



**R454b 60Hz Universal Outdoor
14.3 SEER2 Series
Multi-Position Air Handler
Technical Manual**

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Part 1. General Information

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1. Model Names of Indoor/Outdoor Units

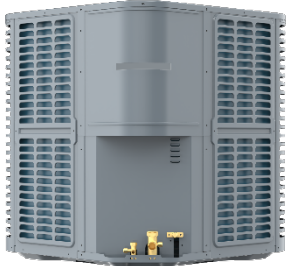
1.1 Indoor Units

Model name	Dimension(W×H×D) (inch)	Power supply
CTA515C001A	19-5/8×45-3/4×22	208/230V-1Ph-60Hz
CTA515C002A	19-5/8×45-3/4×22	208/230V-1Ph-60Hz
CTA515C003A	19-5/8×45-3/4×22	208/230V-1Ph-60Hz
CTA515C004A	19-5/8×45-3/4×22	208/230V-1Ph-60Hz
CTA515C005A	22×53-1/8×24-1/2	208/230V-1Ph-60Hz
CTA515C006A	22×53-1/8×24-1/2	208/230V-1Ph-60Hz
CTA515C007A	22×53-1/8×24-1/2	208/230V-1Ph-60Hz

1.2 Outdoor Units

Model name	Dimension(W×H×D) (inch)	Power supply
CTV515HN018A	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
CTV515HN024A	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
CTV515HN030A	29-1/7×25×29-1/7	208/230V-1Ph-60Hz
CTV515HN036A	29-1/7×25×29-1/7	208/230V-1Ph-60Hz
CTV515HN042A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz
CTV515HN048A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz
CTV515HN060A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz
CTV515CN018A	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
CTV515CN024A	21-4/5×25×21-4/5	208/230V-1Ph-60Hz
CTV515CN030A	29-1/7×25×29-1/7	208/230V-1Ph-60Hz
CTV515CN036A	29-1/7×25×29-1/7	208/230V-1Ph-60Hz
CTV515CN042A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz
CTV515CN048A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz
CTV515CN060A	29-1/7×32-7/8×29-1/7	208/230V-1Ph-60Hz

2. External Appearance

		14.3 SEER2 TDU		
capacity		1.5/2 Ton	2.5/3 Ton	3.5/4/5 Ton
pic				
14.3 SEER2 AHU				
capacity		1.5/2/2.5/3 Ton	3.5/4/5 Ton	
pic				

3. Features

3.1 Wide operation range. Heating:5-80°F. Cooling:54-120°F. High vertical / Long line heat pump mode14~80°F

3.2 Well-known brand LG scroll 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 motors, provide selections of air flow to meet desired applications.

3.6 ECM fan motor for air handlers, higher efficiency, lower noise, constant speed.

3.7 24V control, time delay relay, fan relay and transformer included.

3.8 R454b environment friendly refrigerant.

3.9 The air handler unit has a refrigerant leakage sensor, providing safer protection.

3.10 AHRI certification, ETL certification.

3.11 Multiple defrosting modes are available.

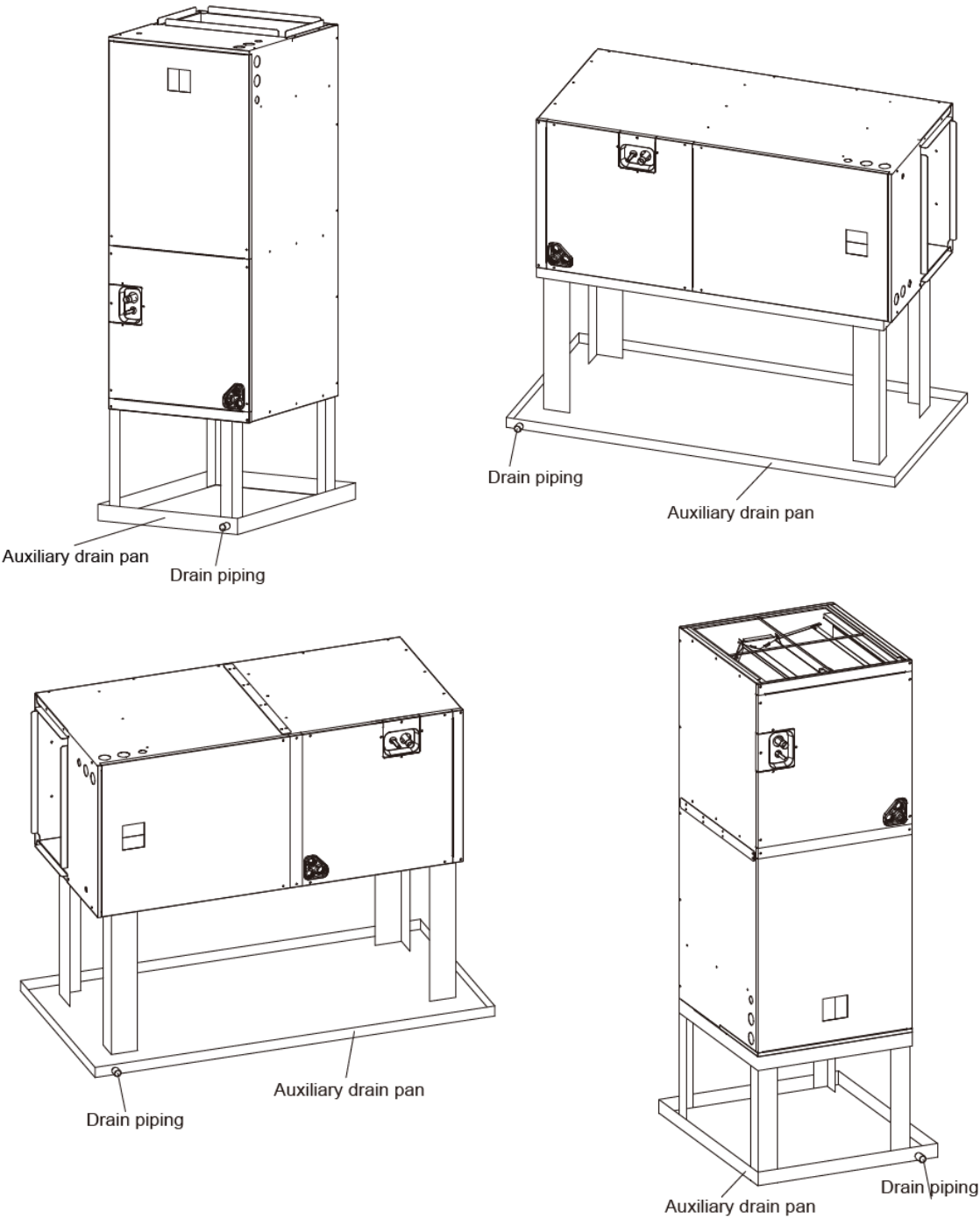
3.12 Refrigerant leakage sensor is configured to detect the refrigerant content in the air

Intelligent oil return program to provide operating life

“A” shape coils, constructed with Oxygen-free copper tubing and enhanced aluminum fins

Detachable air filter for cleaning or renewal

Versatile 4-way convertible design. The air can be discharged from four directions.



Part 2. Indoor Unit

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1.Specification

		cooling only									
Market Model		CAH-F18CNRI-FMC-E3	CAH-F24CNRI-FMC-E3	CAH-F30CNRI-FMC-E3	CAH-F36CNRI-FMC-E3	CAH-F42CNRI-FMC-E3	CAH-F48CNRI-FMC-E3	CAH-F60CNRI-FMC-E3			
Power supply	V/Ph/Hz	208-230V/1N/60Hz	208-230V/1N/60Hz	208-230V/1N/60Hz	208-230V/1N/60Hz	208-230V/1N/60Hz	208-230V/1N/60Hz	208-230V/1N/60Hz			
Indoor external static pressure	Pa	145	145	145	145	145	145	145			
Throttle type		piston	piston	piston	piston	piston	piston	piston			
MCA	A	4	4	5	5	7	7	10			
MOP	A	6	6	6	6	10	10	10			
Indoor coil	Number of row	3(row)x2(piece)	3(row)x2(piece)	4(row)x2(piece)	4(row)x2(piece)	4(row)x2(piece)	5(row)x2(piece)	5(row)x2(piece)			
	Tube pitch(a)xrow pitch(b)	0.83x0.53	0.83x0.53	0.83x0.53	0.83x0.53	0.83x0.53	0.83x0.53	0.83x0.53			
	Fin spacing	1/16	1/16	1/16	1/16	1/16	1/16	1/16			
	Fin material	Hydrophilic	Hydrophilic	Hydrophilic	Hydrophilic	Hydrophilic	Hydrophilic	Hydrophilic			
	Tube outside diameter	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276			
	Tube material	inner grooved	inner grooved	inner grooved	inner grooved	inner grooved	inner grooved	inner grooved			
Indoor fan motor	Coil length x height x width	17.5/8x14.7/8x1.5/8	17.5/8x14.7/8x1.5/8	16.1/2x17.1/2x2.1/8	16.1/2x17.1/2x2.1/8	17.7/16x16.1/32x2.7/64	19.27/32x21.1/2x2.5/8	19.27/32x21.1/2x2.5/8			
	Number of circuit	6	6	8	8	/	/	/			
	Brand	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean			
	Type	ECM	ECM	ECM	ECM	ECM	ECM	ECM			
	Model	DZL249F-12	DZL249F-12	DZL373F-12	DZL373F-12	DZL560F-12	DZL560F-12	DZL560F-12			
	Rate current	A 2.6	2.6	3.8	3.8	5.4	5.4	5.4			
Blower	Input	W 142.4	142.4	245.9	245.9	249.3	249.3	249.3			
	Output	W 249	249	373	373	560	560	560			
	Capacitor	pF /	/	/	/	/	/	/			
	Speed (Hi/Me/Low) 5/4/3/2/1	643/593/556/476/412	643/593/556/476/412	760/718/662/610/548	760/718/662/610/548	977/833/760/683/610	977/833/760/683/610	977/833/760/683/610			
	diameter	in 12 5/16	12 5/16	12 5/16	12 5/16	12 5/16	12 5/16	12 5/16			
	width	in 12 29/32	12 29/32	12 29/32	12 29/32	12 29/32	12 29/32	12 29/32			
Indoor air flow	CFM	770	785	975	1030	1330	1490	1700			
Indoor noise level	dB(A)	50	54	56	56	59	59	60			
Indoor dimension	Unit (WxHxD)	in 19-5/8x45-3/4x22	19-5/8x45-3/4x22	19-5/8x45-3/4x22	19-5/8x45-3/4x22	22x53-1/8x24-1/2	22x53-1/8x24-1/2	22x53-1/8x24-1/2			
	Packing (WxHxD)	mm 500x1162x560	500x1162x560	500x1162x560	500x1162x560	560x1350x623	560x1350x623	560x1350x623			
	Net / Gross weight	kg 56/61.5	56/61.5	60/63.5	60/63.5	72/78	72/78	77/83			
	Shipping per STD 20/40/40HQ	lbs 123/135	123/135	132/140	132/140	159/172	159/172	170/183			

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

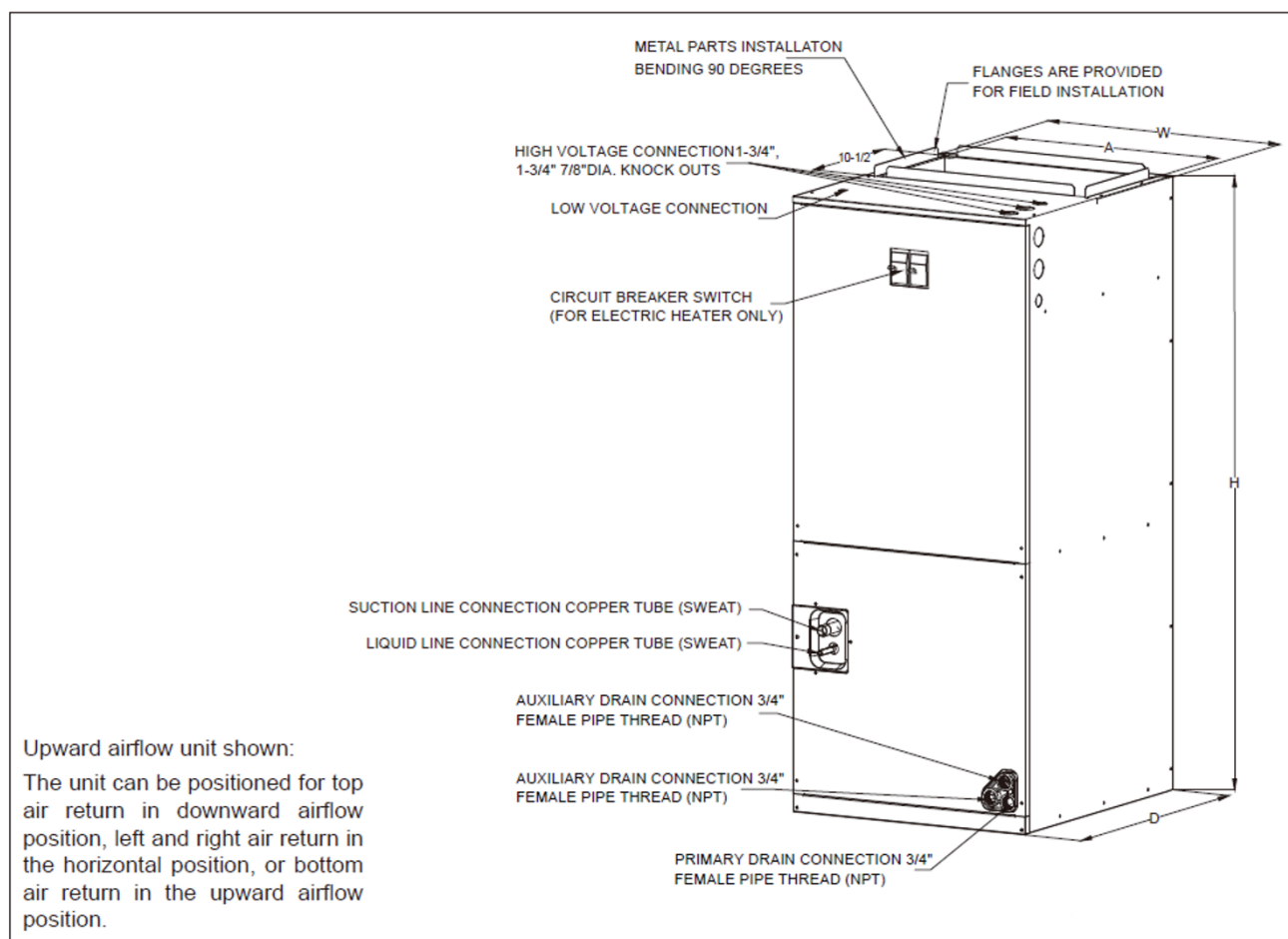


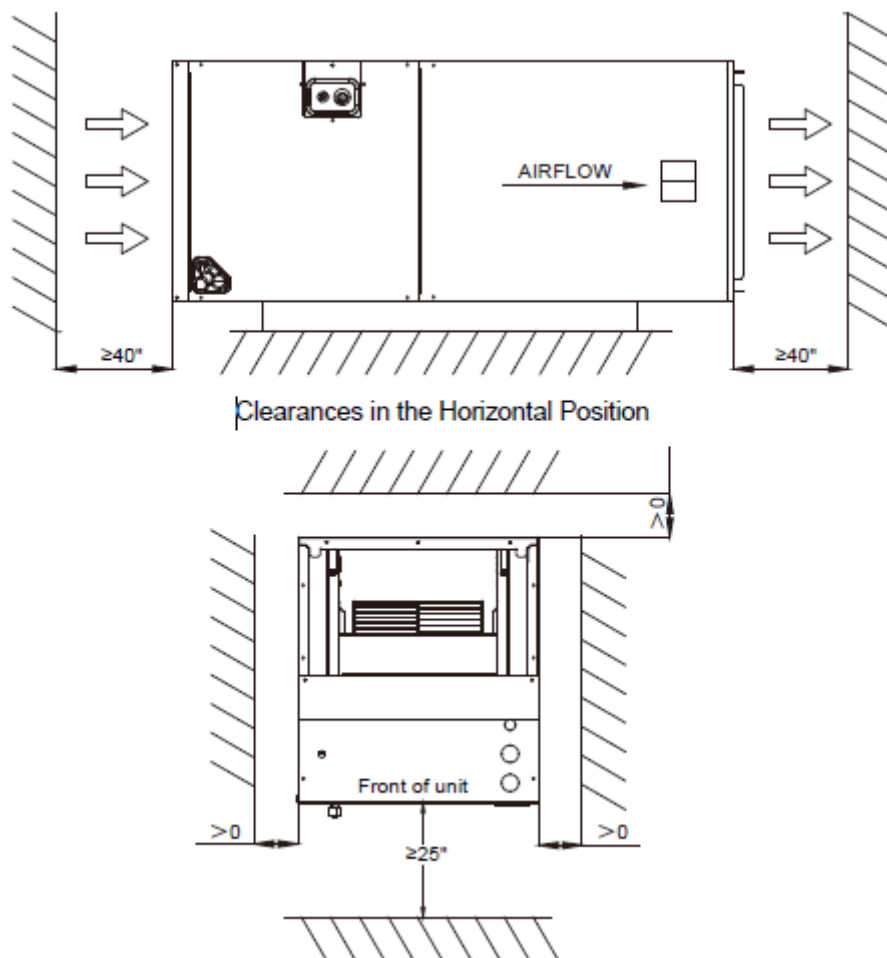
Fig.1 DIMENSIONS

DIMENSIONAL DATA

MODEL SIZE	Dimensions				
	UNIT HEIGHT "H"/ in (mm)	UNIT WIDTH "W"/ in (mm)	UNIT LENGTH "D"/ in (mm)	SUPPLY DUCT "A"/in (mm)	LIQUID LINE / VAPOR LINE IN (mm)
18K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5]/[19]
24K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5]/[19]
30K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5]/[19]
36K	45-3/4 [1162]	19-5/8 [500]	22 [560]	17-7/8 [454]	3/8 / 3/4 [9.5]/[19]
42K	53-1/8 [1350]	22 [560]	24 -1/2[623]	19-1/2 [496]	3/8 / 7/8 [9.5]/[22]
48K	53-1/8 [1350]	22 [560]	24 -1/2[623]	19-1/2 [496]	3/8 / 7/8 [9.5]/[22]
60K	53-1/8 [1350]	22 [560]	24 -1/2[623]	19-1/2 [496]	3/8 / 7/8 [9.5]/[22]

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.Four-way installation

Horizontal right installation is the default factory configuration for all models. By removing the indoor coil assembly and reinstalling the coil, the vertical up flow position can be converted into a horizontal left position. Rotate the device by 90° to the horizontal left position, with the coil segment on the right and the blower segment on the left. Re-install the indoor coil by rotating 180° from the original position. Ensure that the fixing groove is fully engaged with the coil guide rail. When configured to be placed horizontally above the ceiling and/or living space, it is recommended to use an additional field supplied drain pan.

