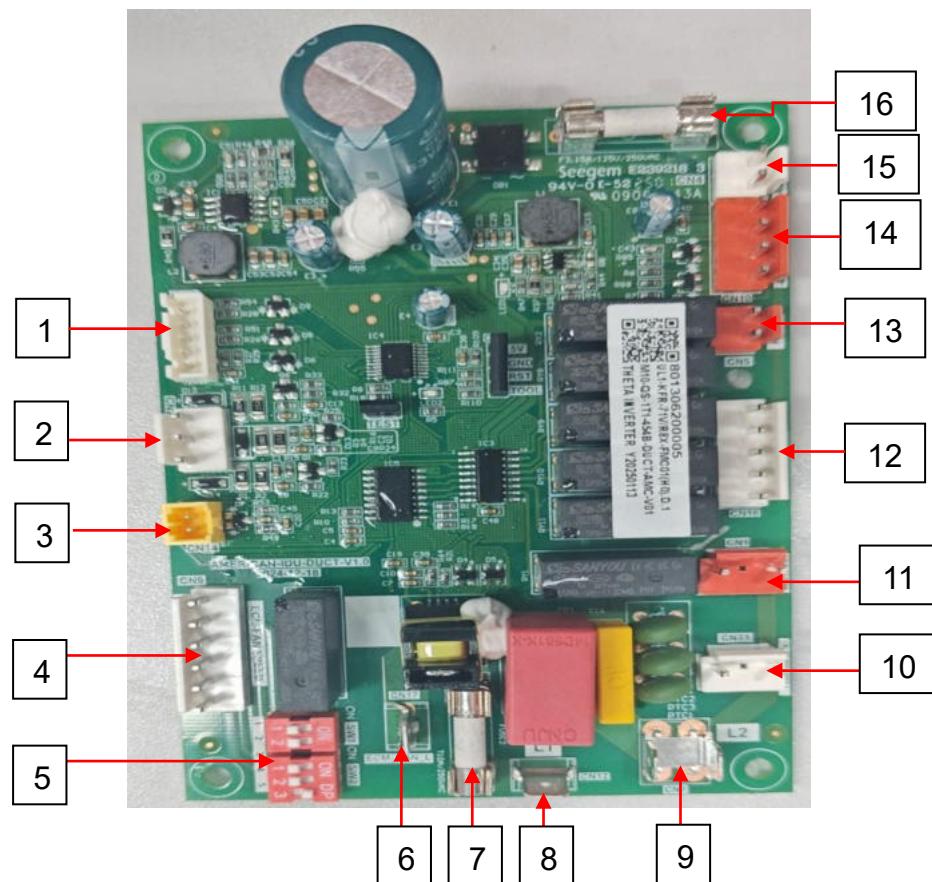
	LED Status	System status
Model	LED light always on	Runing Mode
System warning	LED light 1 Flash/Cycle	R454B refrigerant leak Protection
	LED light 2 Flash/Cycle	Anti-freezed Protection
	LED light 3 Flash/Cycle	Evaporator Temperature Sensor Error
	LED light 4 Flash/Cycle	R454B refrigerant sensor Error
	LED light 5 Flash/Cycle	ECM motor Error

#### Outdoor unit

	Digital tube display content	System status
Model	0	Standby Mode
System warning	1	Cooling Mode
	2	Heating Mode
	3	T3 Sensor Error
	4	T4 Sensor Error
	5	T5 Sensor Error
	6	Low Pressure Protection
	7	High Pressure Protection
	8	Outdoor Fan Error
	9	T3 High Temperature Protection
	A	T4 Ambient Temperature Protection
	C	T5 High Compressor Discharge Temperature Protection
	E	TH Sensor Error
	F	TH Anti-freezed Protection
	L	Low Voltage Protection
System lock	6.	6 times Low Pressure Protection within 60 minutes
	7.	6 times High Pressure Protection within 60 minutes
	8.	4 times Outdoor Fan Error within 60 minutes
	C.	3 times High Compressor Discharge Temperature Protection within 60 minutes
	L.	2 times Low Voltage Protection within 120 minutes

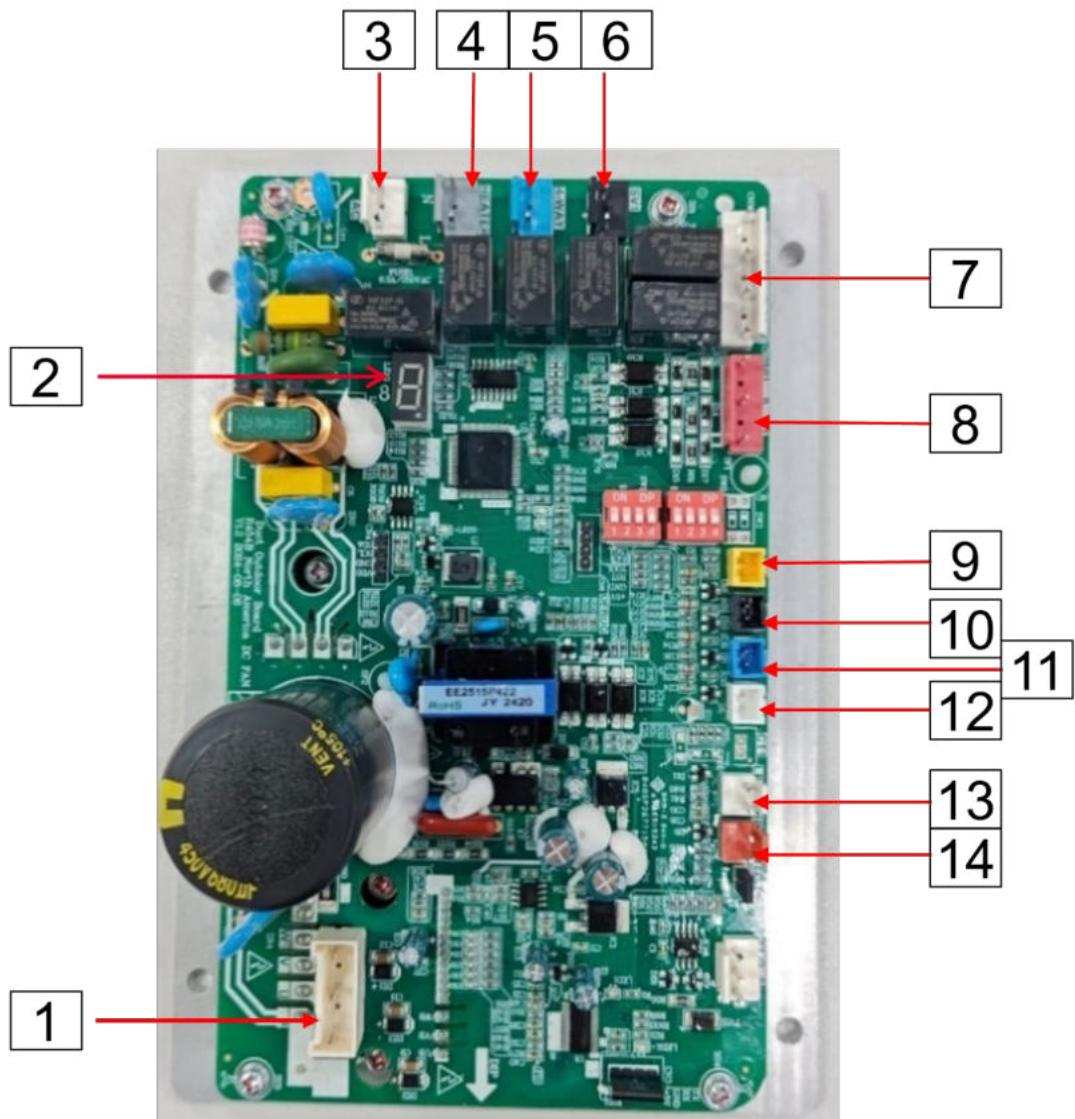
## 9.2 Indoor unit control board

18-36k



NUM	Port definition	NUM	Port definition
1	Reserve	9	Power supply L2
2	24V terminal connected to 24V thermostat	10	Transformer input(230v)
3	T2 sensor	11	Alarm output (230V)
4	ECM motor	12	Electric heater port (connected to electric heater)
5	Function switch	13	24V thermostat power supply R, C
6	Power supply of motor	14	Refrigerant leakage sensor
7	Fuse	15	Transformer output(24v)
8	Power supply L1	16	Fuse