Steps to Change Cabinet Direction to Vertical Downward or Horizontal Left Direction

1. Remove the screws and the front panel, and disconnect the plug of T1 sensor 、 T2 sensor and leak

detection sensor wire from the circuit board (Figure 4.1, Step 1).

2. Pull out the coil with sensor wire (do not disconnect T1 sensor、 T2 sensor and leak detection sensor

from the coil). (Figure 4.2, Step 2)

3. Install the coil in the correct direction and fix it in place. Reinsert those sensor wire in PCBA through

the gap on the cabinet cover (Figure 4.3, Step 3).

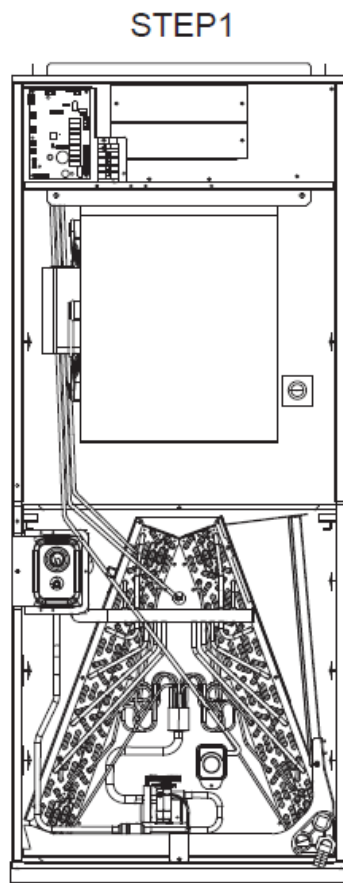


Figure 4.1

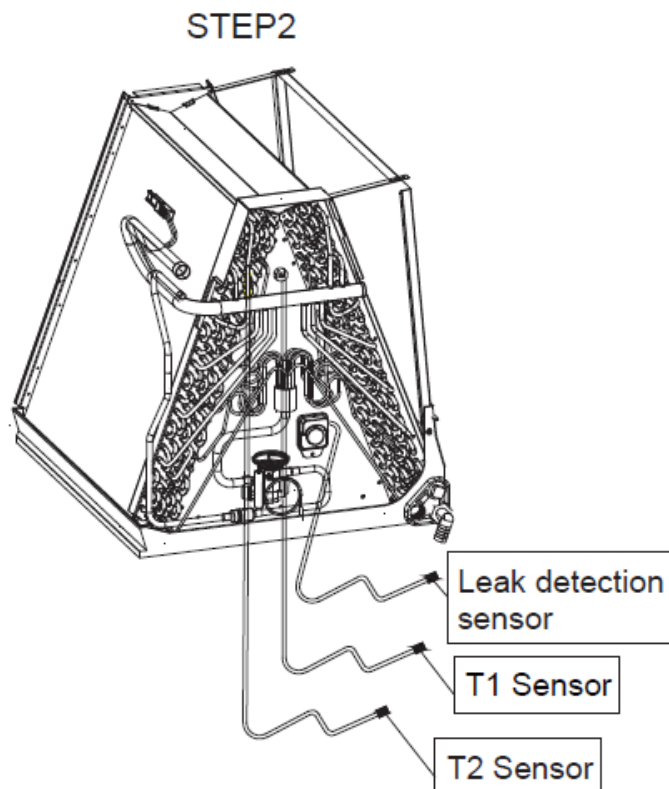


Figure 4.2

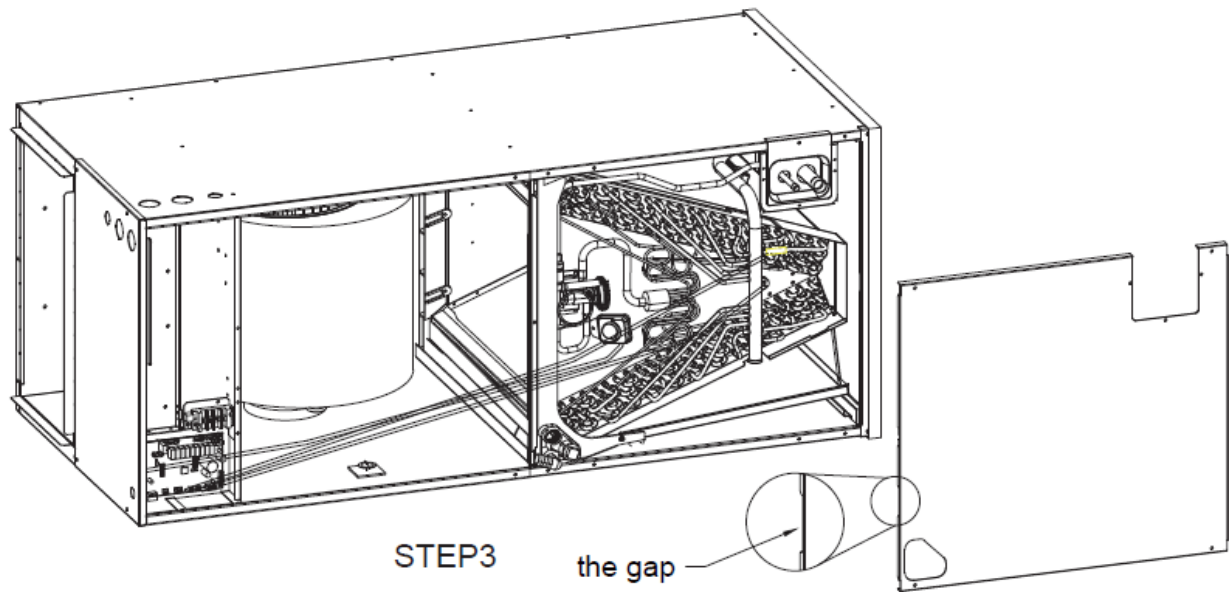


Figure 4.3

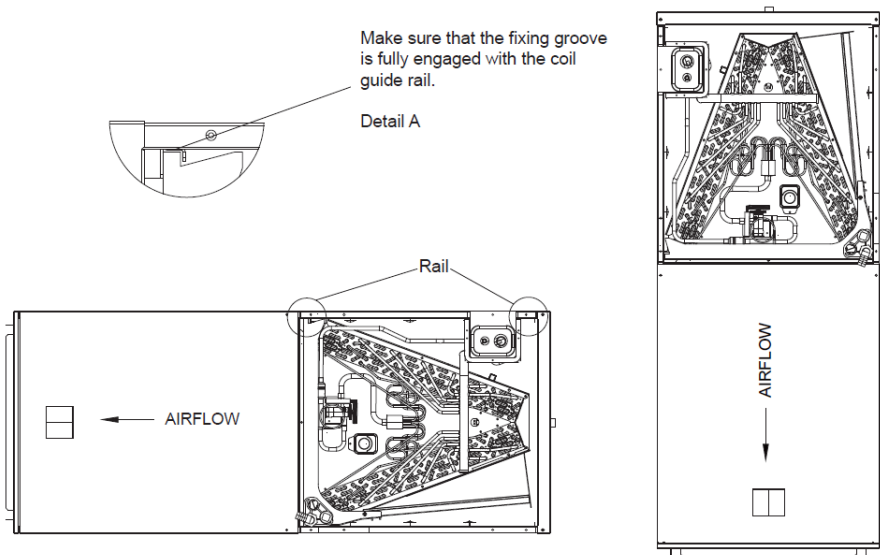


Figure 4.3

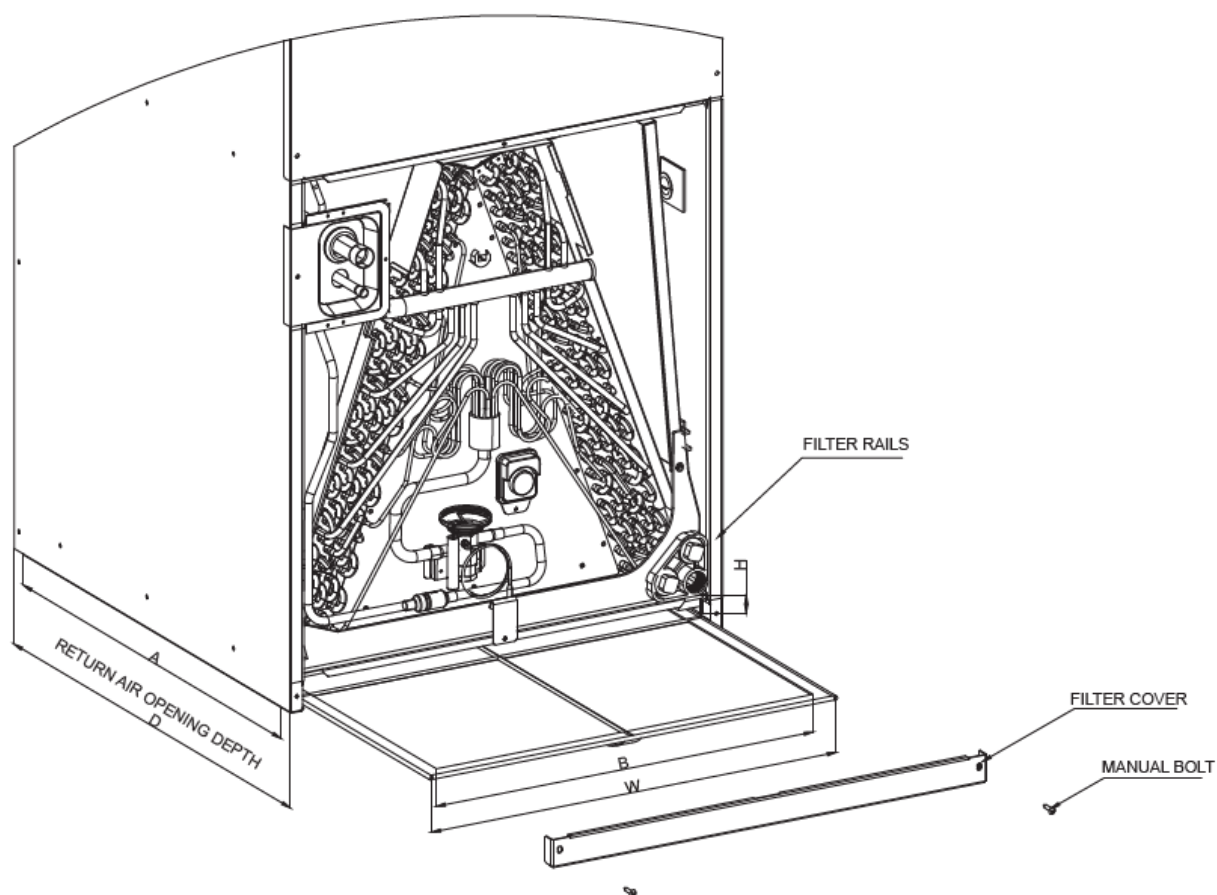
5.Air Filter (Not Factory Installed)

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]	"W" Inch [mm]	"D" Inch [mm]	"H" Inch [mm]	Return Width "A" inch [mm]	Return Length "B" inch [mm]
18K/24K/30K/36K	18.1×21.4[460×544]	18.3 [466]	21.6 [548]	1 [25.4]	20.8 [528]	16.3 [414]
42K/48K/60K	20.5×23.8[521×605]	20.7 [526]	23.9 [608]	1 [25.4]	23 [584]	18.8 [478]

6. Electric heater

Heat kit model	AHU model	electric heat	MIN. Circuit Ampacity		MAX. Fuse or Breaker Ampacity		Fan speed				
		(kW)	208 VAC	230 VAC	208 VAC	230 VAC	1	2	3	4	5
21-4444-01	18K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	×	×	●	●	●
21-4444-01	24K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	×	×	●	●	●
21-4444-03		10	40	45	55	60	×	×	×	●	●
21-4444-01	30K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	×	●	●	●	●
21-4444-03		10	40	45	55	60	×	×	●	●	●
21-4444-01	36K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	×	●	●	●	●
21-4444-03		10	40	45	55	60	×	×	●	●	●
21-4444-04		15	30+30	35+35	40+40	45+45	×	×	×	●	●
21-4444-01	42K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	●	●	●	●	●
21-4444-03		10	40	45	55	60	×	●	●	●	●
21-4444-04		15	30+30	35+35	40+40	45+45	×	×	●	●	●
21-4444-01	48K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	●	●	●	●	●
21-4444-03		10	40	45	55	60	×	●	●	●	●
21-4444-04		15	30+30	35+35	40+40	45+45	×	×	●	●	●
21-4444-05		20	40+40	45+45	55+55	60+60	×	×	×	●	●
21-4444-01	60K	5	20	25	30	35	●	●	●	●	●
21-4444-02		7.5	30	35	40	45	●	●	●	●	●
21-4444-03		10	40	45	55	60	×	●	●	●	●
21-4444-04		15	30+30	35+35	40+40	45+45	×	×	●	●	●
21-4444-05		20	40+40	45+45	55+55	60+60	×	×	×	●	●

● 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.