### 9.3 Outdoor unit control board



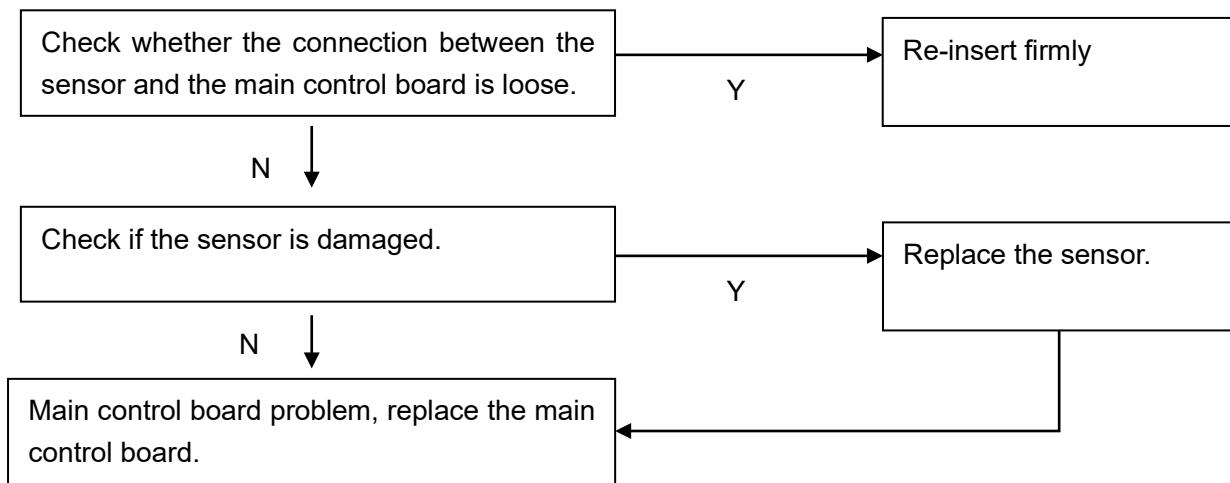
NUM	Port definition	NUM	Port definition
1	DC motor communicate port	8	24V communication (Y/B)
2	Digital display tube	9	Return air temperature sensor
3	Power supply	10	Condenser temperature sensor
4	Crankshaft heating belt	11	ambient temperature sensor
5	Four-way valve	12	Exhaust temperature sensor
6	Solenoid valve	13	Low pressure switch
7	24V communication (W/C)	14	High pressure switch

## 9.4 Troubleshooting guide

### 9.4.1 T1/T2/ sensor fault, R32 sensor fault (Indoor unit sensor failure)

### 9.4.2 T3/T4/T5 sensor fault (Outdoor unit sensor failure)

**Reason:** Sensor reading error



- Confirm whether the sensor is firmly connected and check the sensor connector to ensure it is firmly connected.
- Unplug the sensor and use a multimeter to measure the resistance to check whether it is open circuit or short circuit. If so, replace the sensor; if not, replace the main control board.



- Sensor resistance table see Appendix 1

### 9.4.3 Refrigerant leakage fault

**Reason:** Refrigerant leakage detected

- Firstly, open windows for ventilation and extinguish indoor open flames.
- Then check if there is any leakage in the copper pipe. If it is confirmed to be leaking, the pipe needs to be repaired by welding.
- If no leakage is found, it may be a false alarm fault on the main control board. Replace the indoor board first. If the fault is not resolved, replace the refrigerant sensor.

### 9.4.4 Indoor control board chip failure

**Reason:** The indoor control board chip is broken

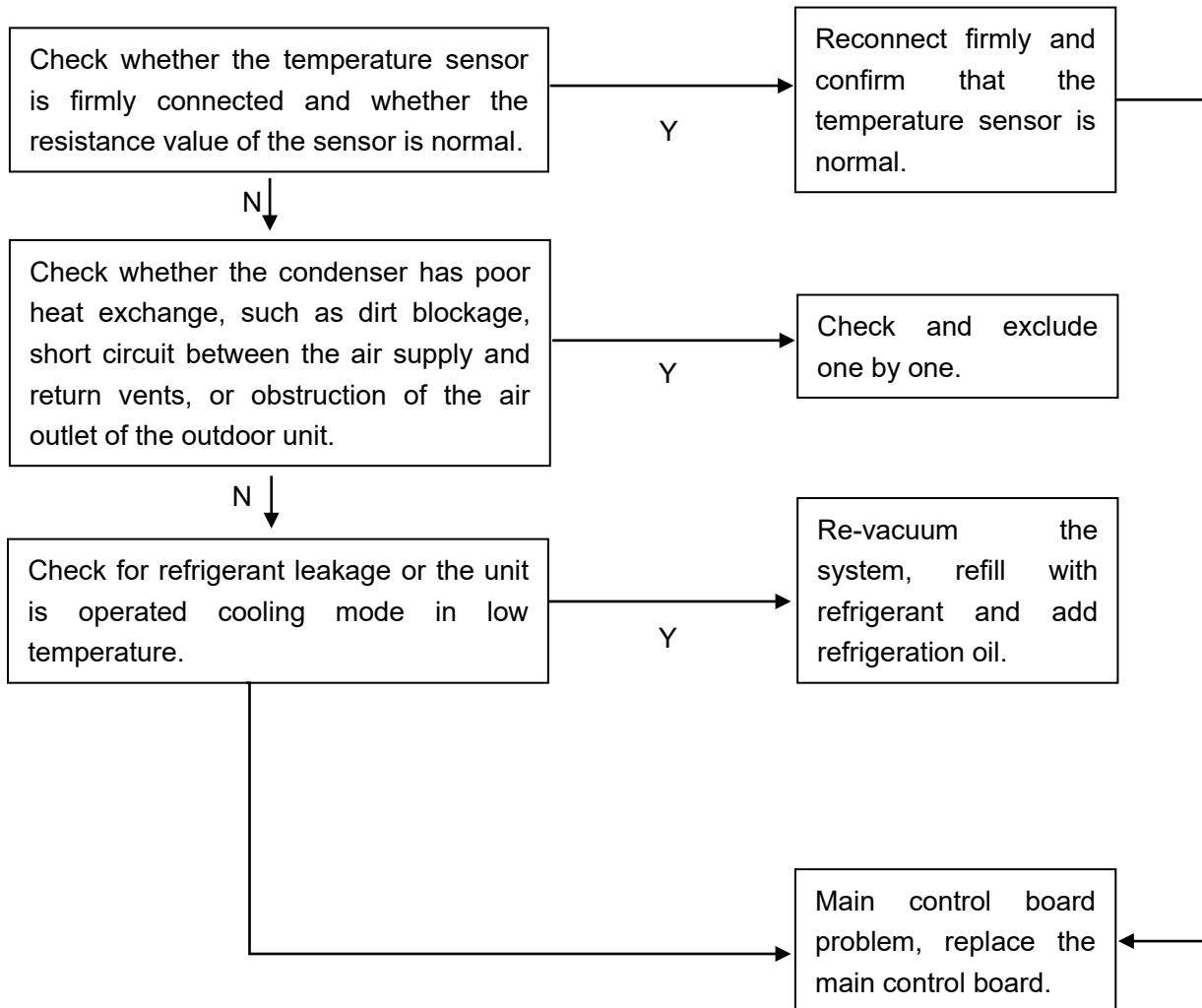
- Replace the indoor control board.

#### 9.4.5 Anti-freeze protection

##### Reason:

**Indoor unit:** The T2 sensor detects that the evaporator temperature is too low( $T2 < 0^{\circ}\text{C}$ )

**Outdoor unit:** The TH sensor detects that the gas return temperature is too low( $T2 < 0^{\circ}\text{C}$ )



- Check if the actual temperature of the evaporator is very low or even frozen.
- If the evaporator is frozen, please check if the air conditioning system is blocked or if the refrigerant is leaking, etc. If no, then you need to clean the pipes, re-evacuate, and recharge refrigerant.
- If the evaporator is not frozen, use a multimeter to measure whether the resistance of the temperature sensor is normal (see the appendix for the R-T table). If it is not normal, you need to replace the sensor.
- If the sensor resistance is normal, then you need to replace the main control board of the indoor unit.