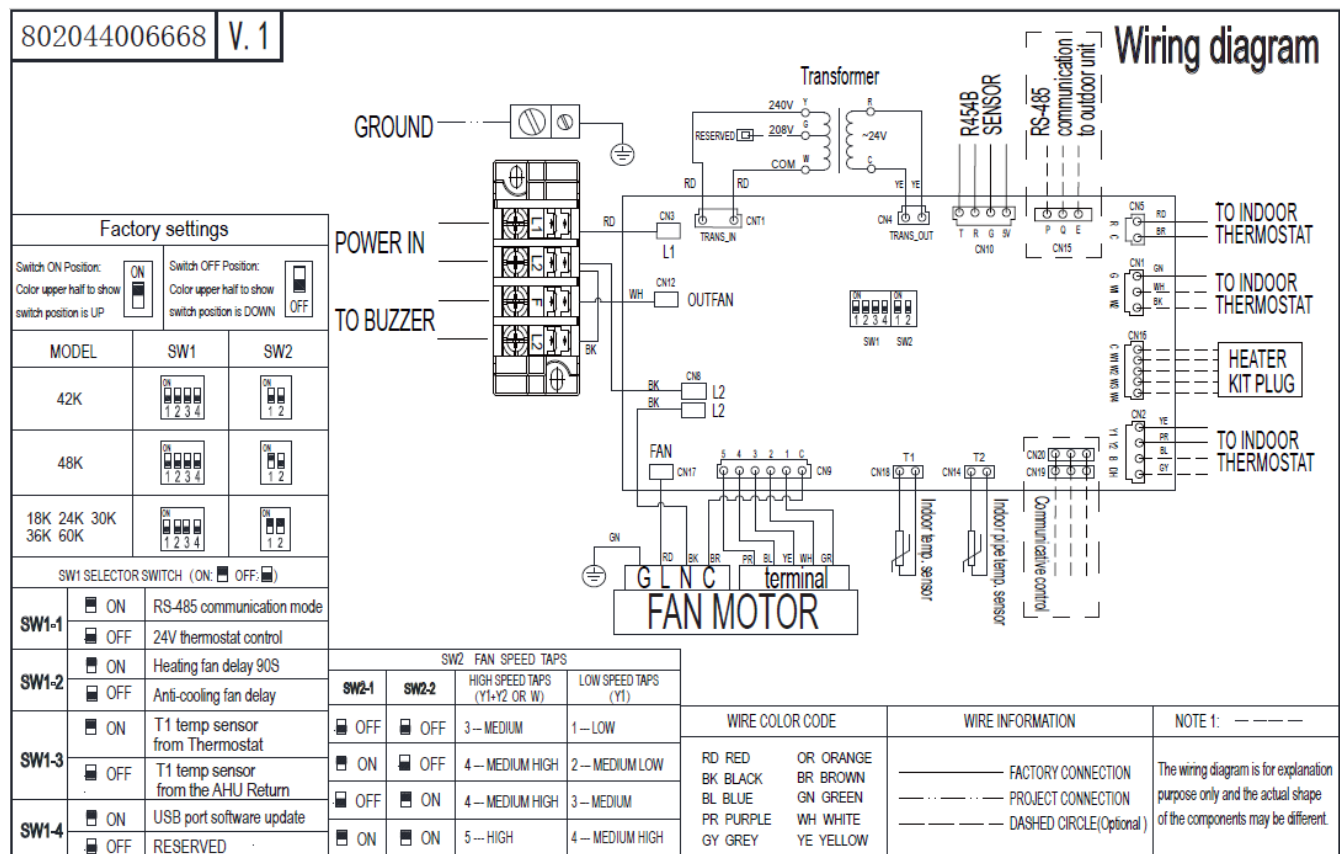
Model size of air processor	Motor speed		SCFM								
			External Static Pressure-Inch Water Column [kPa]								
			0[0]	0.1[.025]	0.2[.050]	0.3[.075]	0.4[.100]	0.5[.125]	0.6[.150]	0.7[.175]	0.8[.200]
18K	Tap (1)	SCFM	669.9	571.8	490.9	394.3	269.5	-	-	-	-
		Watts	41	47	52	57	61	-	-	-	-
	Tap (2)	SCFM	792.2	708.6	615.9	548.5	474.2	371.5	265.1	-	-
		Watts	59	67	73	77	83	88	93	-	-
	Tap (3)	SCFM	948.8	887.5	809.6	723.6	671.6	597.0	504.2	410.2	-
		Watts	96	102	109	115	129	126	132	141	-
	Tap (4)	SCFM	1020.9	966.5	887.1	798.4	738.8	697.9	672.3	572.8	490.1
		Watts	118	127	136	144	150	156	160	167	177
	Tap (5)	SCFM	1115.2	1059.2	995.0	906.5	842.5	791.4	727.2	707.0	652.5
		Watts	148	157	167	178	186	191	198	205	211
24K	Tap (1)	SCFM	669.9	571.8	490.9	394.3	269.5	-	-	-	-
		Watts	41	47	52	57	61	-	-	-	-
	Tap (2)	SCFM	792.2	708.6	615.9	548.5	474.2	371.5	265.1	-	-
		Watts	59	67	73	77	83	88	93	-	-
	Tap (3)	SCFM	948.8	887.5	809.6	723.6	671.6	597.0	504.2	410.2	-
		Watts	96	102	109	115	129	126	132	141	-
	Tap (4)	SCFM	1020.9	966.5	887.1	798.4	738.8	697.9	672.3	572.8	490.1
		Watts	118	127	136	144	150	156	160	167	177
	Tap (5)	SCFM	1115.2	1059.2	995.0	906.5	842.5	791.4	727.2	707.0	652.5
		Watts	148	157	167	178	186	191	198	205	211
30K	Tap (1)	SCFM	955.3	897.8	839.5	739.4	655.3	575.9	511.5	432.4	392.2
		Watts	91	96	102	110	115	121	127	138	140
	Tap (2)	SCFM	1080.7	1031.5	977.4	925.6	819.4	743.8	675.5	608.7	547.1
		Watts	125	131	137	143	153	160	166	173	179
	Tap (3)	SCFM	1182.2	1138.1	1089.0	1042.9	986.9	879.5	811.4	749.5	689.2
		Watts	158	165	172	177	185	197	203	212	221
	Tap (4)	SCFM	1305.6	1261.8	1220.9	1179.5	1132.2	1086.1	984.1	914.5	856.6
		Watts	207	214	221	228	236	244	257	266	273
	Tap (5)	SCFM	1386.7	1350.0	1309.4	1274.6	1233.1	1186.6	1137.8	1031.5	970.0
		Watts	245	253	262	270	277	285	295	309	318
36K	Tap (1)	SCFM	955.3	897.8	839.5	739.4	65.5	575.9	511.5	432.4	392.2
		Watts	91	96	102	110	115	121	127	138	140
	Tap (2)	SCFM	1080.7	1031.5	977.4	925.6	819.4	743.8	675.5	608.7	547.1
		Watts	125	131	137	143	153	160	166	173	179
	Tap (3)	SCFM	1182.2	1138.1	1089.0	1042.9	986.9	879.5	811.4	749.5	689.2
		Watts	158	165	172	177	185	197	203	212	221
	Tap (4)	SCFM	1305.6	1261.8	1220.9	1179.5	1132.2	1086.1	984.1	914.5	856.6
		Watts	207	214	221	228	236	244	257	266	273
	Tap (5)	SCFM	1386.7	1350.0	1309.4	1274.6	1233.1	1186.6	1137.8	1031.5	970.0
		Watts	245	253	262	270	277	285	295	309	318

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42K	Tap (1)	SCFM	1343.9	1271.9	1208.5	1150.9	1085.5	1042.0	899.4	839.6	777.6
		Watts	141.9	150.5	159.2	168	175	185	196	202	210
	Tap (2)	SCFM	1513.9	1451.5	1392.2	1320.2	1266.8	1211.4	1148.5	1036.2	975.4
		Watts	194.2	203.9	214	220.2	228.8	238.7	247.9	264.2	271.9
	Tap (3)	SCFM	1672.5	1620.5	1562.0	1522.0	1470.6	1422.7	1371.1	1309.8	1204.8
		Watts	259	271	282	293	303	312	323	333	353
	Tap (4)	SCFM	1807.3	1781.4	1731.6	1686.0	1640.4	1595.5	1547.1	1509.5	1460.8
		Watts	328.4	343.6	357.5	370.6	385.6	395.2	407	418	430
	Tap (5)	SCFM	2048.0	2000.5	1950.9	1905.3	1861.4	1819.2	1776.4	1729.9	1684.1
		Watts	447	462	476	491	507	520	525.6	538	550
48K	Tap (1)	SCFM	1343.9	1271.9	1208.5	1150.9	1085.5	1042.0	899.4	839.6	777.6
		Watts	141.9	150.5	159.2	168	175	185	196	202	210
	Tap (2)	SCFM	1513.9	1451.5	1392.2	1320.2	1266.8	1211.4	1148.5	1036.2	975.4
		Watts	194.2	203.9	214	220.2	228.8	238.7	247.9	264.2	271.9
	Tap (3)	SCFM	1672.5	1620.5	1562.0	1522.0	1470.6	1422.7	1371.1	1309.8	1204.8
		Watts	259	271	282	293	303	312	323	333	353
	Tap (4)	SCFM	1807.3	1781.4	1731.6	1686.0	1640.4	1595.5	1547.1	1509.5	1460.8
		Watts	328.4	343.6	357.5	370.6	385.6	395.2	407	418	430
	Tap (5)	SCFM	2048.0	2000.5	1950.9	1905.3	1861.4	1819.2	1776.4	1729.9	1684.1
		Watts	447	462	476	491	507	520	525.6	538	550
60K	Tap (1)	SCFM	1275.4	1220.3	1165.5	1115.8	1051.6	974.7	913.6	859.1	800.6
		Watts	153	163	173	183	194	203	212	220	231
	Tap (2)	SCFM	1435.1	1381.7	1335.1	1289.5	1243.6	1186.2	1113.6	1075.9	1016.2
		Watts	210	220	232	243	254	266	276	287	297
	Tap (3)	SCFM	1610.6	1567.1	1528.1	1482.2	1440.8	1396.1	1350.6	1261.8	1219.6
		Watts	287	301	313	325	336	355	361	381	391
	Tap (4)	SCFM	1756.8	1718.5	1674.5	1633.8	1601.1	1557.2	1519.5	1475.1	1426.2
		Watts	366	376	392	405	415	431	444	459	472
	Tap (5)	SCFM	1917.1	1882.9	1842.6	1798.9	1772.9	1734.2	1700.6	1662.9	1622.4
		Watts	467	482	496	512	525	542	553	569	584

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

8. Wiring Diagrams



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	4.0	6.0
30K	60	208-230V	187V	253V	5.0	6.0
36K	60	208-230V	187V	253V	4.0	6.0
42K	60	208-230V	187V	253V	7.0	10.0
48K	60	208-230V	187V	253V	7.0	10.0
60K	60	208-230V	187V	253V	7.0	10.0

10.The Specification of Wiring

Note:

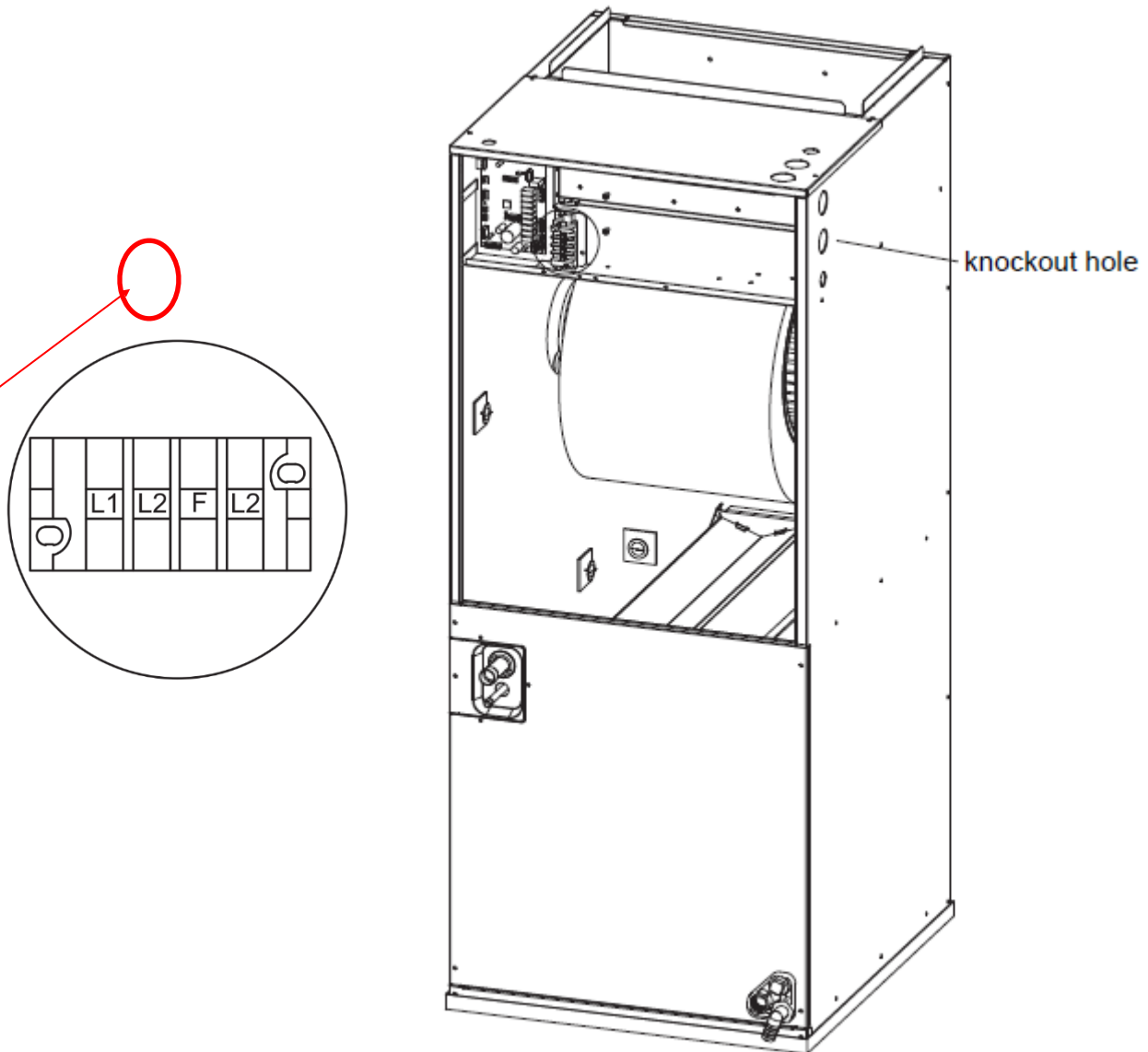
The cross-section areas of wires or lines should not be less than the corresponding ones listed in the table below; Besides, if the power wires is quite long from the unit, please choose the windings with larger cross-section guarantee the normal power supply.

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
42K	3*16	18	3*10
48K	3*16	18	3*10
60K	3*16	18	3*10

11. Field Wiring

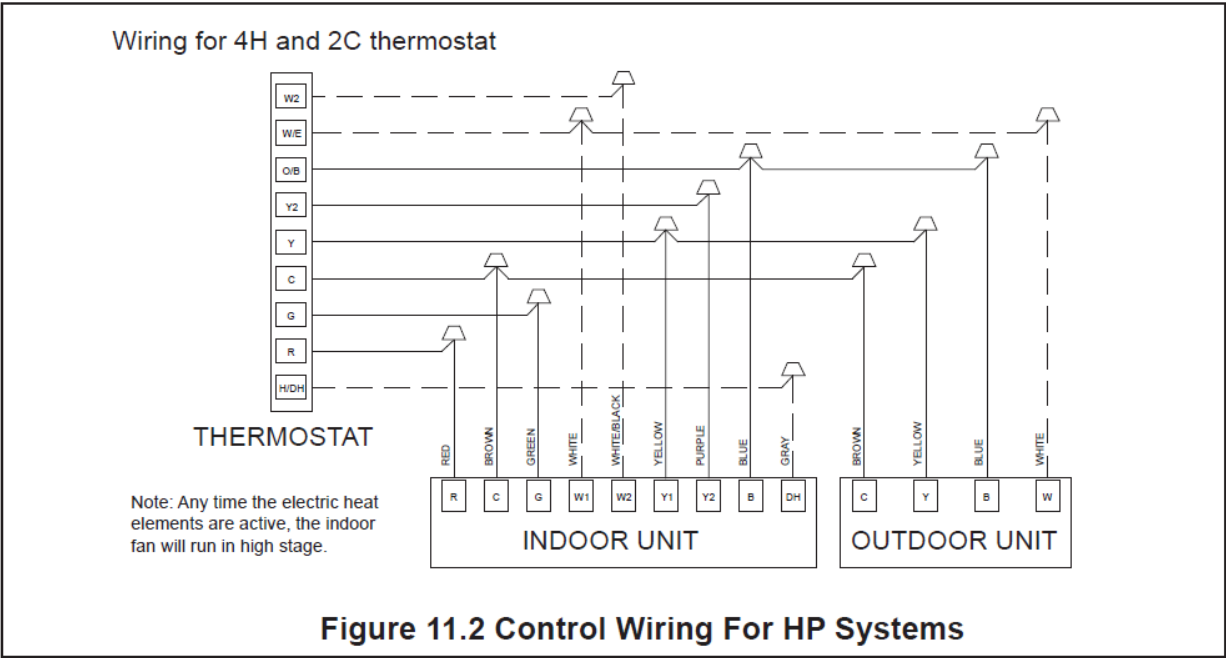
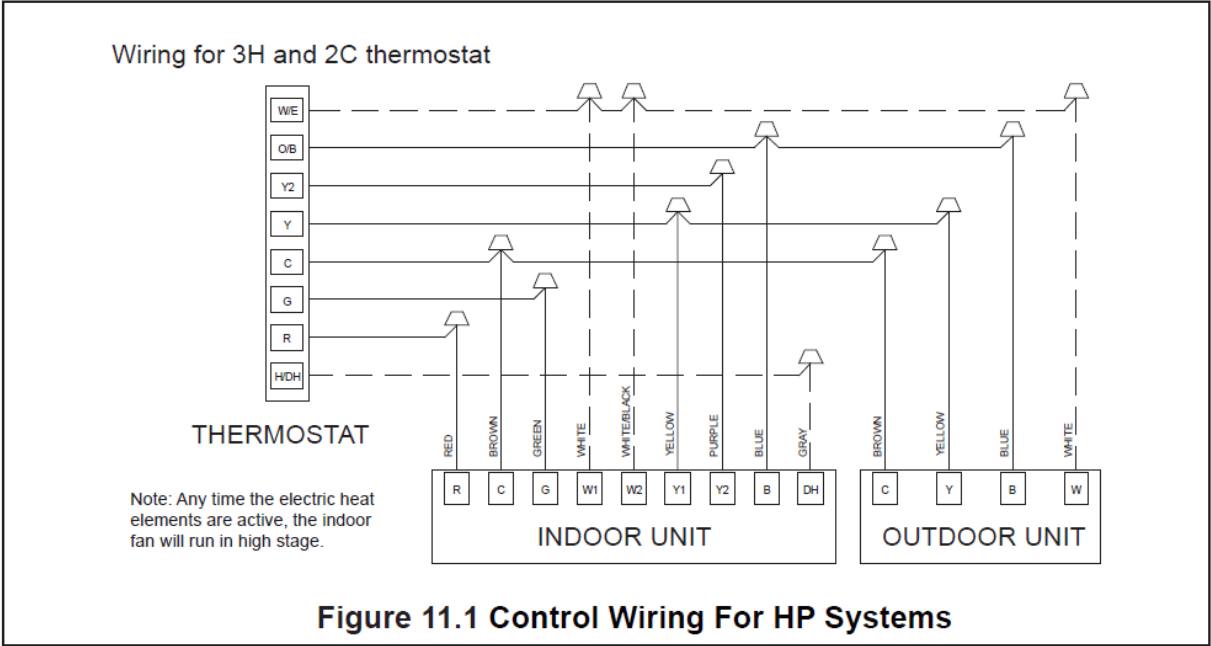
1. To avoid the electrical shock, please connect the air conditioner with the ground lug.
2. The main power plug in the air conditioner has been joined with the ground wiring, please don't change it freely.
3. The power socket is used as the air conditioner specially.
4. Don't pull the power wiring hard.
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 1C thermostat

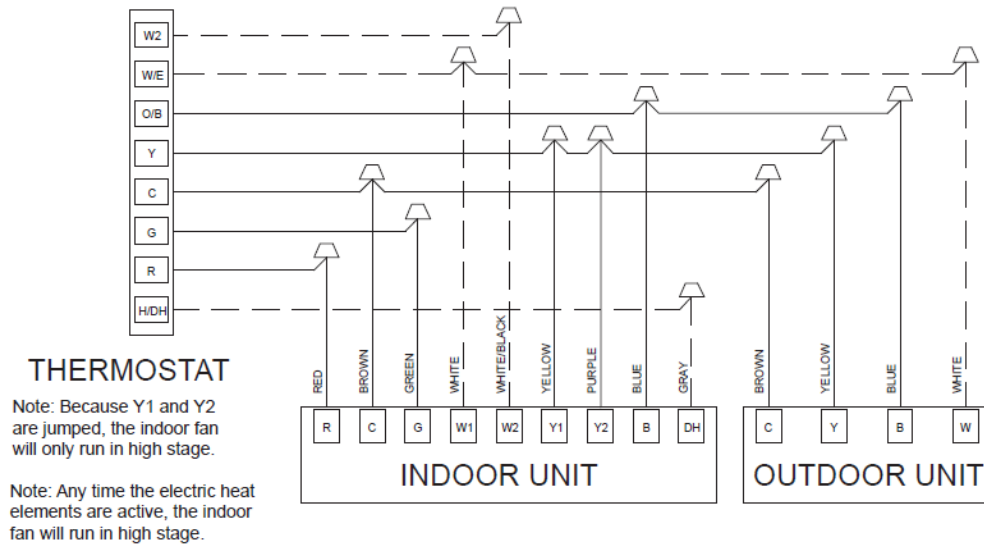


Figure 11.3 Control Wiring For HP Systems

Wiring for 2H and 2C thermostat

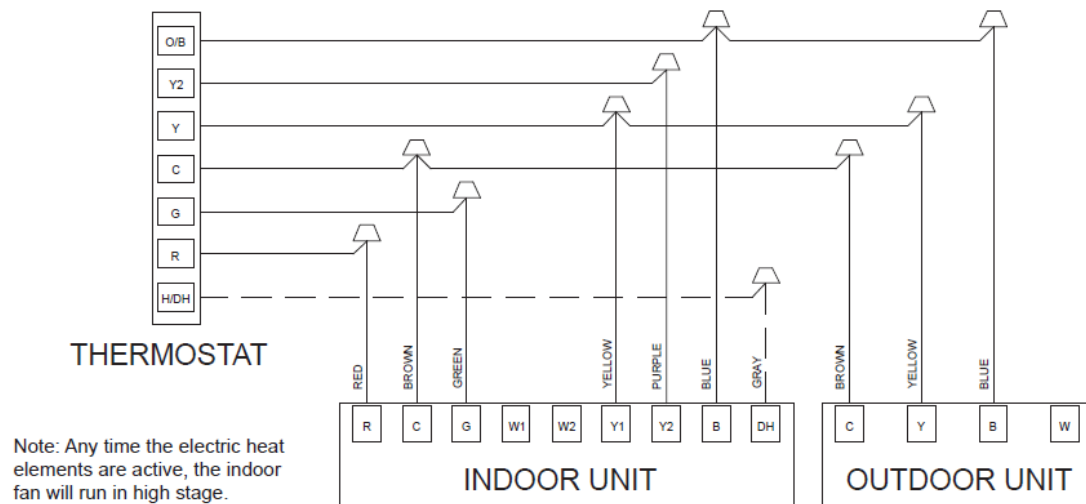


Figure 11.4 Control Wiring For HP Systems

Wiring for 1H and 1C thermostat

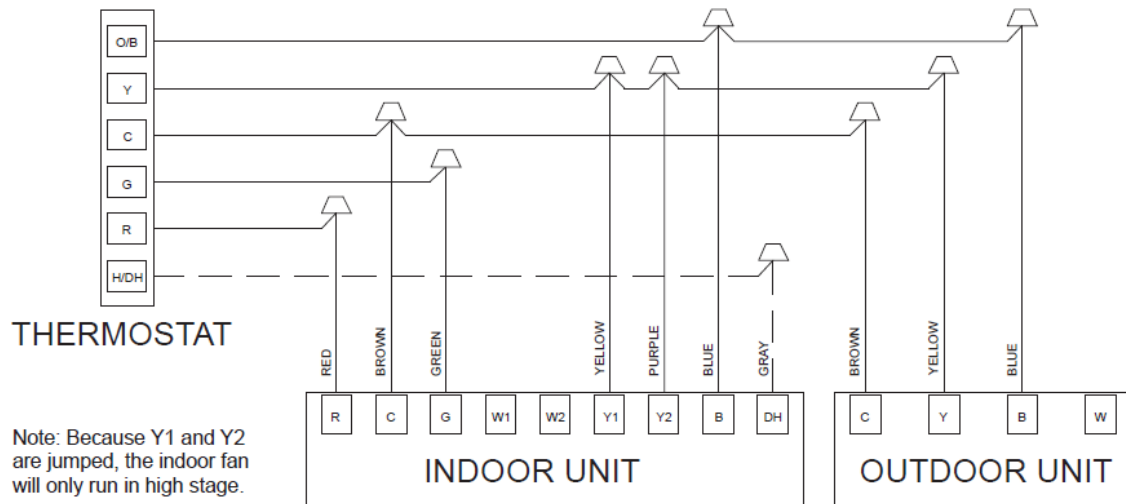


Figure 11.5 Control Wiring For HP Systems

Wiring for 2H and 1C thermostat

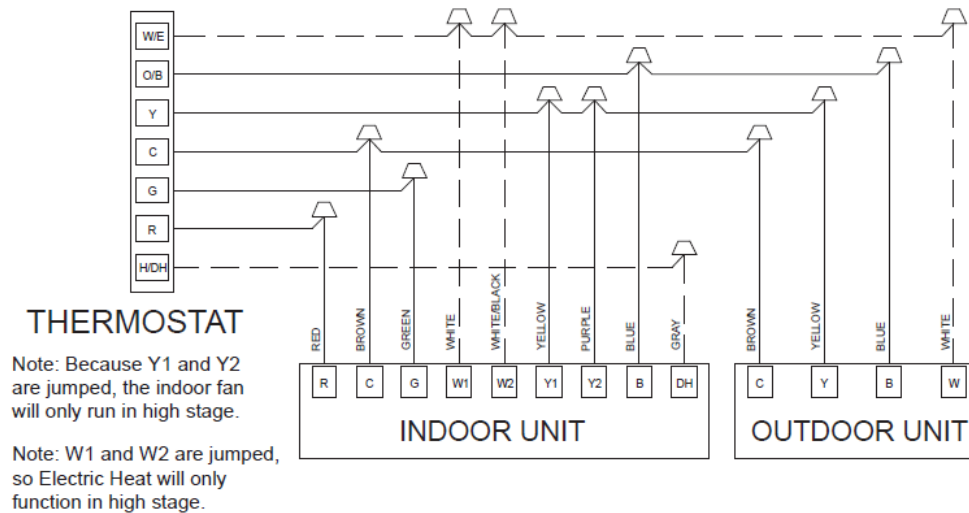
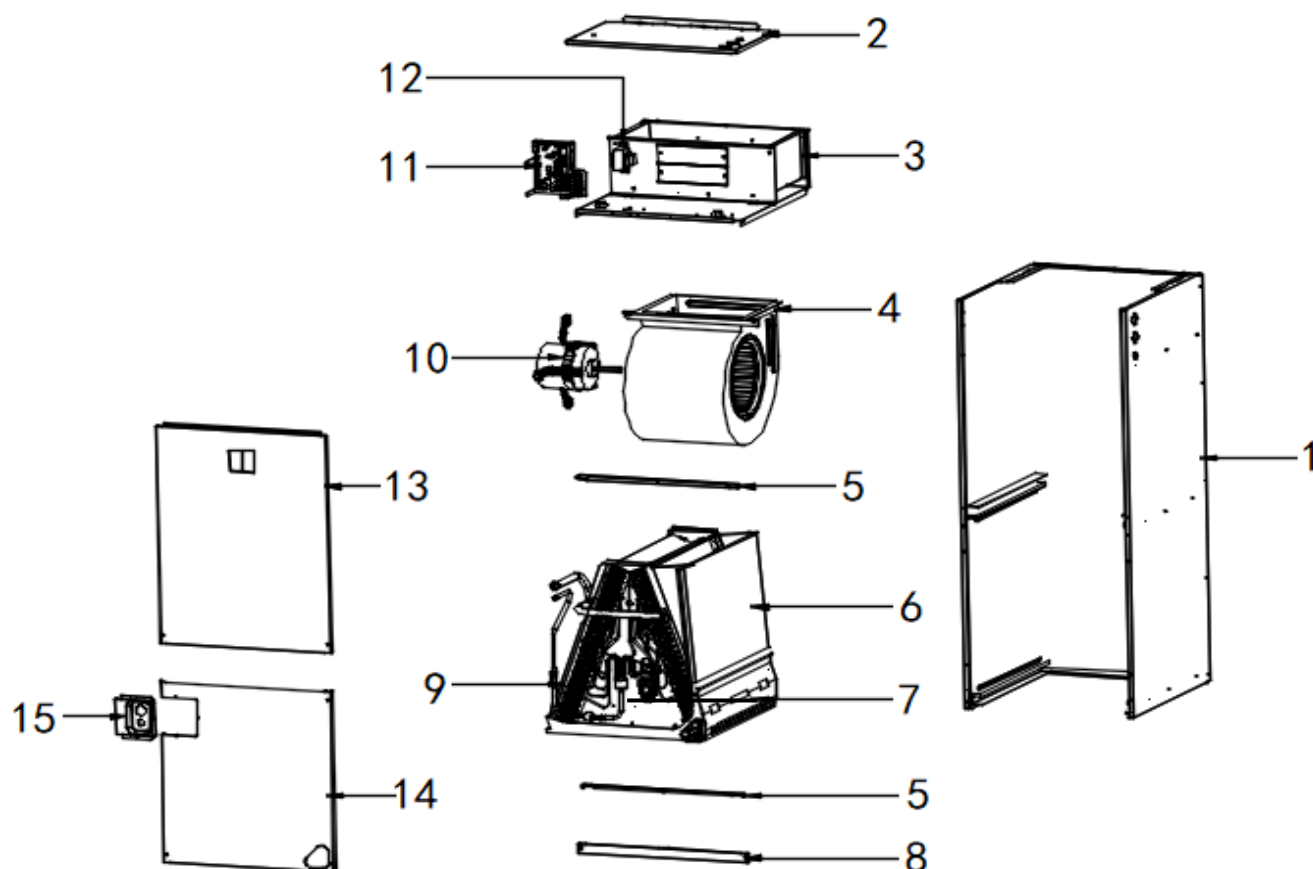


Figure 11.6 Control Wiring For HP Systems

12.Exploded View



No.	Part Name	Quantit	No.	Part Name	Quantit
1	Rear Enclosure Assembly	1	9.3	Evaporator baffle	2
2	Control box cover assembly	1	10	DC Motor	1
3	Duct assembly	1	11	Indoor electric control box	1
4	Right Volute Wind Wheel	1	11.1	Indoor main control board	1
5	Support bar	2	11.2	Ambient temperature sensor	1
6	Water pan components	1	11.3	Coil temperature sensor	1
7	Refrigerant leakage sensor	1	12	Transformers	1
8	Filter Cover plate	1	13	Upper side plate assembly	1
9	Evaporator components	1	14	Down side plate assembly	1
9.1	Evaporator output tube	1	15	Pipe Cover plate assembly	1
9.2	Evaporator input tube	1			

Part 3 Outdoor Unit

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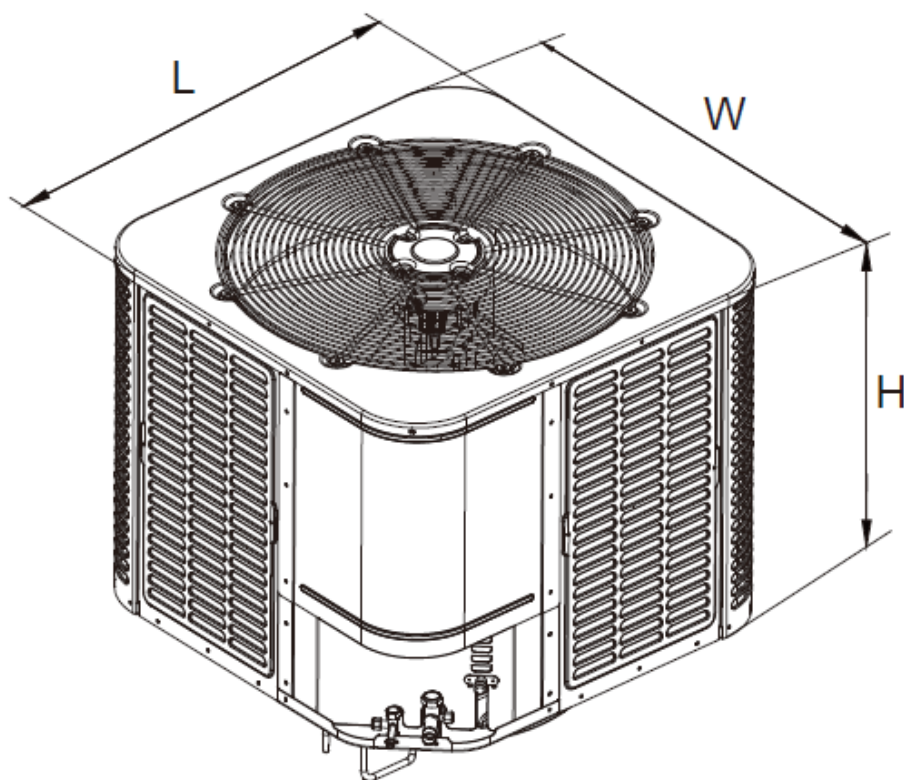
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1.Specification