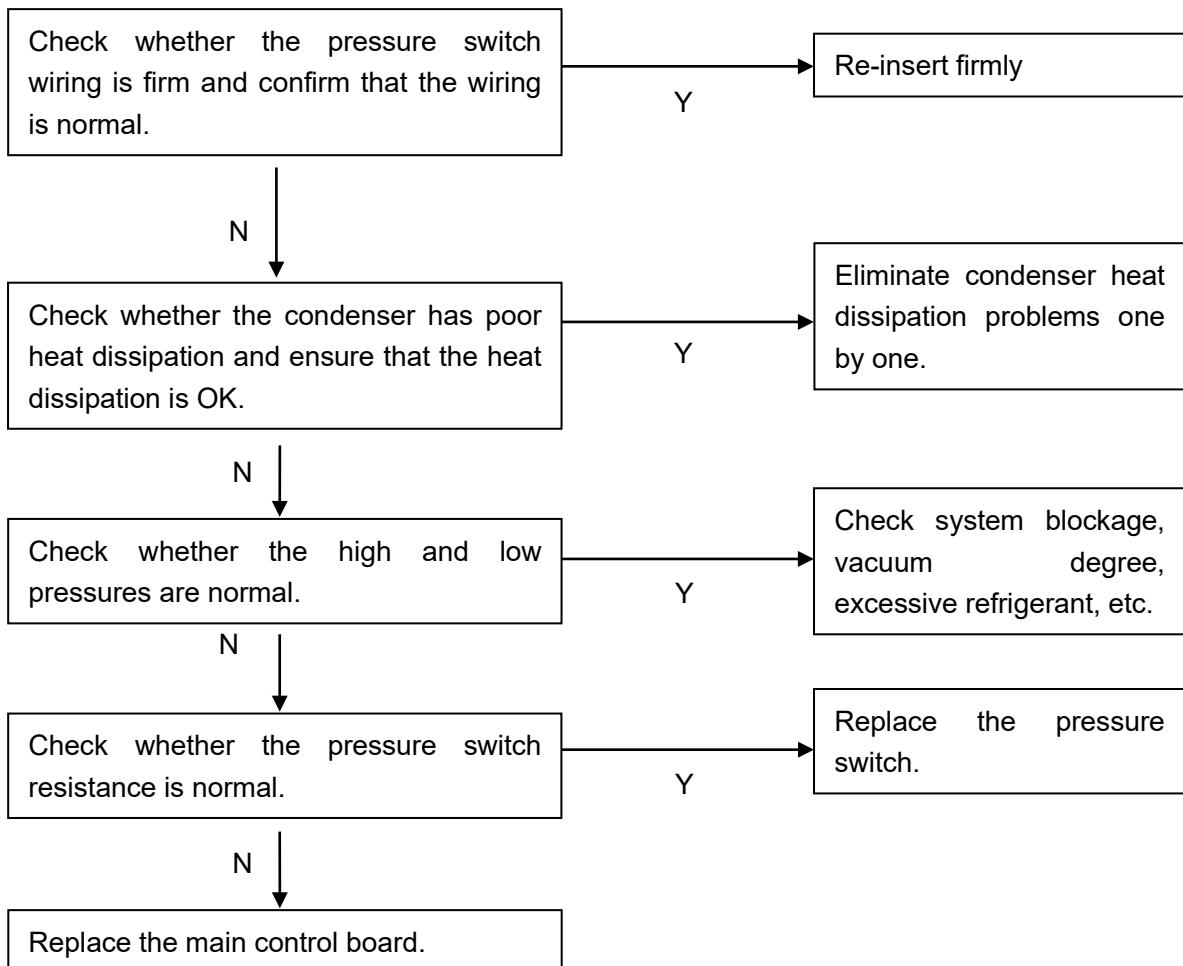
#### **9.4.6 Indoor fan protection**

**Reason: The DC fan motor of the indoor unit has issue**

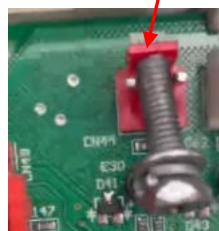
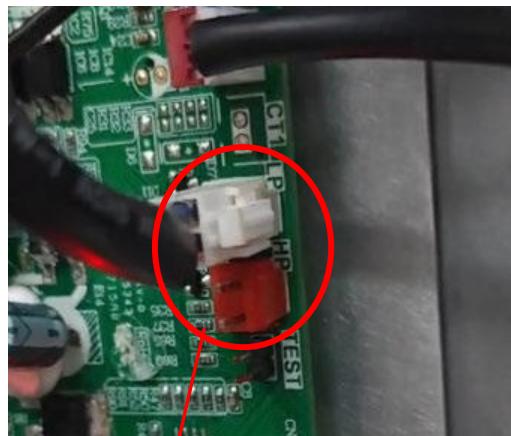
- Replace the control board of the indoor unit.
- If not resolved, replace the motor.

#### 9.4.7 High /Low pressure protection

**Cause: The high and low-pressure switch is continuously in the disconnected state**



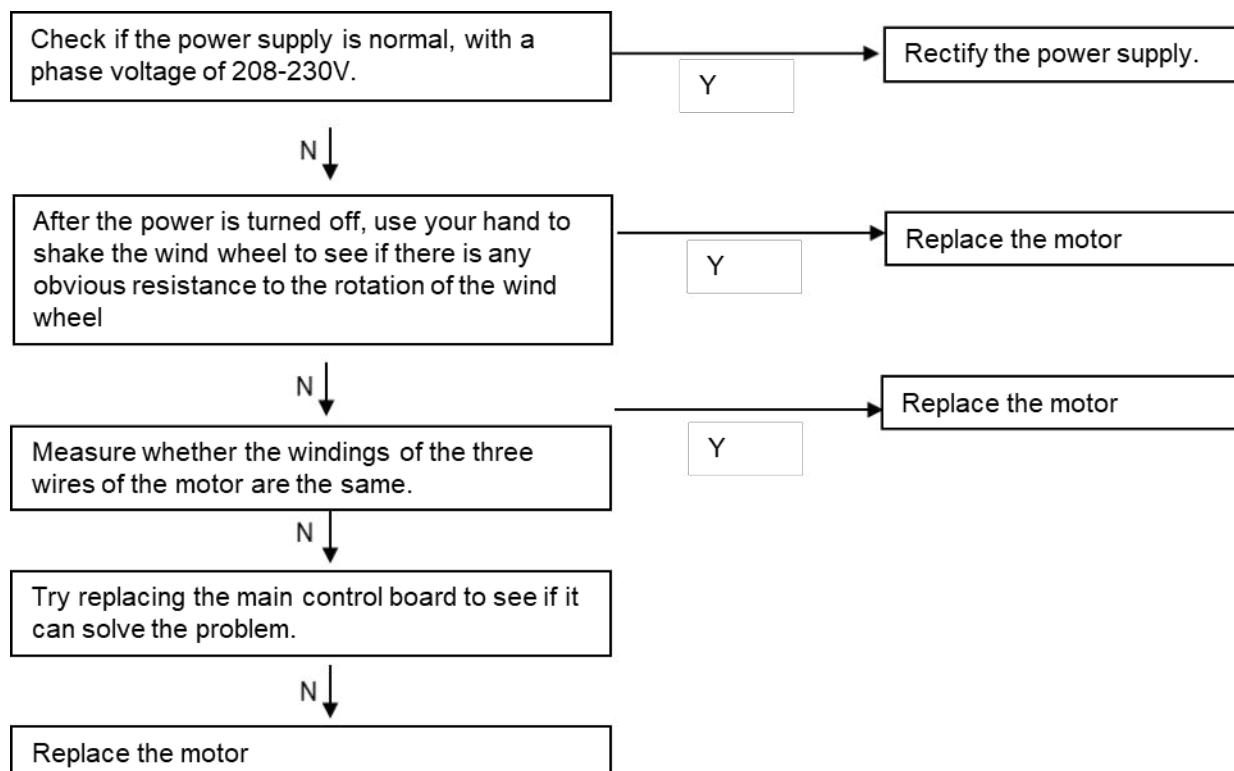
- Then turn off the power of the machine and then turn on the power, and use the controller to start the machine.
- If the machine fails after running for a while, there may be a problem with the refrigerant system and the system needs to be checked.
- If the machine fails as soon as it is powered on, there may be a problem with the pressure switch or the outdoor main board.
- Use a jump cap or metal short-circuit to connect the pressure switch port of the electronic control board, then turn off the power and restart the machine, and observe whether the fault disappears.
- If the fault is resolved, replace the pressure switch.
- If the fault is not resolved, replace the main control board.



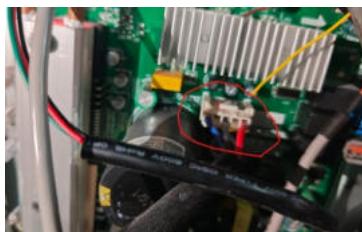
The high-pressure switch port can be short circuited by using a screw clamped between two pins.

#### 9.4.8 DC fan malfunction

Cause: Abnormal detection of fan motor.



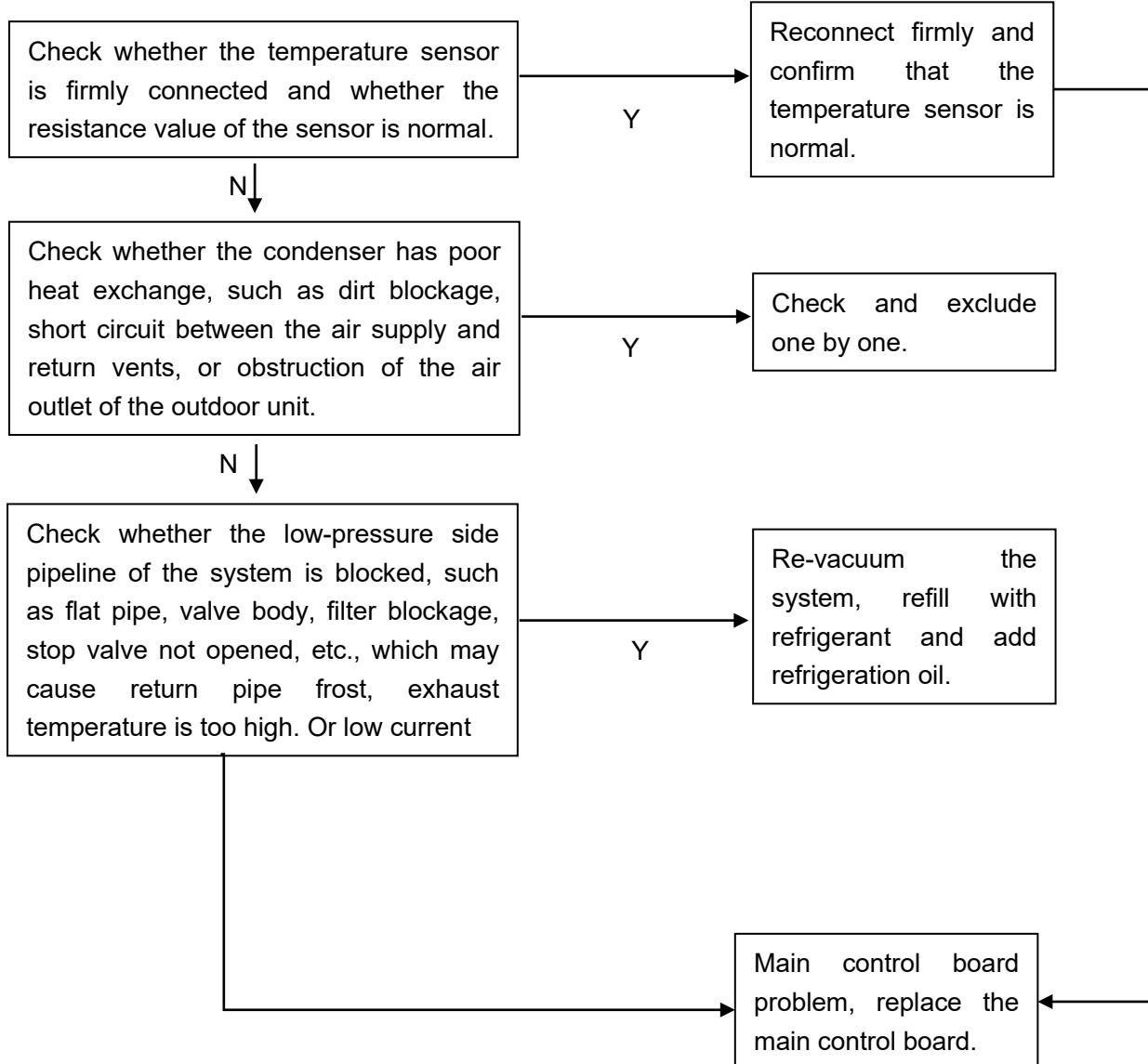
- Check if the power supply is normal, with a phase voltage of 208-230V, and confirm that the power supply is functioning properly.