Outdoor power supply		HEAT PUMP									
Model	V/Ph/Hz	COT-F18NR8-CA01(E3)	COT-F24NR8-CA01(E3)	COT-F30NR8-EA01(E3)	COT-F42NR8-GA01(E3)	COT-F48NR8-GA01(E3)	COT-F60NR8-GA01(E3)				
Capacity	Btu/h	18000	23000	27800	34000	41000	47500				
SEER2	Btu/h.W	11.7	11.7	12	11.7	11.7	11.2				
SEER2	Btu/h.W	14.3	14.3	15.2	14.3	14.3	14.3				
Capacity	Btu/h	17600	22400	27800	33000	41000	47000				
HSPF2	Btu/h.W	7.5	7.5	7.5	7.5	7.5	7.5				
Refer to Room Area		277.00	382.00	441.00	516.00	630.00	748.00				
MCA	A	16	20	23	30	34	41				
MOP	A	25	30	35	45	50	60				
Brand		LG	LG	LG	LG	LG	LG				
Model	YPH016KAA	YPH020KAA	YPH024KAA	YPH029KAA	YPH033KAA	YPH042KAA	YPH048KAA				
Type	scroll	scroll	scroll	scroll	scroll	scroll	scroll				
Capacity	Btu/h	19500.00	24800.00	29700.00	36000.00	44700	52200				
Input	W	1192.00	1498.00	1772.00	2134.00	2684	3115				
Rated current(RLA)	A	11.20	14.30	16.30	24.6	30.2	36.4				
Locked rotor Amp(LRA)	A	47.00	59.00	71.00	75.00	96	102				
Brand		Broad-Ocean	Broad-Ocean	Broad-Ocean/Panasonic	Broad-Ocean/Panasonic	Broad-Ocean/Panasonic	Broad-Ocean/Panasonic				
Model	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10				
Rate current	A	1.80	1.80	1.80	1.80	1.80	1.80				
Input	W	220.00	226.00	226.00	226.00	256.00	256.00				
Output	W	200.00	200.00	200.00	200.00	200.00	200.00				
Capacitor	µF	/	/	/	/	/	/				
Speed	rpm	850.00	850.00	950.00	950.00	950.00	1100.00				
Dimension	mm	Φ450×120×Φ12.7	Φ585×110×Φ12.7	Φ685×110×Φ12.7	Φ685×110×Φ12.7	Φ685×110×Φ12.7	Φ595×115×Φ12.7				
Number of row		2.00	2.00	2.00	2.00	2.70	2.70				
Fin spacing	in	0.06	0.06	0.06	0.06	0.06	0.06				
Fin material		Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin	Hydrophilic Aluminium Fin				
Tube outside diameter	in	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276				
Tube material		Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved				
Coil length x height x width	in	54.68×23.14×1.05	54.68×23.14×1.05	84.09×23.15×1.05	84.09×23.15×1.05	84.65×31.48×1.05	84.65×31.48×1.05				
Number of circuit		6.00	6.00	6.00	6.00	8.00	8.00				
Outdoor air flow	CFM	1780.00	3060.00	3350.00	3350.00	3910.00	4100.00				
Outdoor noise level	dB(A)	59.00	60.00	60.00	60.00	63.00	63.00				
Throttling type		Piston	Piston	Piston	Piston	Piston	Piston				
Outdoor dimension	Unit (W×H×D)	21-4/5×25×21-4/5	21-4/5×25×21-4/5	28-1/7×25×29-1/7	28-1/7×25×29-1/7	28-1/7×32-7/8×29-1/7	29-1/7×32-7/8×29-1/7				
	Packing (W×H×D)	554×633×554	554×633×554	740×633×740	740×633×740	740×835×740	740×835×740				
	Net / Gross weight	60/63	60.5/63	74.5/78.5	76/80.5	77.5/80.5	92/96				
		132/139	133/139	168/173	168/177	183/196	203/212				
Refrigerant	Type	R454b	R454b	R454b	R454b	R454b	R454b				
	Charging	oz	82.89	82.89	125.22	137.56	137.56				
	Liquid side	in	Φ3/8	Φ3/8	Φ3/8	Φ3/8	Φ3/8				
	Gas side	in	Φ3/4	Φ3/4	Φ3/4	Φ3/4	Φ7/8				
Refrigerant pipe	Max. refrigerant pipe length	ft	131	131	131	147	147				
	Max. difference in level	ft	60	60	60	60	60				
Design pressure	MPa	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72				
Max pressure	MPa	4.15	4.15	4.15	4.15	3.92	3.92				
Operation temp range	Cooling	°F	53-120	53-120	53-120	53-120	53-120				
	Heating	°F	5-80	5-80	5-80	5-80	5-80				

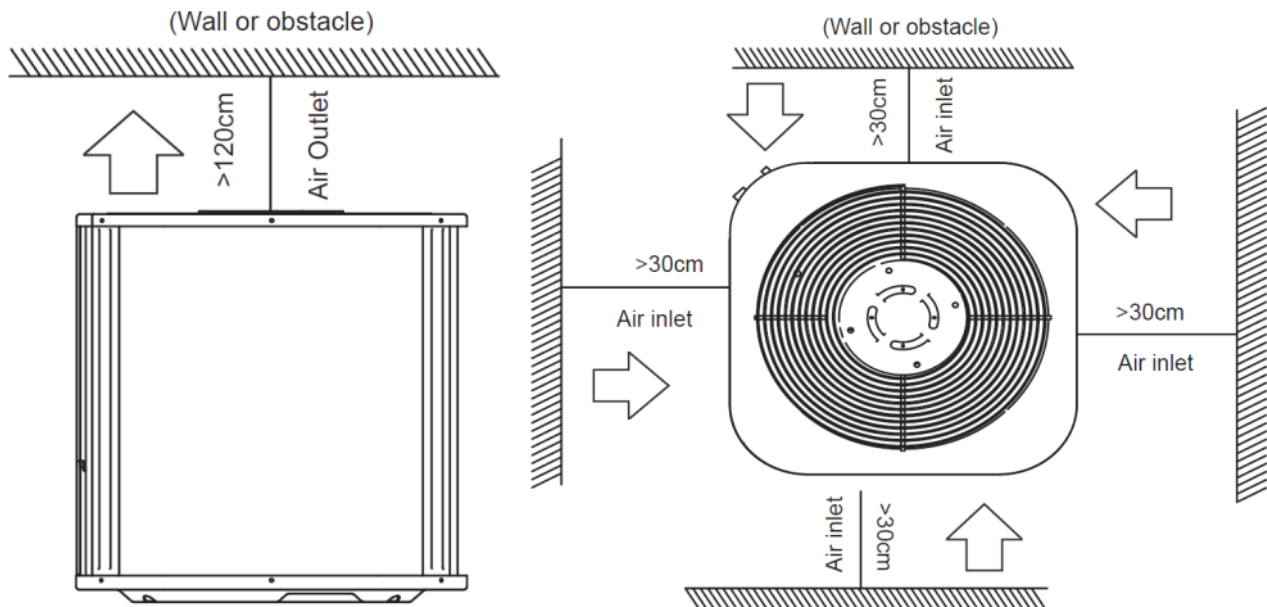
		COOL ONLY									
Outdoor power supply	Model	COT-F18CNR8-CA01(E3)		COT-F24CNR8-CA01(E3)		COT-F30CNR8-EA01(E3)		COT-F36CNR8-EA01(E3)		COT-F48CNR8-GA01(E3)	
		230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz	230V/1N/60Hz
Cooling	Capacity	18000	23000	27600	33400	41000	47000	54000			
	SEER2	11.7	11.7	11.7	11.7	11.7	11.7	11.2			
Refer to Room Area	SEER2	14.3	14.3	15.2	14.3	14.3	14.3	14.3			
	Square feet	277.00	362.00	441.00	516.00	630.00	748.00	785.00			
MCA	A	16	20	23	30	34	41	48			
MOP	A	25	30	35	45	50	60	80			
Compressor	Brand	LG	LG	LG	LG	LG	LG	LG			
	Model	YPH016KAA	YPH020KAA	YPH029KAA	YPH036KAA	YPH042KAA	YPH049KAA	YBHO49KAA			
Outdoor fan motor	Type	scroll	scroll	scroll	scroll	scroll	scroll	scroll			
	Capacity	19500.00	24800.00	29700.00	36000.00	44700	52200	61400			
Outdoor fan blade	Input	W	1192.00	1498.00	2134.00	2684	3115	3664			
	Rated current(RLA)	A	11.20	14.30	21.00	24.6	30.2	36.4			
Outdoor coil	Locked rotor Amp(LRA)	A	47.00	59.00	71.00	96	102	125			
	Brand	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean	Broad-Ocean			
Outdoor fan flow	Model	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10	DRN-310-200-10			
	Rate current	A	1.10	1.10	1.30	1.30	1.70	1.70			
Outdoor noise level	Input	W	220	226	228	256	286	296			
	Output	W	200	200	200	200	200	200			
Throttling type	Capacitor	µF	/	/	/	/	/	/			
	Speed	rpm	850	950	950	950	1050	1050			
Outdoor dimension	Dimension	mm	Φ450×120×Φ12.7	Φ450×120×Φ12.7	Φ585×110×Φ12.7	Φ585×110×Φ12.7	Φ585×110×Φ12.7	Φ585×110×Φ12.7			
	Number of row	2	2	2	2	2	2	2			
Outdoor coil	Fin spacing	In	0.055	0.055	0.055	0.055	0.055	0.055			
	Fin material	In	Hydrophilic Aluminum Fin	Hydrophilic Aluminum Fin	Hydrophilic Aluminum Fin	Hydrophilic Aluminum Fin	Hydrophilic Aluminum Fin	Hydrophilic Aluminum Fin			
Outdoor coil	Tube outside diameter	In	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276	Φ 0.276			
	Tube material	In	Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved	Inner Grooved			
Outdoor air flow	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	84.09×23.15×1.05	84.65×31.48×1.05	84.65×31.48×1.05			
	Number of circuit	6	6	6	6	6	6	6			
Outdoor noise level	CFM	1780	1990	3350	3350	3820	3820	3820			
	dB(A)	59	60	60	60	63	63	63			
Throttling type	Type	Piston	Piston	Piston	Piston	Piston	Piston	Piston			
	Unit (WxHxD)	In	21-4/5×25×21-4/5	21-4/5×25×21-4/5	29-17/8×25×29-1/7	29-17/8×25×29-1/7	29-17/8×25×29-1/7	29-17/8×25×29-1/7			
Outdoor dimension	Packing (WxHxD)	mm	554×633×554	554×633×554	740×633×740	740×633×740	740×633×740	740×633×740			
	Net / Gross weight	kg	57/60	57/60	77/84	77/84	80/84	80/84			
Refrigerant	Type	lbs	126/132	127/132	160/170	160/170	160/170	160/170			
	Charging	oz	70.55	77.60	116.40	123.46	123.45	134.04			
Refrigerant pipe	Liquid side	In	Φ3/8	Φ3/8	Φ3/8	Φ3/8	Φ3/8	Φ3/8			
	Gas side	In	Φ3/4	Φ3/4	Φ3/4	Φ3/4	Φ3/4	Φ3/4			
Design pressure	Max. refrigerant pipe length	ft	131	131	131	131	147	147			
	Max. difference in level	ft	60	60	60	60	60	60			
Max pressure	MPa	MPa	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72	3.79/1.72			
	MPa	MPa	4.15	4.15	4.15	4.15	3.92	3.92			
Operation temp range		°F	53-120	53-120	53-120	53-120	53-120	53-120			
Cooling											

2.Dimensions

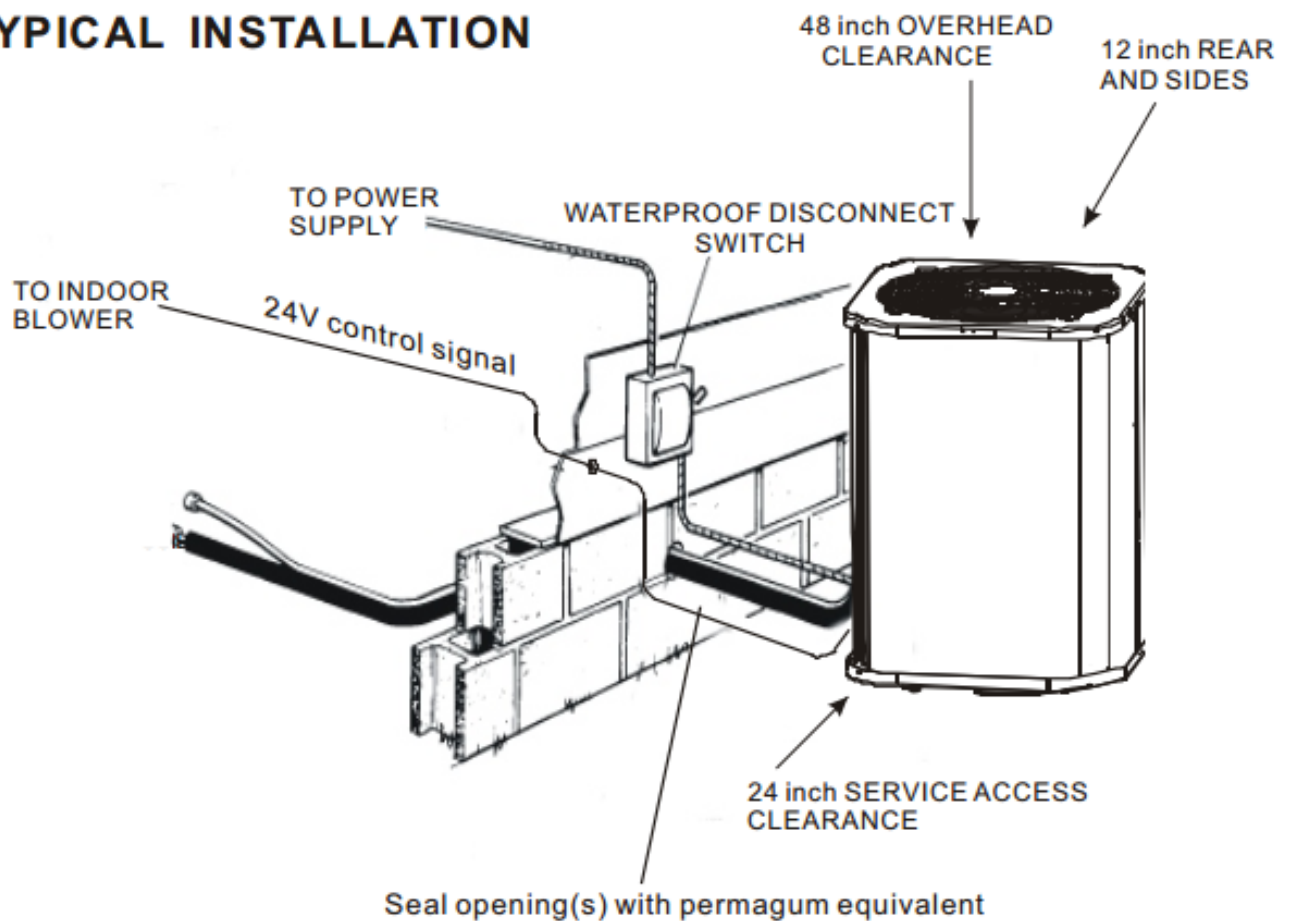


model	H×W×L (inches)
18K/24K	25 × 21-4/5 × 21-4/5
30K/36K	25 × 29-1/7 × 29-1/7
42K/48K/60K	32-7/8 × 29-1/7 × 29-1/7

3. Service Space

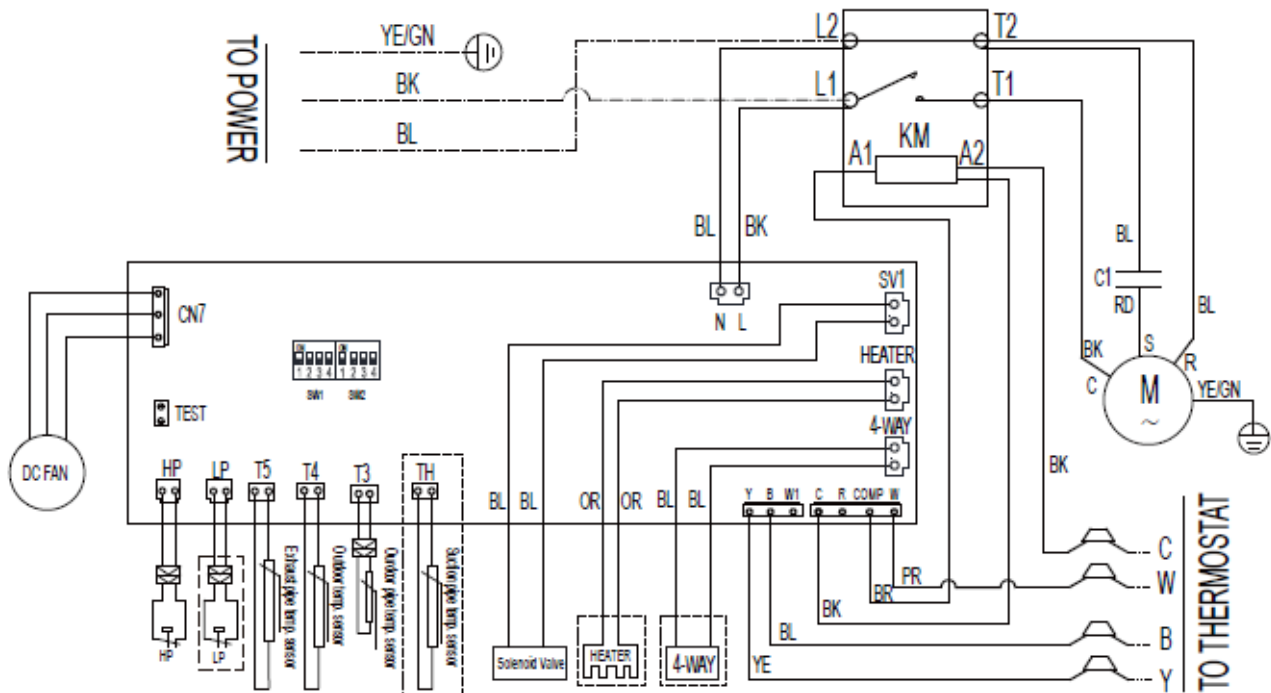


TYPICAL INSTALLATION

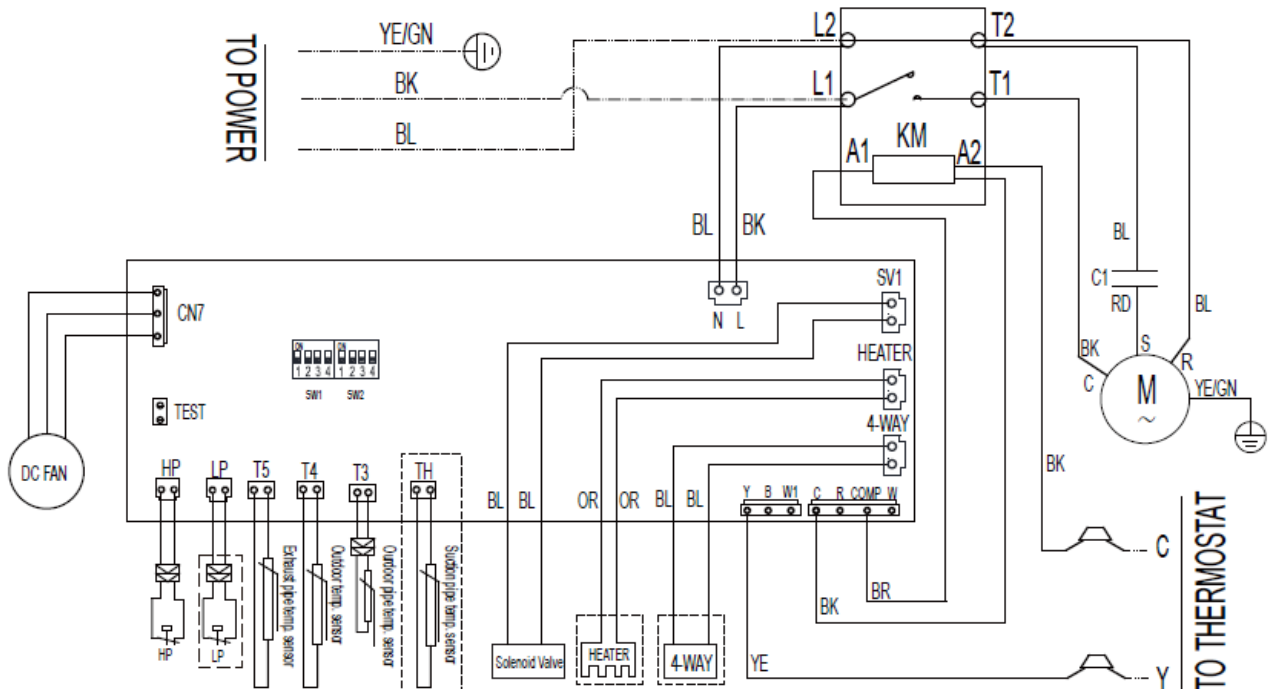


4.Wiring Diagrams.

Heat pump unit



Cooling only unit



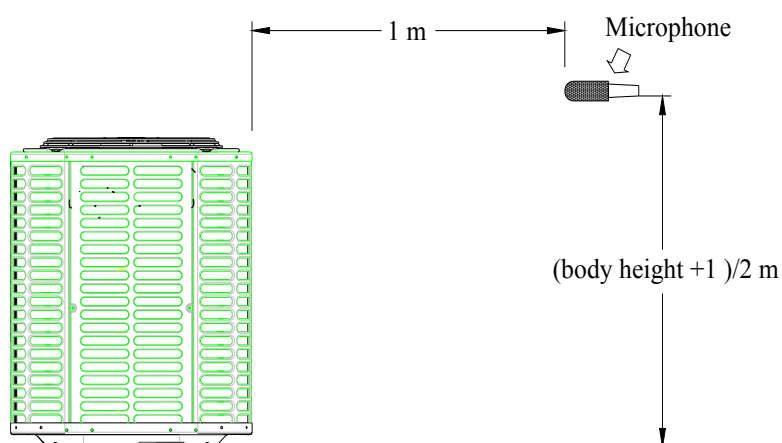
5. Electric Characteristics

Model	Outdoor Unit					
	Hz	Voltage	Min.	Max.	MCA	MOP
18K	60	208~230V	187V	253V	16	25
24K	60	208~230V	187V	253V	20	30
30K	60	208~230V	187V	253V	23	35
36K	60	208~230V	187V	253V	30	45
42K	60	208~230V	187V	253V	25	35
48K	60	208~230V	187V	253V	30	40
60K	60	208~230V	187V	253V	33	45

6. Operation Limits

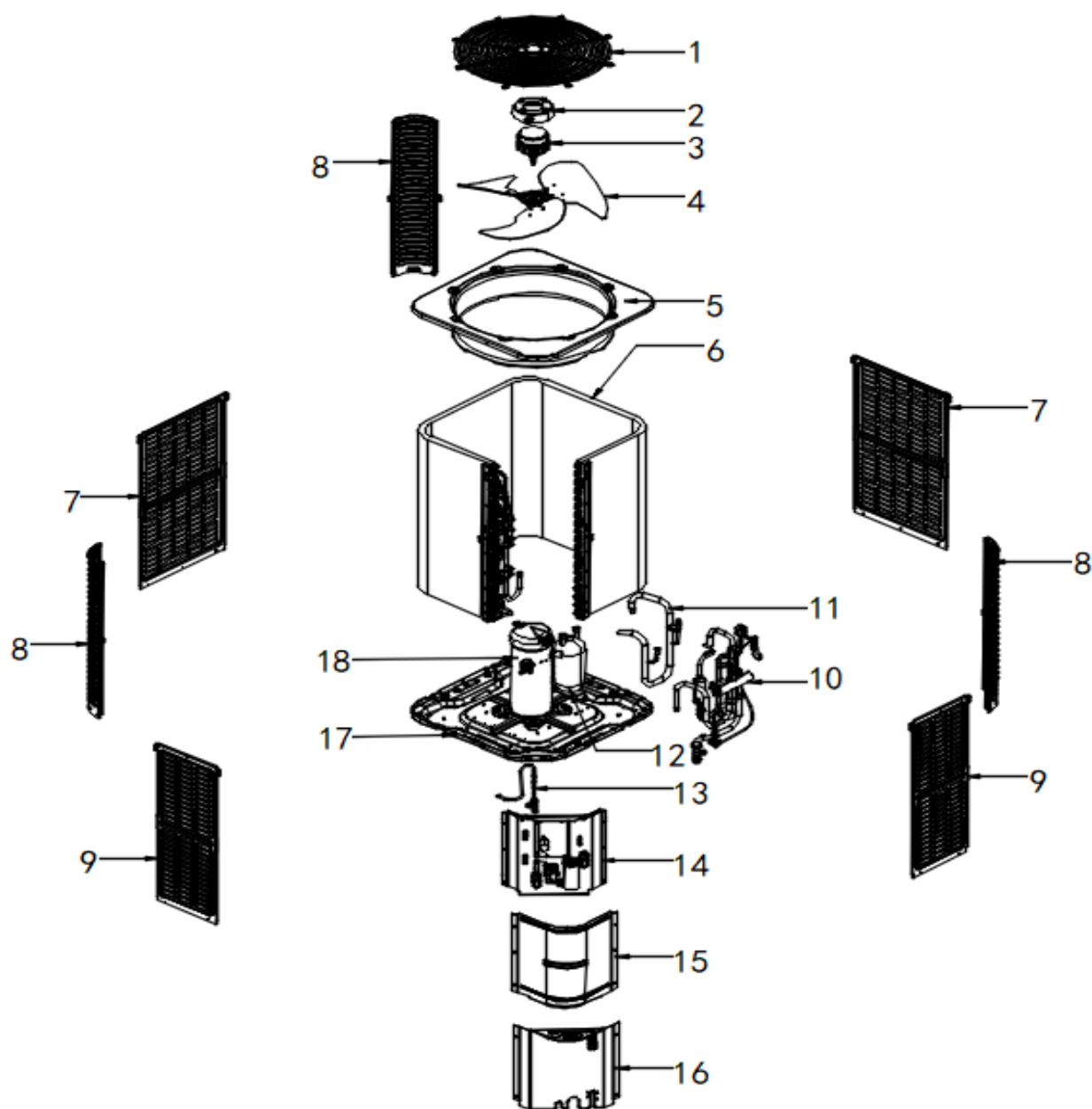
Operation mode	Outdoor temperature(°F)	Room temperature(°F)
Cooling operation	53—120	61—90
Heating operation	5—80	61—90

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	Quantity	No.	Part Name	Quantity
1	Cover net	1	14	electric control box	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

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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
8	Support board	3	13.9	AC contactor	1
9	Left side-panel	2	13.10	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

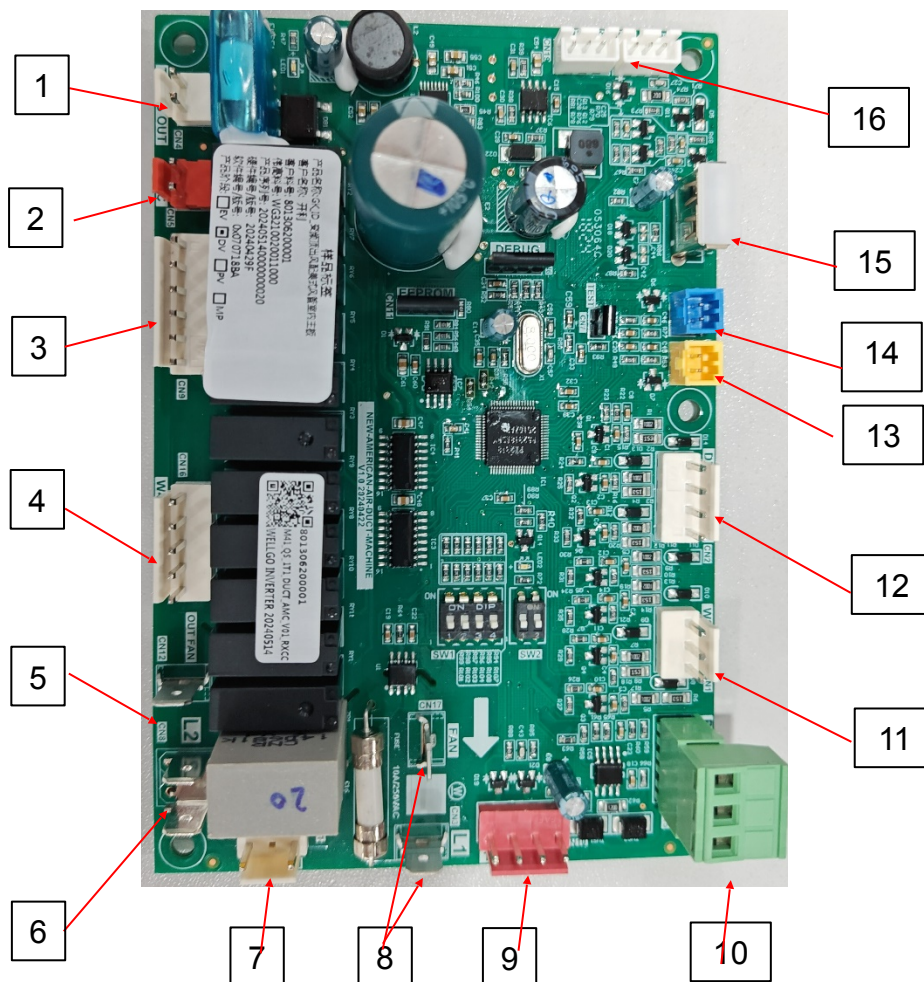
Number of green light flashes	Fault description
2	T1 sensor fault
3	T2 sensor fault
4	Refrigerant concentration sensor fault
5	Refrigerant leakage
6	Anti-freeze protection
7	Mainboard chip fault
8	Motor protection
9	IDU and ODU unit communication fault (RS485 communication mode)
10	Wire controller communication fault (RS485 communication mode)

Outdoor unit

status code	System status
0	Standby Mode
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-freeze Protection

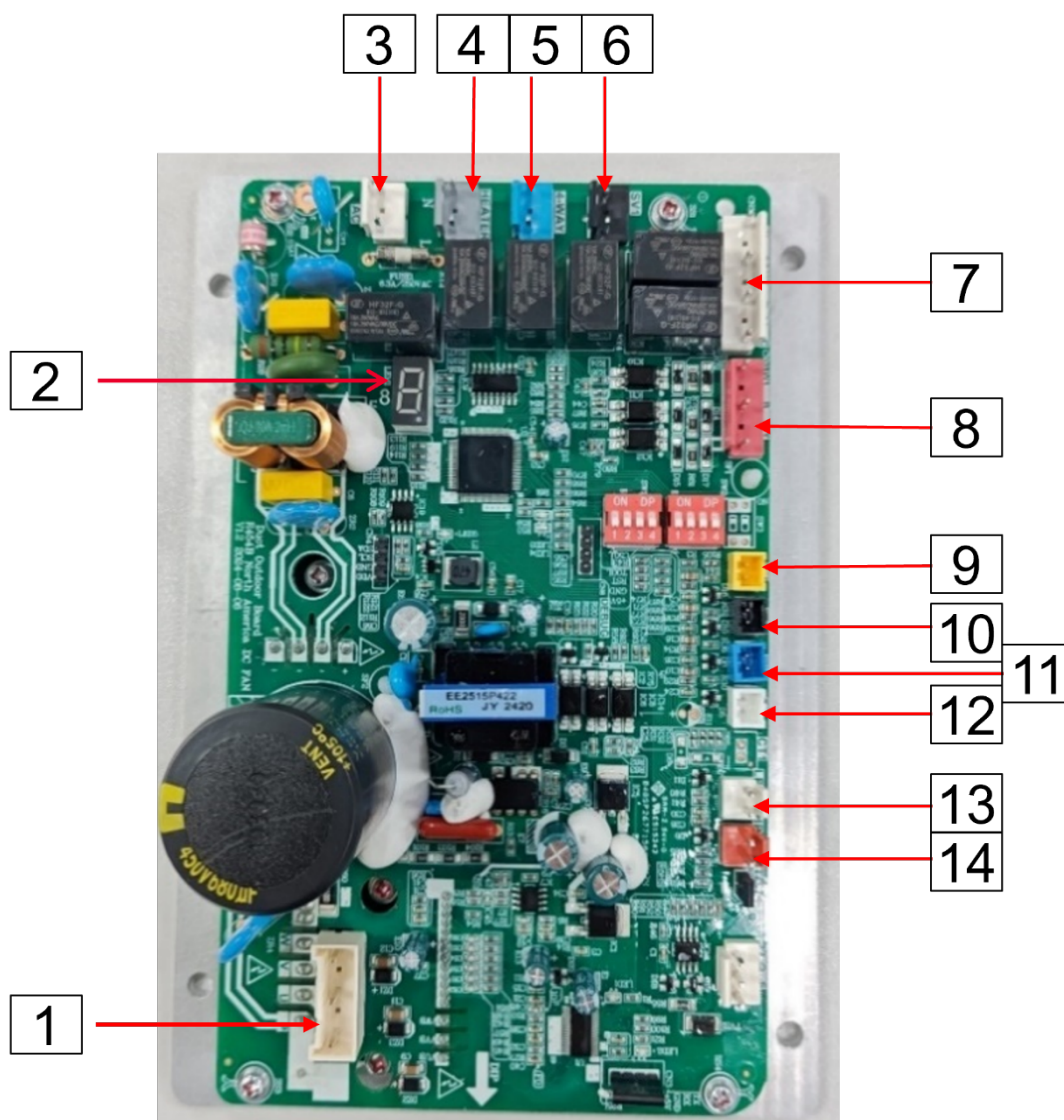
6.	6 times Low Pressure Protection within 60 minutes
7.	6 times High Pressure Protection within 60 minutes
8.	4 times Outdoor Fan Error within 60 minutes
C.	3 times T5 Temperature Protection within 60 minutes
F.	8 times TH Anti-freeze Protection within 200 minutes

9.2 Indoor unit control board



NUM	Port definition	NUM	Port definition
1	Transformer output (24v)	9	Refrigerant leakage sensor
2	24V thermostat power supply R, C	10	PQE indoor and outdoor communication
3	DC motor communicate port	11	Electric heater port (to 24V thermostat)
4	Electric heater port (connected to electric heater)	12	24V terminal connected to 24V thermostat
5	Power supply of control board and DC motor N (L2)	13	T1 sensor
6	Power supply (L2)	14	T2 sensor
7	Transformer input(230v)	15	Debug port
8	Power supply of control board and DC motor L (L1)	16	Smart controller port (only active functional in RS485 communication)