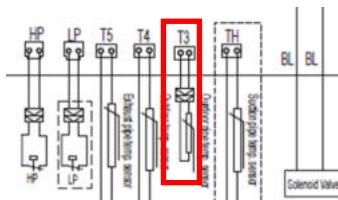
- After the power is turned off, use your hand to shake the wind wheel to see if there is any obvious resistance to the rotation of the wind wheel. If you find that the wind wheel does not rotate smoothly when you turn it by hand, replace the motor, otherwise proceed to the next step.
- Measure whether the windings of the three wires of the motor are the same. If the winding cannot be measured, or the measured resistance is different, replace the motor.
- Try replacing the main control board to see if it can solve the problem.
- Replace the motor.

#### 9.4.9 Outdoor coil temperature over-high protection (cooling mode) $T3 > 60^\circ\text{C}$

Cause: The condenser temperature sensor detected that the temperature was too high



- Check if the heat dissipation of the condenser is normal, ensuring that there are no dirty blockages, short circuits in the air supply and return ports, etc.
- Measure the resistance of the temperature sensor and check whether it drifts by comparing it with the resistance table. If it drifts, replace the sensor. Please see the appendix for R-T table



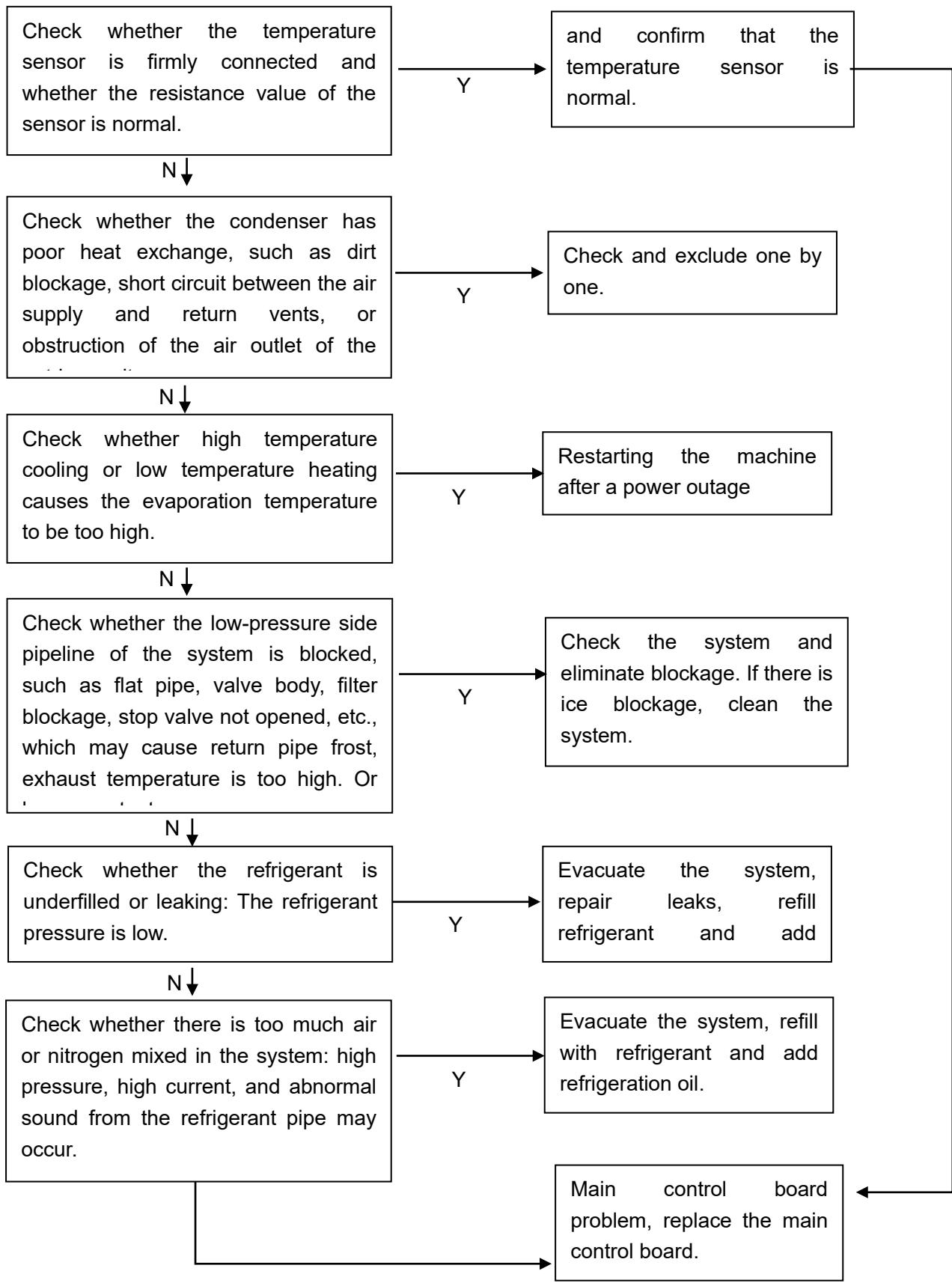
- If the temperature sensor resistance is normal, check the exhaust temperature in item 8 and compare it with the actual exhaust temperature (use a infrared thermometer to

measure the exhaust temperature). If the temperature of the main control board is unreasonable, replace the main control board.

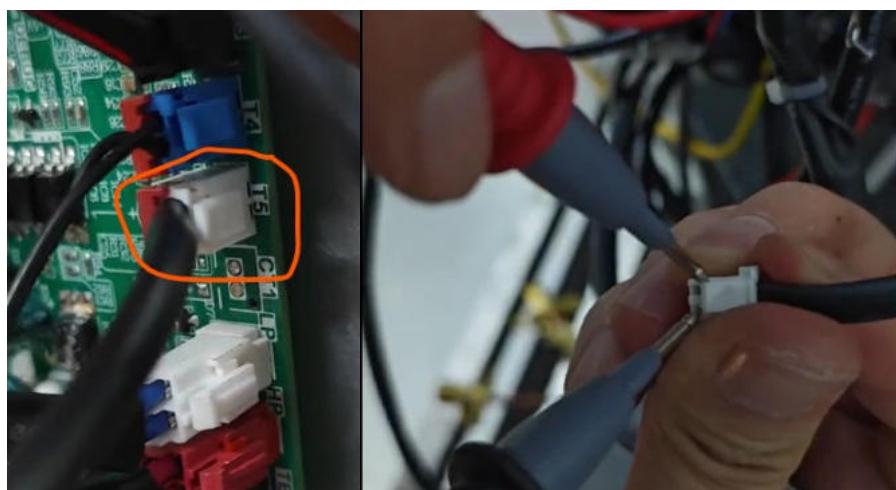
- If the above steps are normal, check whether the refrigerant system is normal, such as return air blockage, poor evaporation, compressor wear, etc.

#### 9.4.10 Exhaust temperature too high protection $>120^{\circ}\text{C}$

Cause: The exhaust temperature sensor reads a temperature that is too high

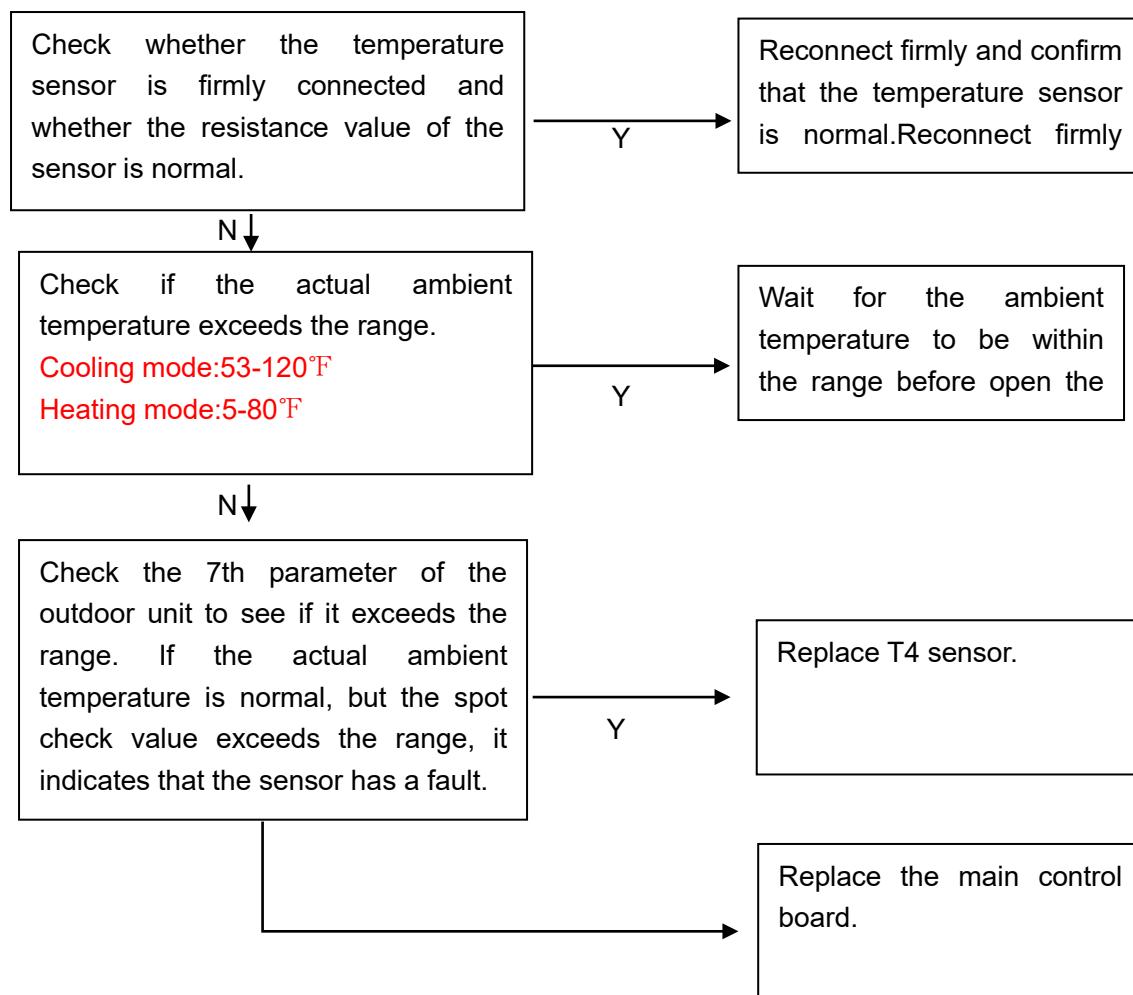


- Connect a pressure gauge to measure whether the return gas pressure is too low (normally 0.7-0.9MPa). If the pressure is too low, add refrigerant.
- Measure the resistance of the temperature sensor and check whether it drifts by comparing it with the resistance table. If it drifts, replace the sensor. Please see the appendix for R-T table
- If the above steps are normal, check whether the refrigerant system is normal, such as return air blockage, poor evaporation, compressor wear, etc.



#### 9.4.11 Over temperature protection

Cause: Outdoor sensor T4 detects that the ambient temperature exceeds the range



## Part 4 Function introduction

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<a href="#"><u>2.Outdoor gas return temperature Anti-Freezing Function</u></a> .....	46
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<a href="#"><u>4.Indoor Coil Anti-Freezing Function</u></a> .....	47

## 1. Electrical Components Description

### Temperature Sensor

#### T2: Indoor Coil Temperature

- Anti-Cold Air Function (heating mode)
- Anti-Freezing Function

#### T3: Outdoor Coil Temperature

- High/Low temperature protection
- Outdoor fan control (cooling mode)
- Defrost control (heating mode)

#### T4: ODU Ambient Temperature

- Operating condition permission
- Defrosting condition (heating mode)
- Outdoor fan control (heating mode)

#### T5: Compressor Discharge Temperature

- High temperature / Low superheat protection
- Electronic Expansion Valve (EEV) control

#### TH: Gas side return Temperature

- Anti-freeze protection

## 2. Outdoor gas return temperature Anti-Freezing Function

The function utilizes the Outdoor gas return temperature (TH) to determine whether the indoor coil is freezing or not. The feature prevents the unit running at low evaporating temperature as well as low suction super heat.

Only valid in cooling mode and after the compressor has been running for 3 minutes.

When the gas return temperature  $TH \leq TH1$  for "t" minutes, or the gas return temperature  $TH \leq TH2$ , the compressor and the outdoor fan will be stopped, and the anti-freezing protection will be reported

	TH1	TH2	t
$T4 \leq 8^{\circ}\text{C}$	-1	-4	0
$8^{\circ}\text{C} < T4 \leq 16^{\circ}\text{C}$	-1	-4	$20 + 5^{\circ}\text{C} \times (T4 - 12)$
$16^{\circ}\text{C} < T4 \leq 35^{\circ}\text{C}$	$-1 + 0.15^{\circ}\text{C} \times (T4 - 16)$	$-4 + 0.3^{\circ}\text{C} \times (T4 - 16)$	40
$T4 > 35^{\circ}\text{C}$	$2 + 0.2^{\circ}\text{C} \times (T4 - 35)$	$2 + 0.1^{\circ}\text{C} \times (T4 - 35)$	40

When the return air temperature is greater than 10 degrees or the shutdown time reaches 6 minutes, start the compressor and external fan (the minimum start interval is 5 minutes).

### 3.R32 Leakage Detection Function

The function utilizes a R32 refrigerant sensor to detect the R32 concentration. Terminal F/L2 is reserved for connecting buzzer if needed.

When R32 leakage occur in the indoor coil and the concentration is above 6.7%LEF, the unit will perform as the following:

- A. Cut off power to thermostat to stop compressor operation.
- B. Electric Heat kit will be turned off.
- C. High voltage will be output between terminal F and terminal L2.
- D. The indoor fan is running at high wind speed, and at the same time, the fault light on the indoor main board is flash.

### 4.Indoor Coil Anti-Freezing Function

The function utilizes the indoor coil sensor(T2) to determine whether the indoor coil is freezing or not. The feature prevents the unit running at low evaporating temperature as well as low suction super heat.

When all the following conditions are met, the Anti-Freezing Function will activate, and the compressor will be turned off.

- A.  $T2 < 32^{\circ}\text{F}$  Duration exceeding 1 minute.
- B.  $T2 \leq 26.6^{\circ}\text{F}$  Duration exceeding 30 seconds.

when  $T2 \geq 42.8^{\circ}\text{F}$ , the Anti-Freezing Function will deactivate:

## Part 5 Installation

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<a href="#"><u>2. Oil return bend installation</u></a> .....	52
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## 1.Precaution on Installation

### 1.1. Measure pipe length

Measure the necessary length of the connecting pipe and make it by the following way.

Connect the indoor unit at first, then the outdoor unit.

Bend the tubing in proper way.

Please refer to the table below for the length dimensions of the connection pipe

Table 1.1.1

Refrigerant Piping		Capacity (Btu/h)			
		18K	24K	30K	36K
Liquid-Vapor	In.	3/8-3/4	3/8-3/4	3/8-3/4	3/8-3/4
Max. Refrigerant Line Length*	Ft.	131			
Max. Vertical Lift	Ft.	66			

#### CAUTIONS:

Daub the surfaces of the flare pipe and the joint nuts with frozen oil, and wrench it for 3~4 rounds

With hands before fasten the flare nuts.

Be sure to use two wrenches simultaneously when you connect or disconnect the pipes.

Pipe gauge	Tightening torque	Flare dimension A Min (mm) Max		Flare shape
Φ6.35	15~16N.m (153~163 kgf.cm)	8.3	8.7	
Φ9.52	25~26N.m (255~265kgf.cm)	12.0	12.4	
Φ12.7	35~36N.m (357~367kgf.cm)	15.4	15.8	
Φ15.9	45~47N.m (459~480 kgf.cm)	18.6	19.1	
Φ19.1	65~67N.m (663~684kgf.cm)	22.9	23.3	

The stop value of the outdoor unit should be closed absolutely (as original state). Every time you connect it, first loosen the nuts at the part of stop value, then connect the flare pipe immediately (in 5 minutes). If the nuts have been loosened for a long time, dusts and other impurities may enter the pipe system and may cause malfunction later. So please expel the air out of the pipe with refrigerant before connection.

Expel the air after connecting the refrigerant pipe with the indoor unit and the outdoor unit. Then fasten the nuts at the repair-points.