9.3 Outdoor unit control board



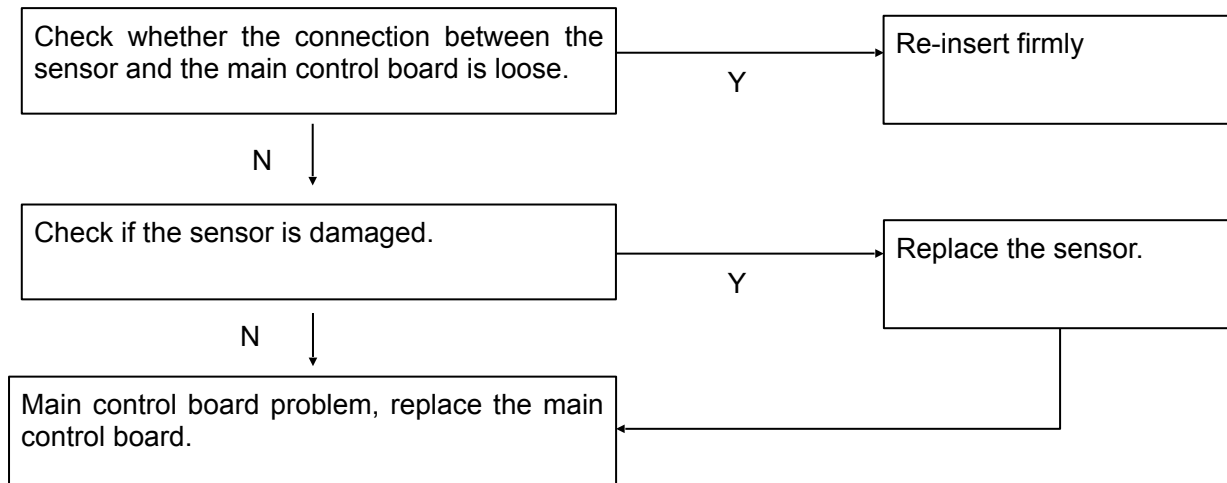
NUM	Port definition	NUM	Port definition
1	DC motor communicate port	8	24V communication (Y/B)
2	Digital display tube	9	Return air temperature sensor
3	Power supply	10	Condenser temperature sensor
4	Crankshaft heating belt	11	ambient temperature sensor
5	Four-way valve	12	Exhaust temperature sensor
6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

9.4 Troubleshooting guide

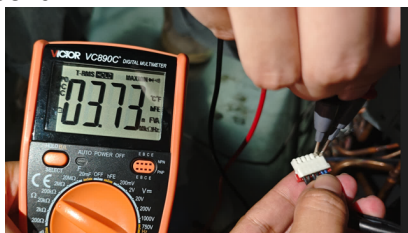
9.4.1 T1/T2/ sensor fault, R454b sensor fault (Indoor unit sensor failure)

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

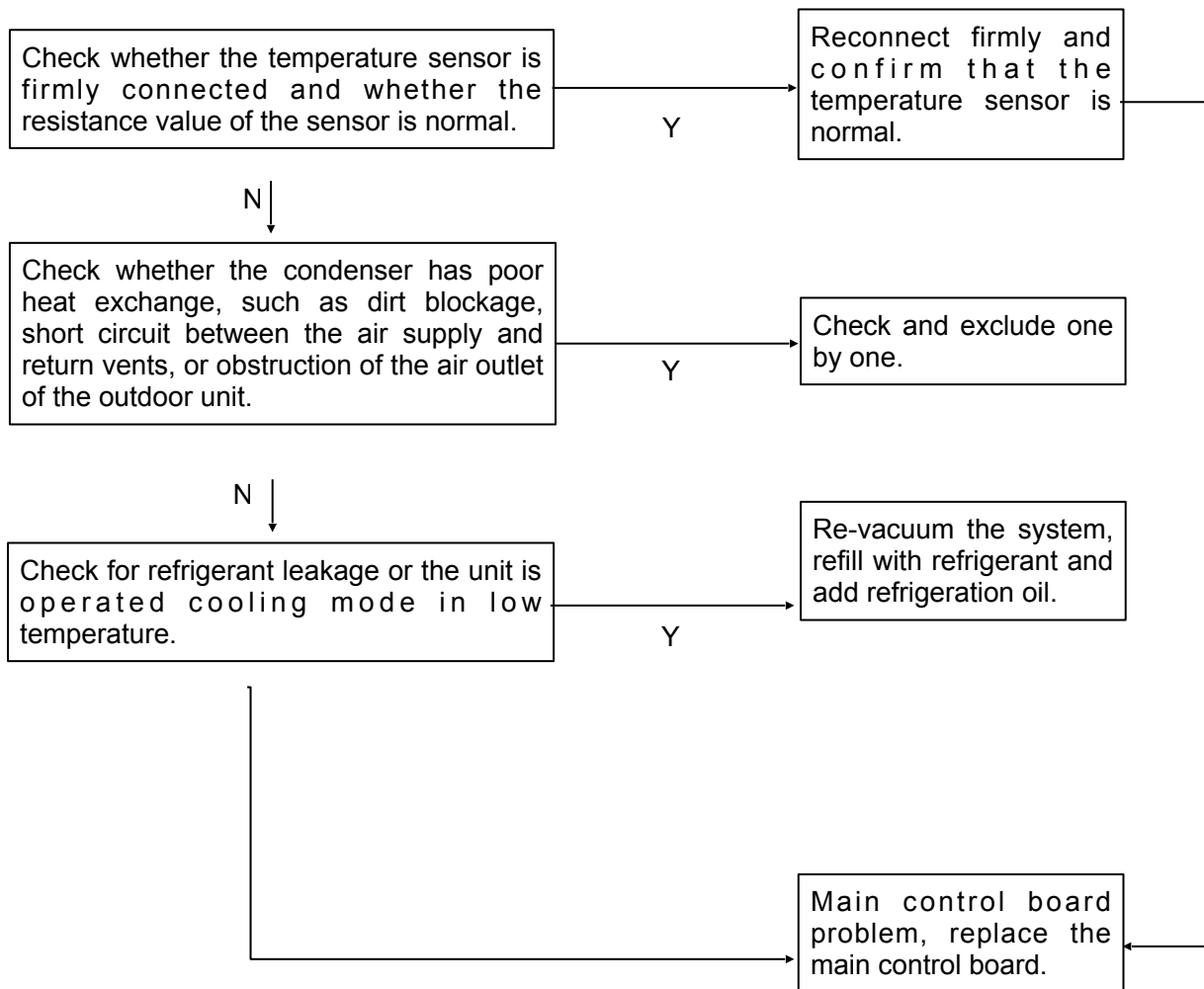
- Replace the indoor control board.

9.4.5 Anti-freeze protection

Reason:

Indoor unit: The T2 sensor detects that the evaporator temperature is too low($T_2 < 0^{\circ}\text{C}$)

Outdoor unit: The TH sensor detects that the gas return temperature is too low($T_2 < 0^{\circ}\text{C}$)



- 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.

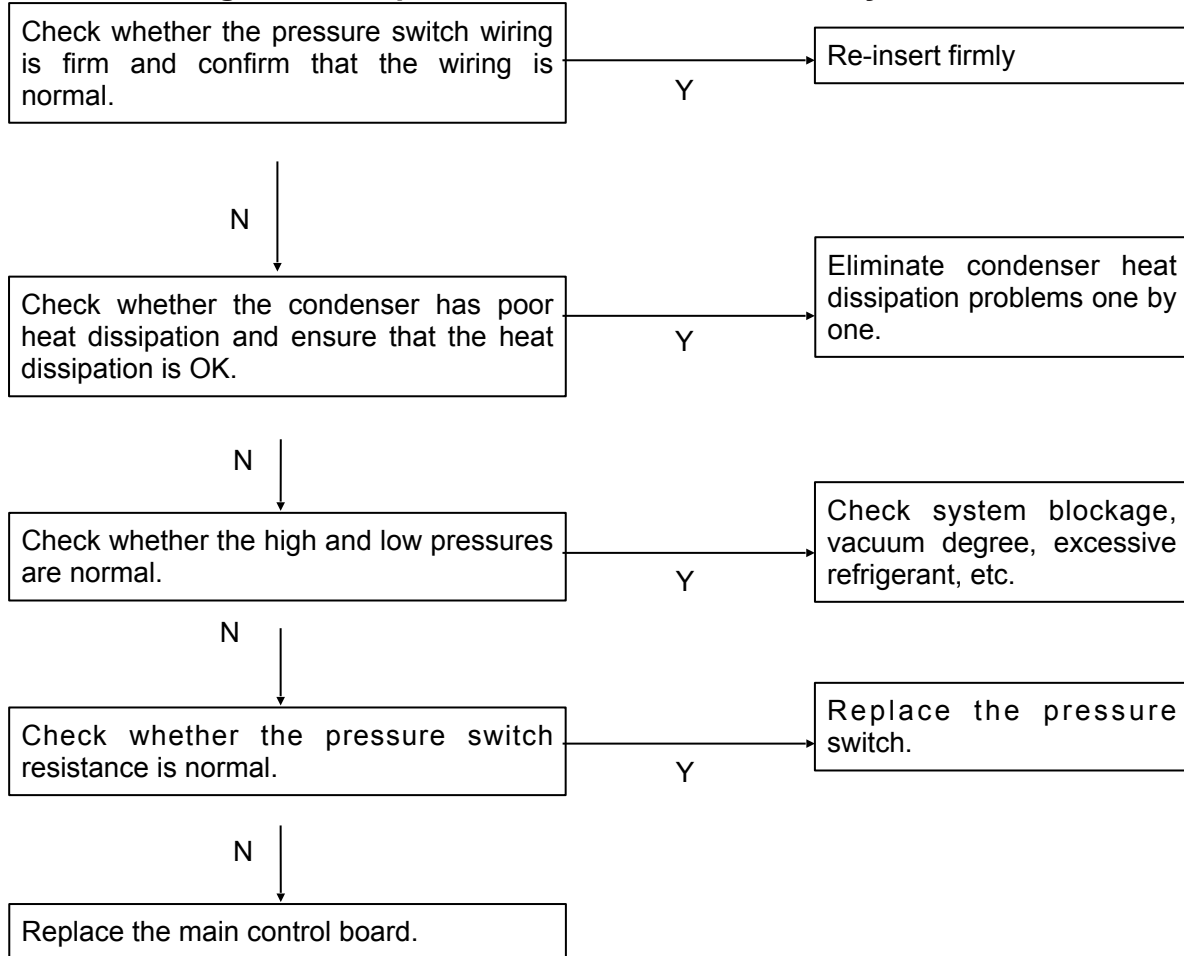
9.4.6 Indoor fan protection

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

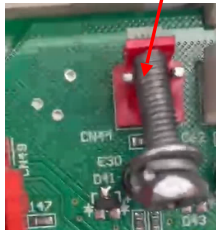
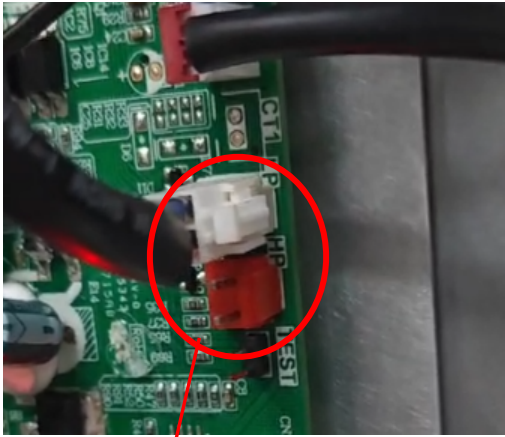
- Replace the control board of the indoor unit.
- If not resolved, replace the motor.

9.4.7 High /Low pressure protection

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



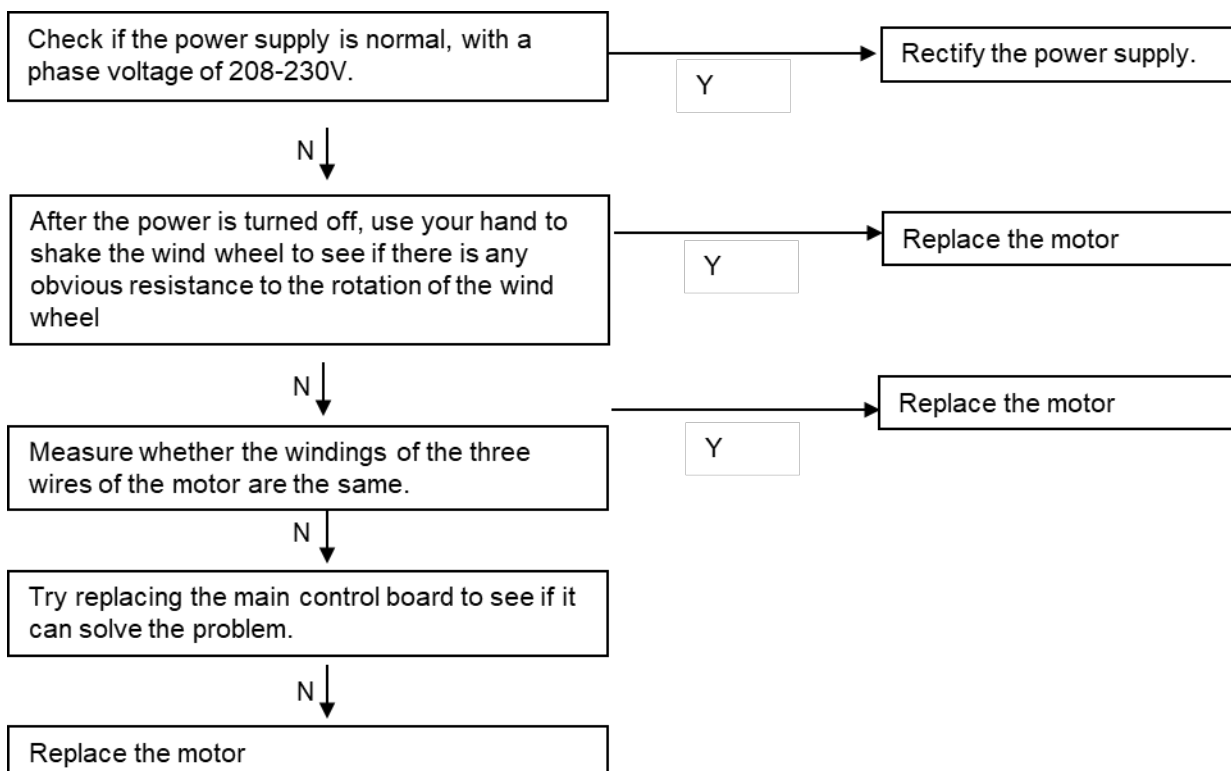
- Then turn off the power of the machine and then turn on the power, and use the controller to start the machine.
- If the machine fails after running for a while, there may be a problem with the refrigerant system and the system needs to be checked.
- If the machine fails as soon as it is powered on, 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.



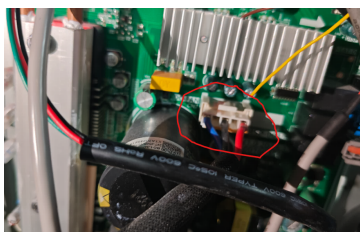
The high-pressure switch port can be short circuited by using a screw clamped between two pins.

9.4.8 DC fan malfunction

Cause: Abnormal detection of fan motor.



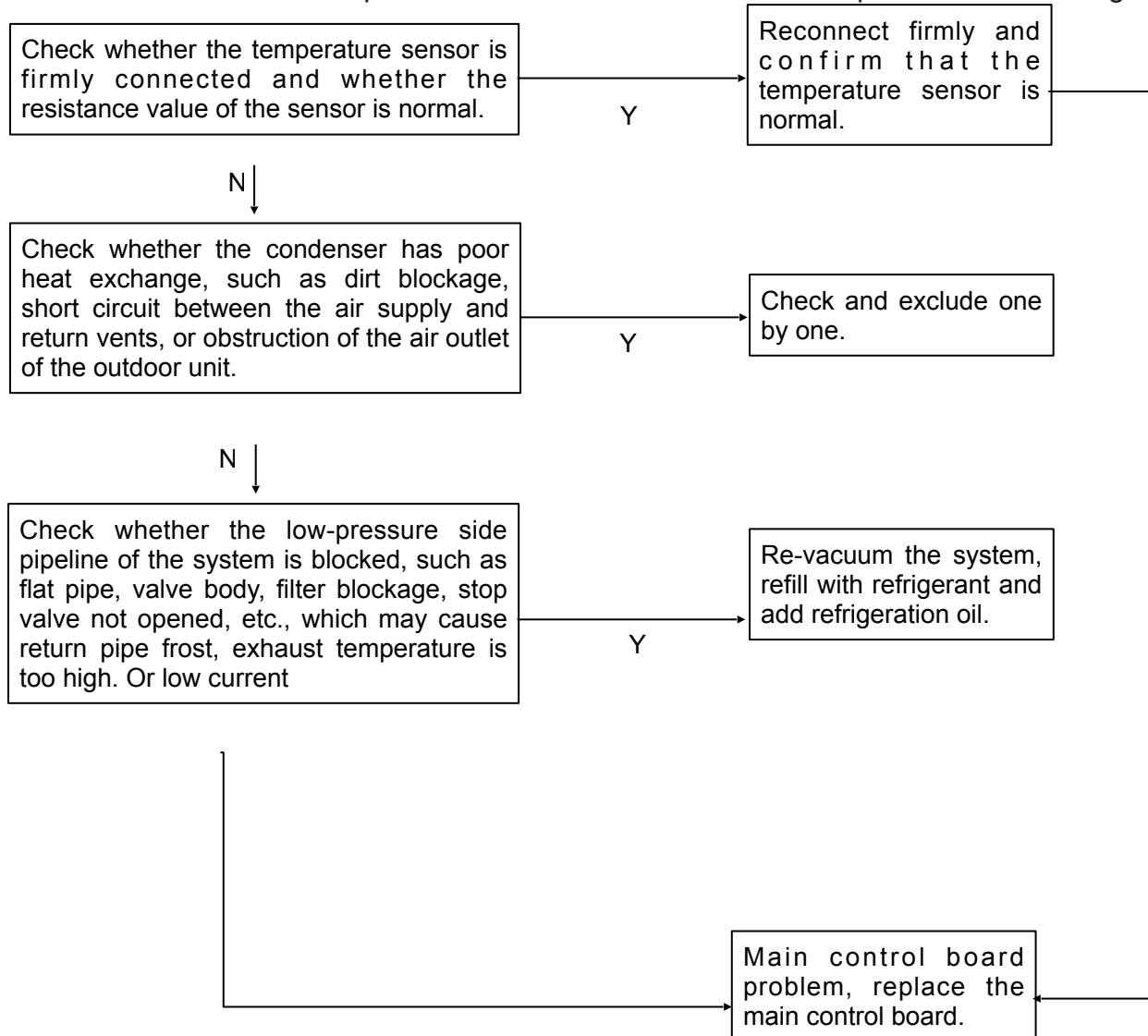
- Check if the power supply is normal, with a phase voltage of 208-230V, and confirm that the power supply is functioning properly.