## **1.2. Locate The Pipe**

Drill a hole in the wall (suitable just for the size of the wall conduit), then set on the fittings such as the wall conduit and its cover.

Bind the connecting pipe and the cables together tightly with binding tapes. Do not let air in, which will cause water leakage by condensation.

Pass the bound connecting pipe through the wall conduit from outside. Be careful of the pipe allocation to do no damage to the tubing.

## **1.3. Connect the pipes.**

**1.4. Then, open the stem of stop values of the outdoor unit to make the refrigerant pipe connecting the indoor unit with the outdoor unit in fluent flow.**

**1.5. Be sure of no leakage by checking it with leak detector or soap water.**

**1.6. Cover the joint of the connecting pipe to the indoor unit with the soundproof / insulating sheath (fittings), and bind it well with the tapes to prevent leakage.**

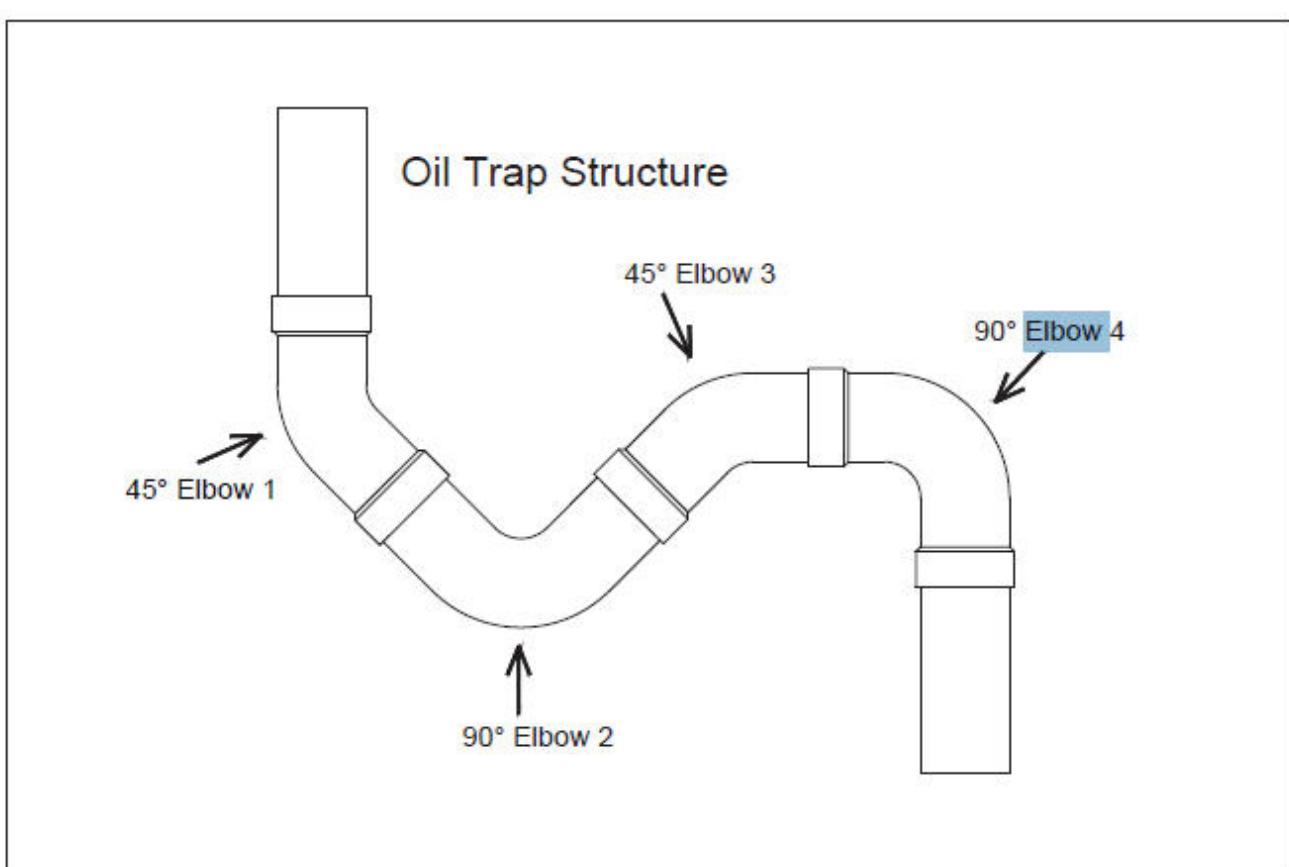
## 2. Oil return bend installation

Note that the length of the connecting line from the outdoor unit to the indoor unit cannot exceed 131 feet.

- If all long lines are in a horizontal state, no additional measures are required;
- If there is a vertical height difference in the long line, it needs to be installed according to the following requirements:
  - When the outdoor unit is below the indoor unit, no additional measures are required;
  - When the outdoor unit is below the indoor unit , and the vertical height difference is  $h < 40$ feet, no additional measures are required.
  - When the outdoor unit is below the indoor unit , and the vertical height difference is  $h > 40$ feet, An oil return band needs to be added.

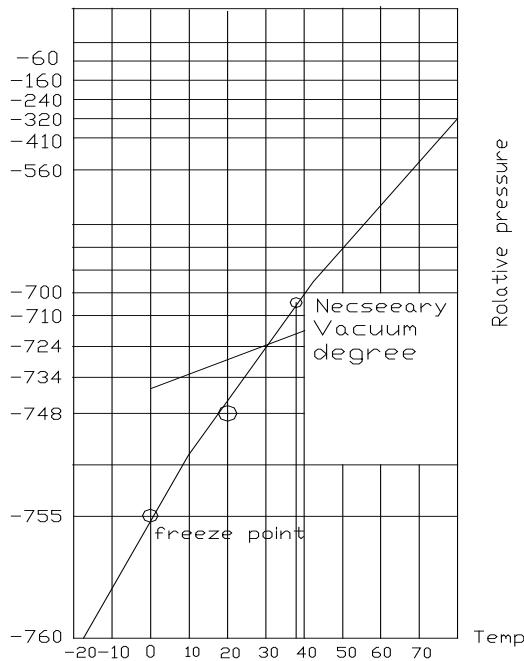
**NOTE:** The vertical height difference between the outdoor unit and the indoor unit cannot exceed 66 feet.

The following is the connection method of the oil return bend



### 3. Vacuum Dry and Leakage Checking

**3.1 Vacuum Dry:** use vacuum pump to change the moisture (liquid) into steam (gas) in the pipe and discharge it out of the pipe to make the pipe dry. Under one atmospheric pressure, the boiling point of water(steam temperature) is 100°C. Use vacuum pump to make the pressure in the pipe near vacuum state, the boiling point of water falls relatively. When it falls under outdoor temperature, the moisture in the pipe will be vaporized.



#### 3.2 Vacuum dry procedure

There are two methods of vacuum dry due to different construction environment: common vacuum dry, special vacuum dry.

##### ①. Common vacuum dry procedure

Vacuum dry (for the first time) ---connect the all-purpose detector to the inlet of liquid pipe and gas pipe, and run the vacuum pump more than two hours (the vacuum pump should be below -755mmHg)

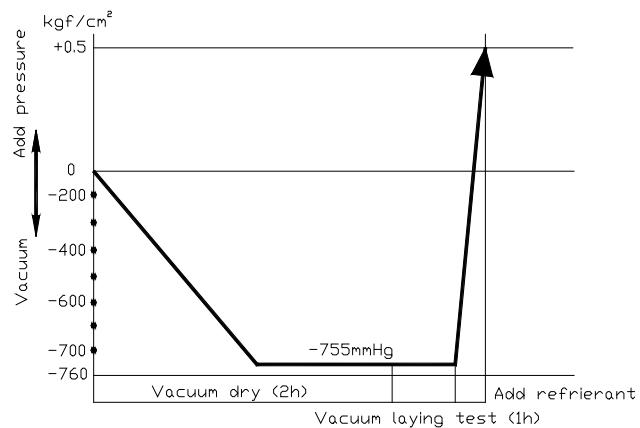
If the pump can't achieve below -755mmHg after pumping 2 hours, moisture or leakage point will still exist in the pipe. At this time, it should be pumped 1 hour more.

If the pump can't achieve -755mmHg after pumping 3 hours, please check if there are some leakage points.

Vacuum placement test: place 1 hour when it achieves -755mmHg, pass if the vacuum watch shows no rising. If it rises, it shows there's moisture or leakage point.

Vacuuming from liquid pipe and gas pipe at the same time.

Sketch map of common vacuum dry procedure.

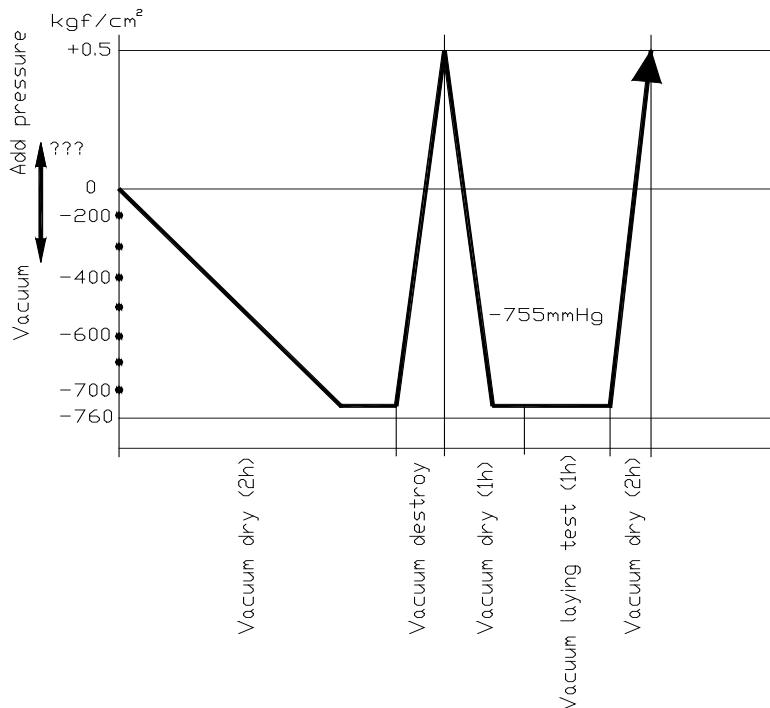


## ② Special vacuum dry procedure

- Vacuum dry for the first time 2h pumping
- Fill nitrogen to 0.5Kgf/cm<sup>2</sup>

Because nitrogen is for drying gas, it has vacuum drying effect during vacuum destroy. But if the moisture is too much, this method can't dry thoroughly. So, please pay more attention to prevent water entering and forming condensation water.

- Vacuum dry for the second time for 1h pumping
- If -755mmHg can't be achieved in 2h, repeat procedure "b" and "c".
- Vacuum placing test ..... 1h
- Sketch map of special vacuum dry procedure



## 4. Additional Refrigerant Charge

### Caution

- Refrigerant cannot be charged until field wiring has been completed.
- Refrigerant may only be charged after performing the leak test and the vacuum pumping.
- When charging a system, care shall be taken that its maximum permissible charge is never exceeded, in view of the danger of liquid hammer.
- Charging with an unsuitable substance may cause explosions and accidents, so always ensure that the appropriate refrigerant is charged.
- Refrigerant containers shall be opened slowly.
- Always use protective gloves and protect your eyes when charging refrigerant.

### Weigh-In Method

The factory charge in the outdoor unit is sufficient for 15 feet of standard size interconnecting liquid line. Additional 0.47 oz/ft refrigerant is needed when length of pipe is more than 25 feet.

#### Additional Refrigerant Guidelines

Piping length (ft)/(m)	Additional charge (oz)/(kg)
15/4.57	0
25/7.62	4.73/0.13
75/22.86	28.39/0.80
100/30.48	40.21/1.14
131/39.93	54.88/1.56

### Charging and Refrigerant Adjustment in Cooling Mode

#### Check the outdoor ambient temperature

Check the ambient temperature. Subcooling method (cooling mode) is only for outdoor temperature between 57°F and 118°F, and indoor temperature between 68°F and 89°F. For temperature out of the range, use the weight-in method mentioned above.

#### Super heat Method in Cooling for Piston Matchups

Calculate super heat value in Cooling for Piston Matchups. Calculate super heat value with measured vapor line temperature and pressure according to Table 4.1. If calculated super heat value is lower than the design super heat value of Table 4.2, refrigerant should be recovered. If calculated super heat value is higher than the value of Table 4.2, refrigerant should be added.

Suction Temp (°F)	Superheat Value (°F)								
	6	8	10	12	14	16	18	20	22
	Suction Gauge Pressure (PSI)								
40	107	103	99	95	91	87	84	80	77
42	112	107	103	99	95	91	87	84	80
44	116	112	107	103	99	95	91	87	84
46	121	116	112	107	103	99	95	91	87
48	126	121	116	112	107	103	99	95	91
50	131	126	121	116	112	107	103	99	95
52	136	131	126	121	116	112	107	103	99
54	141	136	131	126	121	116	112	107	103
56	146	141	136	131	126	121	116	112	107
58	151	146	141	136	131	126	121	116	112
60	157	151	146	141	136	131	126	121	116
62	162	157	151	146	141	136	131	126	121
64	168	162	157	151	146	141	136	131	126
66	174	168	162	157	151	146	141	136	131
68	180	174	168	162	157	151	146	141	136
70	186	180	174	168	162	157	151	146	141
72	193	186	180	174	168	162	157	151	146

**Table 4.1**

Outdoor DB (°F)	Indoor DB/WB (°F)				
	90/75	85/71	80/67	75/63	70/58
110	8±2	8±2	5±2	5±2	5±2
100	10±2	9±2	7±2	5±2	5±2
90	10±2	9±2	8±2	5±2	5±2
80	12±2	10±2	7±2	7±2	5±2
70	10±2	8±2	8±2	5±2	5±2
60	9±2	7±2	5±2	5±2	5±2

\* For 30K/36K, add 6°F of super heat.

**Table 4.2**

## 5. Insulation Work

### 5.1 Insulation material and thickness

#### 5.1.1. Insulation material

Insulation material should adopt the material which is able to endure the pipe's temperature: no less than 70°C in the high-pressure side, no less than 120°C in the low-pressure side (For the cooling type machine, no requirements at the low-pressure side.)

Example: Heat pump type----Heat-resistant Polyethylene foam (withstand above 120°C)

Cooling only type----Polyethylene foam (withstand above 100°C)

#### 5.1.2. Thickness choice for insulation material

Insulation material thickness is as follows:

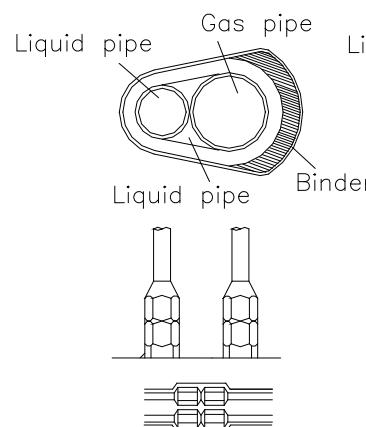
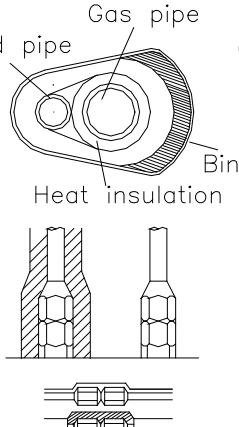
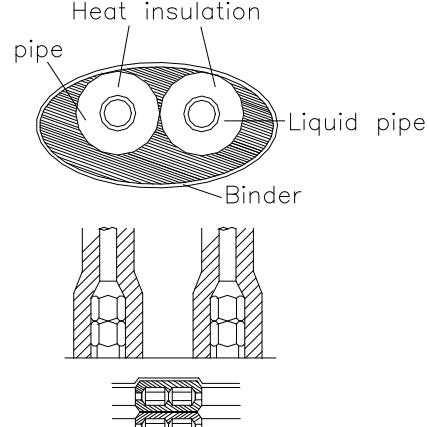
	Pipe diameter (mm)	Adiabatic material thickness
Refrigerant pipe	Φ6.4—Φ25.4	10mm
	Φ28.6—Φ38.1	15mm
Drainage pipe	Inner diameterΦ20—Φ32	6mm

### 5.2 Refrigerant pipe insulation

#### 5.2.1. Work Procedure

- ① Before laying the pipes, the non-jointing parts and non-connection parts should be heat insulated.
- ② When the gas proof test is eligible, the jointing area, expanding area and the flange area should be heat insulated.

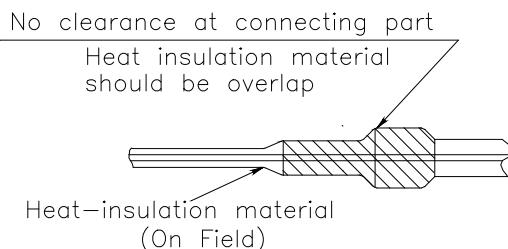
#### 5.2.2. Insulation for non-jointing parts and non-connection parts

wrong	right	
Gas pipe and liquid pipe should not be put together to insulate	Insulate the gas pipe (cooling only)	Insulate the gas pipe and liquid pipe
		

For construction convenience, before laying pipes, use insulation material to insulate the pipes to be dealt with, at the same time, at two ends of the pipe, remain some length not to be insulated, in order to be welded and check the leakage after laying the pipes.

### 5.2.3. Insulate for the jointing area, expanding area and the flange area

- ① Insulate for the jointing area, expanding area and the flange area should be done after checking leakage of the pipes
- ② Make sure there's no clearance in the joining part of the accessorial insulation material and local preparative insulation material.



### 5.3 Drainage pipe insulation

The connection part should be insulated, or else water will be condensing at the non-insulation part.

### 5.4 Note

5.4.1 The jointing area, expanding area and the flange area should be heat insulated after passing the pressure test.

5.4.2 The gas and liquid pipe should be heat insulated individually, the connecting part should be heat insulated individually.

5.4.3 Use the attached heat-insulation material to insulate the pipe connections (pipes' tie-in, expand nut) of the indoor unit.

## 6. Test Operation

(1) The test operation must be carried out after the entire installation has been completed.

(2) Please confirm the following points before the test operation.

The indoor unit and outdoor unit are installed properly.

Tubing and wiring are correctly completed.

The refrigerant pipe system is leakage-checked.

The drainage is unimpeded.

The ground wiring is connected correctly.

The length of the tubing and the added stow capacity of the refrigerant have been recorded.

The power voltage fits the rated voltage of the air conditioner.

There is no obstacle at the outlet and inlet of the outdoor and indoor units.

The gas-side and liquid-side stop values are both opened.

The air conditioner is pre-heated by turning on the power.

(3) According to the user's requirement, install the 24v thermostat

(4) Test operation

Set the air conditioner under the mode of "COOLING" with the thermostat.

, and check the following points.

Indoor unit

Whether the fan motor operate normally.

Whether the room temperature is adjusted well.

Whether the indicator lights of indoor board normally.

Whether the drainage is normal.

Whether there is vibration or abnormal noise during operation.

Outdoor unit

Whether there is vibration or abnormal noise during operation.

Whether the generated wind, noise, or condensed of by the air conditioner have influenced your neighborhood.

Whether any of the refrigerant is leaked.

**Appendix: R-T table****5K: Applicable T1/T2/T3/T4 temperature sensor**

T (°C)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)	T (°C)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)
-30	51.159	52.84	54.521	26	4.771	4.821	4.871
-29	48.659	50.232	51.805	27	4.599	4.649	4.699
-28	46.299	47.772	49.248	28	4.434	4.485	4.535
-27	44.071	45.452	46.832	29	4.277	4.327	4.377
-26	41.968	43.261	44.554	30	4.126	4.176	4.226
-25	39.981	41.193	42.405	31	3.981	4.031	4.081
-24	38.102	39.238	40.375	32	3.842	3.892	3.942
-23	36.326	37.391	38.457	33	3.709	3.759	3.808
-22	34.646	35.645	36.645	34	3.581	3.631	3.68
-21	33.055	33.993	34.931	35	3.495	3.508	3.557
-20	31.55	32.43	33.31	36	3.34	3.389	3.438
-19	30.097	30.923	31.748	37	3.226	3.275	3.323
-18	28.722	29.497	30.271	38	3.117	3.165	3.213
-17	27.42	28.147	28.873	39	3.012	3.06	3.107
-16	26.186	26.868	27.55	40	2.912	2.959	3.006
-15	25.017	25.657	26.297	41	2.815	2.861	2.908
-14	23.908	24.509	25.11	42	2.722	2.768	2.814
-13	22.857	23.421	23.985	43	2.633	2.678	2.724
-12	21.859	22.389	22.918	44	2.547	2.592	2.637
-11	20.912	21.409	21.907	45	2.464	2.509	2.553
-10	20.013	20.48	20.917	46	2.385	2.429	2.473
-9	19.116	19.584	20.023	47	2.308	2.352	2.395
-8	18.322	18.734	19.146	48	2.235	2.278	2.231
-7	17.54	17.927	18.314	49	2.164	2.207	2.249
-6	16.797	17.16	17.524	50	2.096	2.138	2.18
-5	16.09	16.431	16.733	51	2.03	2.071	2.112
-4	15.418	15.739	16.06	52	1.966	2.006	2.047
-3	14.779	15.08	15.382	53	1.904	1.944	1.984
-2	14.17	14.454	14.737	54	1.844	1.884	1.923
-1	13.591	13.857	14.124	55	1.787	1.826	1.865
0	13.04	13.29	13.54	56	1.732	1.77	1.809
1	12.505	12.739	12.974	57	1.679	1.717	1.754
2	11.995	12.215	12.436	58	1.628	1.665	1.702
3	11.509	11.717	11.924	59	1.579	1.615	1.652
4	11.047	11.241	11.436	60	1.531	1.567	1.603
5	10.606	10.789	10.971	61	1.485	1.521	1.556
6	10.186	10.357	10.529	62	1.441	1.476	1.511
7	9.785	9.945	10.107	63	1.399	1.433	1.467
8	9.403	9.554	9.705	64	1.357	1.391	1.425
9	9.038	9.18	9.322	65	1.318	1.351	1.384
10	8.69	8.823	8.956	66	1.279	1.312	1.344
11	8.357	8.482	8.607	67	1.242	1.274	1.306
12	8.04	8.157	8.274	68	1.206	1.237	1.269
13	7.736	7.816	7.957	69	1.171	1.202	1.233
14	7.446	7.55	7.653	70	1.137	1.168	1.199
15	7.169	7.266	7.363	71	1.105	1.135	1.165
16	6.9	6.991	7.082	72	1.074	1.103	1.133
17	6.644	6.729	6.814	73	1.043	1.072	1.101
18	6.398	6.478	6.558	74	1.014	1.043	1.071
19	6.163	6.238	6.313	75	0.986	1.014	1.042
20	5.938	6.008	6.078	76	0.959	0.986	1.014
21	5.723	5.789	5.854	77	0.932	0.959	0.986
22	5.517	5.578	5.64	78	0.907	0.933	0.96
23	5.32	5.377	5.484	79	0.882	0.908	0.934
24	5.131	5.185	5.238	80	0.858	0.884	0.91
25	4.95	5	5.05				

**50K: Applicable exhaust temperature sensor (T5/TP)**

T (°C)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)	T (°C)	Rmin (KΩ)	Rnom (KΩ)	Rmax (KΩ)
0	157.7	161.2	164.7	56	14.16	14.48	14.81
1	150.2	153.4	156.7	57	13.65	13.96	14.28
2	142.9	145.9	148.9	58	13.15	13.46	13.77
3	136.1	138.9	141.7	59	12.69	12.99	13.30
4	129.7	132.3	134.9	60	12.23	12.53	12.83
5	123.6	126.0	128.4	61	11.80	12.09	12.39
6	117.8	120.0	122.3	62	11.39	11.67	11.96
7	112.2	114.3	116.4	63	10.98	11.26	11.54
8	107.1	109.0	111.0	64	10.60	10.87	11.15
9	102.1	103.9	105.7	65	10.23	10.50	10.77
10	97.42	99.08	100.8	66	9.880	10.14	10.41
11	92.97	94.51	96.06	67	9.537	9.792	10.05
12	88.74	90.17	91.61	68	9.211	9.460	9.715
13	84.73	86.05	87.38	69	8.897	9.141	9.391
14	80.92	82.14	83.37	70	8.595	8.834	9.078
15	77.29	78.42	79.56	71	8.306	8.539	8.778
16	73.84	74.89	75.95	72	8.028	8.256	8.490
17	70.57	71.54	72.51	73	7.759	7.983	8.212
18	67.46	68.35	69.25	74	7.501	7.720	7.944
19	64.49	65.32	66.15	75	7.254	7.468	7.687
20	61.68	62.44	63.20	76	7.016	7.225	7.440
21	59.00	59.70	60.40	77	6.786	6.991	7.201
22	56.44	57.09	57.74	78	6.565	6.765	6.971
23	54.02	54.61	55.20	79	6.352	6.548	6.749
24	51.70	52.25	52.80	80	6.147	6.339	6.536
25	49.50	50.00	50.50	81	5.950	6.138	6.331
26	47.37	47.87	48.37	82	5.761	5.944	6.133
27	45.34	45.84	46.34	83	5.578	5.757	5.942
28	43.41	43.91	44.41	84	5.401	5.577	5.758
29	41.59	42.08	42.57	85	5.231	5.403	5.580
30	39.84	40.33	40.82	86	5.069	5.237	5.410
31	38.18	38.66	39.15	87	4.912	5.076	5.245
32	36.59	37.07	37.55	88	4.760	4.921	5.087
33	35.07	35.55	36.03	89	4.615	4.772	4.934
34	33.64	34.11	34.58	90	4.474	4.628	4.787
35	32.27	32.73	33.20	91	4.338	4.489	4.645
36	30.95	31.41	31.87	92	4.207	4.354	4.506
37	29.70	30.15	30.61	93	4.081	4.225	4.374
38	28.50	28.95	29.40	94	3.958	4.099	4.245
39	27.37	27.81	28.25	95	3.840	3.978	4.121
40	26.29	26.72	27.16	96	3.726	3.861	4.001
41	25.24	25.67	26.10	97	3.616	3.748	3.885
42	24.25	24.67	25.09	98	3.509	3.639	3.773
43	23.31	23.72	24.14	99	3.407	3.534	3.665
44	22.41	22.81	23.22	100	3.308	3.432	3.560
45	21.53	21.93	22.33	101	3.212	3.333	3.459
46	20.71	21.10	21.50	102	3.119	3.238	3.361
47	19.92	20.30	20.69	103	3.030	3.146	3.267
48	19.16	19.54	19.92	104	2.942	3.056	3.174
49	18.44	18.81	19.18	105	2.858	2.970	3.086
50	17.75	18.11	18.48	106	2.778	2.887	3.000
51	17.08	17.44	17.80	107	2.699	2.806	2.917
52	16.44	16.79	17.14	108	2.623	2.728	2.837
53	15.84	16.18	16.53	109	2.549	2.652	2.758
54	15.26	15.59	15.93	110	2.479	2.579	2.683
55	14.69	15.02	15.35				