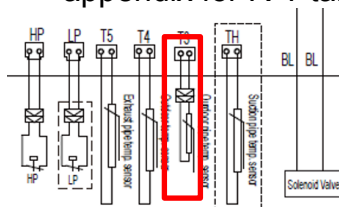
- After the power is turned off, use your hand to shake the wind wheel to see if there is any obvious resistance to the rotation of the wind wheel. If you find that the wind wheel does not rotate smoothly when you turn it by hand, replace the motor, otherwise proceed to the next step.
- Measure whether 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) $T_3 > 60^{\circ}\text{C}$

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



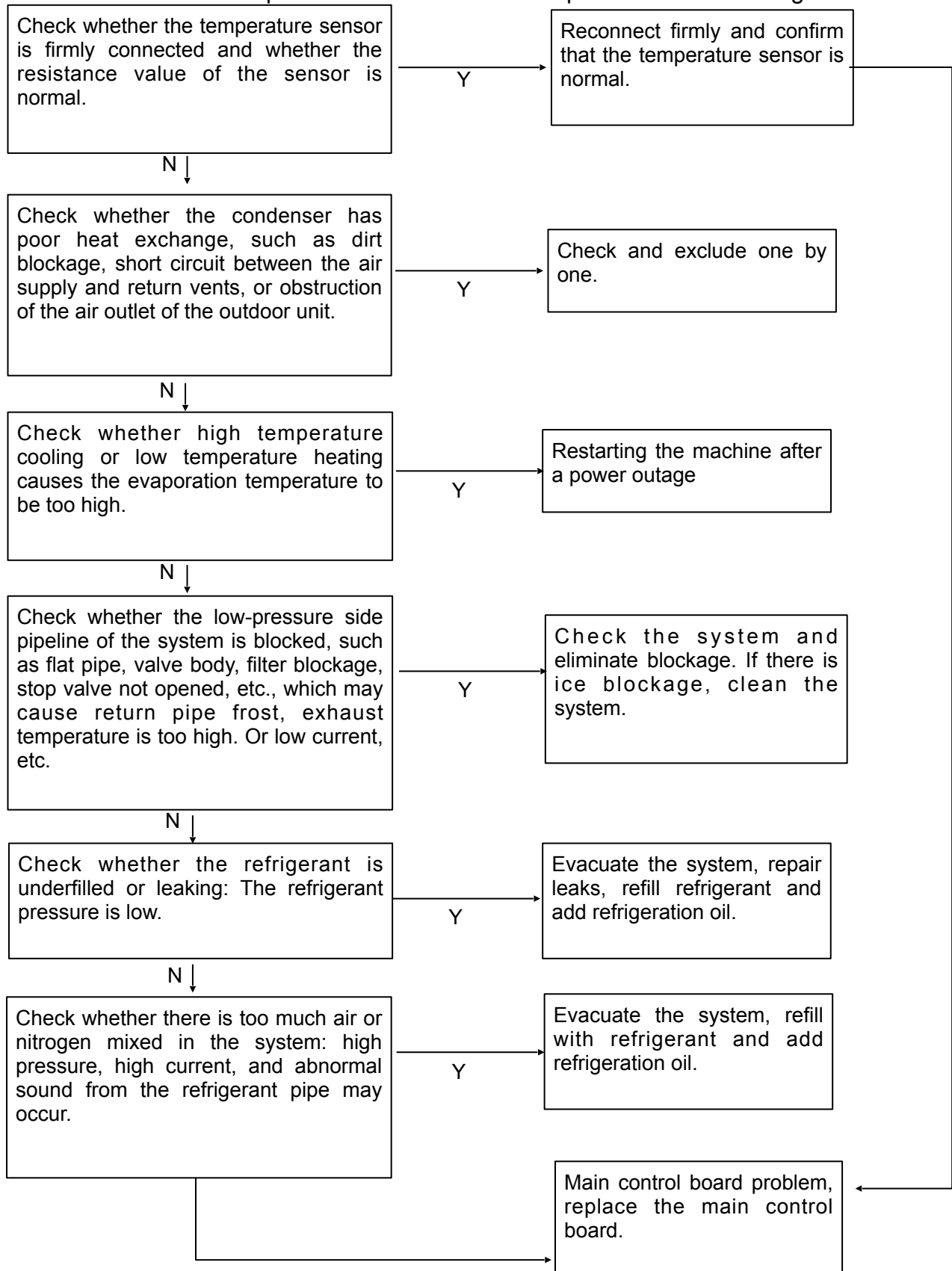
- Check if the heat dissipation of the condenser is normal, ensuring that there are no dirty blockages, short circuits in the air supply and return ports, etc.
- Measure the resistance of the temperature sensor and check whether it drifts by comparing it with the resistance table. If it drifts, replace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

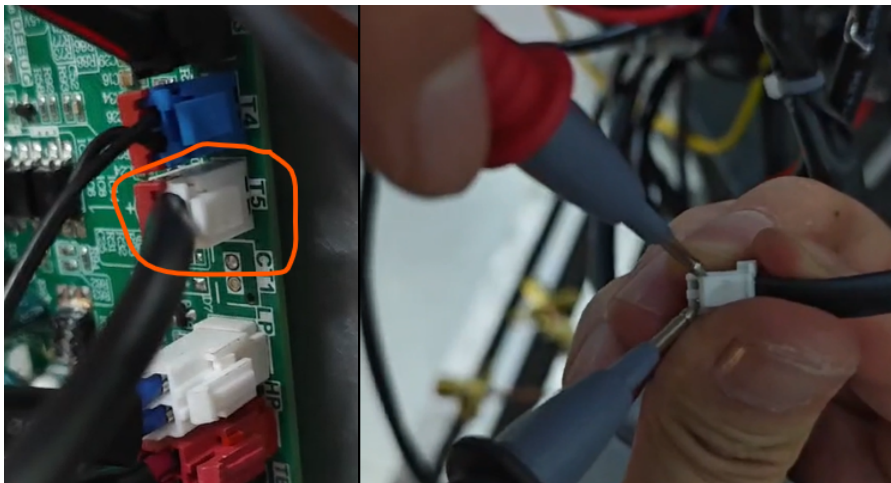
9.4.10 Exhaust temperature too high protection **>120°C**

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



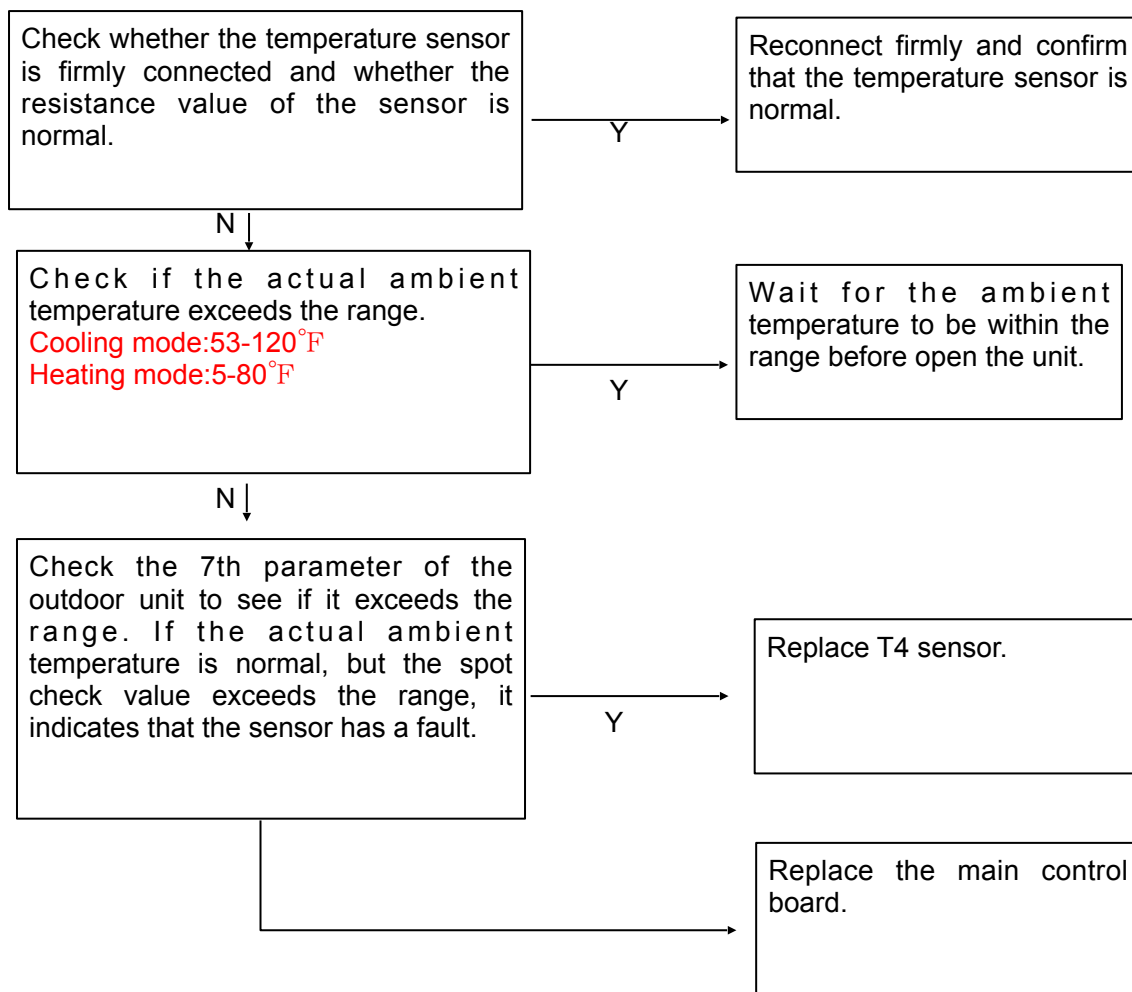
- Connect a pressure gauge to measure whether the return gas pressure is too low (normally 0.7-0.9MPa). If the pressure is too low, add refrigerant.

- 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 Overtemperature protection

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



Part 4 Function introduction

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1. Electrical Components Description

Temperature Sensor

- T1: IDU Ambient Temperature
 - capacity demand control (R485 mode)
 - Defrost control (heating mode)

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

Reversing valve operation

- Reversing valve energizes during heat mode and de-energizes in cool

Compressor Crankcase Heater Description

- Refrigerant migration during the OFF cycle can result in noisy start-ups, therefore a Crankcase Heater (CCH) is used to minimize refrigerant migration thereby minimizing start-up noise and/or bearing “wash out”. All CCHs must be installed around the lower half of the compressor shell. Its purpose is to warm the compressor during the OFF cycle, driving refrigerant from compressor. After extended shutdown periods in cold weather, it is recommended to allow CCH to be energized for at least 12 hours prior to compressor operation by applying line voltage to heat pump with thermostat OFF. CCH operation energizes:

2. Anti-Cold Air & Heating Fan Delay Function

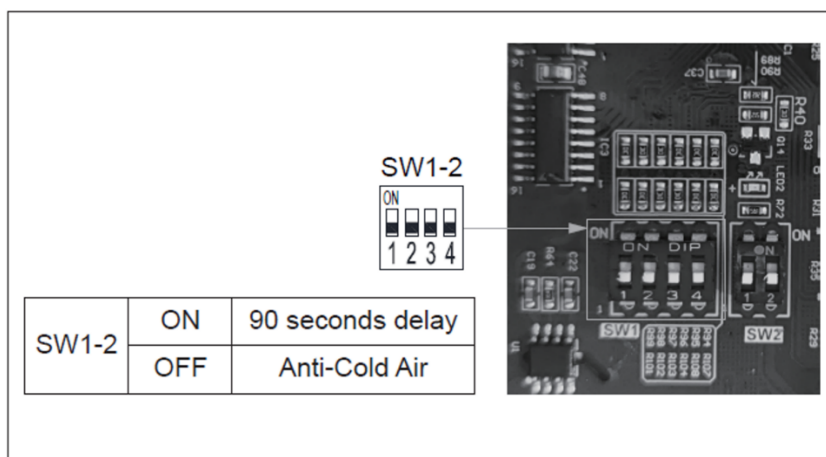
Anti-Cold Air Function (Only effective in heating mode)

When SW1-2 is in the OFF position and running heating mode, the fan will not start when the coil temperature (T2) $< 82.4^{\circ}\text{F}$.

When $T2 \geq 82.4^{\circ}\text{F}$, the fan will start immediately, or when the electric heat kit is manually turned on, the fan will also start immediately

Heating Fan Delay Function

When the dip switch SW1-2 is set to “ON” and the indoor unit is in heating mode, the fan will operate with 90 seconds delay each time it starts. Fan speed determined by the Y1/Y2 signal from thermostat.



3. 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 superheat.

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

A. $T_2 < 32^{\circ}\text{F}$ Duration exceeding 1 minute.

B. $T_2 \leq 26.6^{\circ}\text{F}$ Duration exceeding 30 seconds.

when $T_2 \geq 42.8^{\circ}\text{F}$, the Anti-Freezing Function will deactivate:

4. 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 superheat.

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
$T_4 \leq 8^{\circ}\text{C}$	-1	-4	0
$8^{\circ}\text{C} < T_4 \leq 16^{\circ}\text{C}$	-1	-4	$20 + 5 \cdot (T_4 - 12)$
$16^{\circ}\text{C} < T_4 \leq 35^{\circ}\text{C}$	$-1 + 0.15 \cdot (T_4 - 16)$	$-4 + 0.3 \cdot (T_4 - 16)$	40
$T_4 > 35^{\circ}\text{C}$	$2 + 0.2 \cdot (T_4 - 35)$	$2 + 0.1 \cdot (T_4 - 35)$	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).

5. R454B Leakage Detection Function

The function utilizes a R454B refrigerant sensor to detect the R454B concentration. Terminal F/L2 is reserved for connecting buzzer if needed.

When R454B leakage occur in the indoor coil and the concentration is above 10%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 mainboard is flash.

6. Defrost Description

According to the actual situation on site, the machine has multiple defrost modes to choose from:

Auto defrost:

the machine measures the ambient temperature and the temperature of the outdoor coil through sensors and calculates the condensation pressure and machine running time to determine whether to enter defrost mode. When the temperature of the coil exceeds the set value, the machine automatically exits defrosting mode.

Manual defrost mode:

Through SW2-1, it can manually force the machine to enter defrost mode.

Fixed time defrosting:

You can choose to activate the defrost function every 30 minutes or 60 minutes. When the temperature of the coil exceeds the set value, the machine automatically exits defrosting mode.

Defrosting choice	SW2-1	SW2-2	SW2-3	SW2-4
ON	Manual defrost mode	Fix timed defrost	Timer 30 min	Reserve
OFF	Auto Defrost (factory default)	Auto Defrost (factory default)	Timer 60 min (factory default)	Reserve
Remark	Defrosting: control mode selection	Cycle time selection	Only applicable to fix timed defrosting timer and the Minimum Runtime	Do not to adjust this dial

If SW2-2 is ON, the fixed defrost time is determined by SW2-3 dial selection

Part 5 Installation

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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 In general mode

Refrigerant Piping		Capacity (Btu/h)						
		18K	24K	30K	36K	42K	48K	60K
Liquid-Vapor	In.	3/8-3/4	3/8-3/4	3/8-3/4	3/8-3/4	3/8-7/8	3/8-7/8	3/8-7/8
Max. Refrigerant Line Length*	Ft.	100						
Max. Vertical Lift	Ft.	26						

Table 1.1.2 In high vertical mode

Refrigerant Piping		Capacity (Btu/h)						
		18K	24K	30K	36K	42K	48K	60K
Liquid-Vapor	In.	3/8-3/4	3/8-3/4	3/8-3/4	3/8-3/4	3/8-7/8	3/8-7/8	3/8-7/8
Max. Refrigerant Line Length*	Ft.	131					147	
Max. Vertical Lift	Ft.	60					60	

Table 1.1.3 Dip Switch Diagram

Dial switch	ON	OFF
SW1-4	High-vertical mode	General mode



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 100 feet.

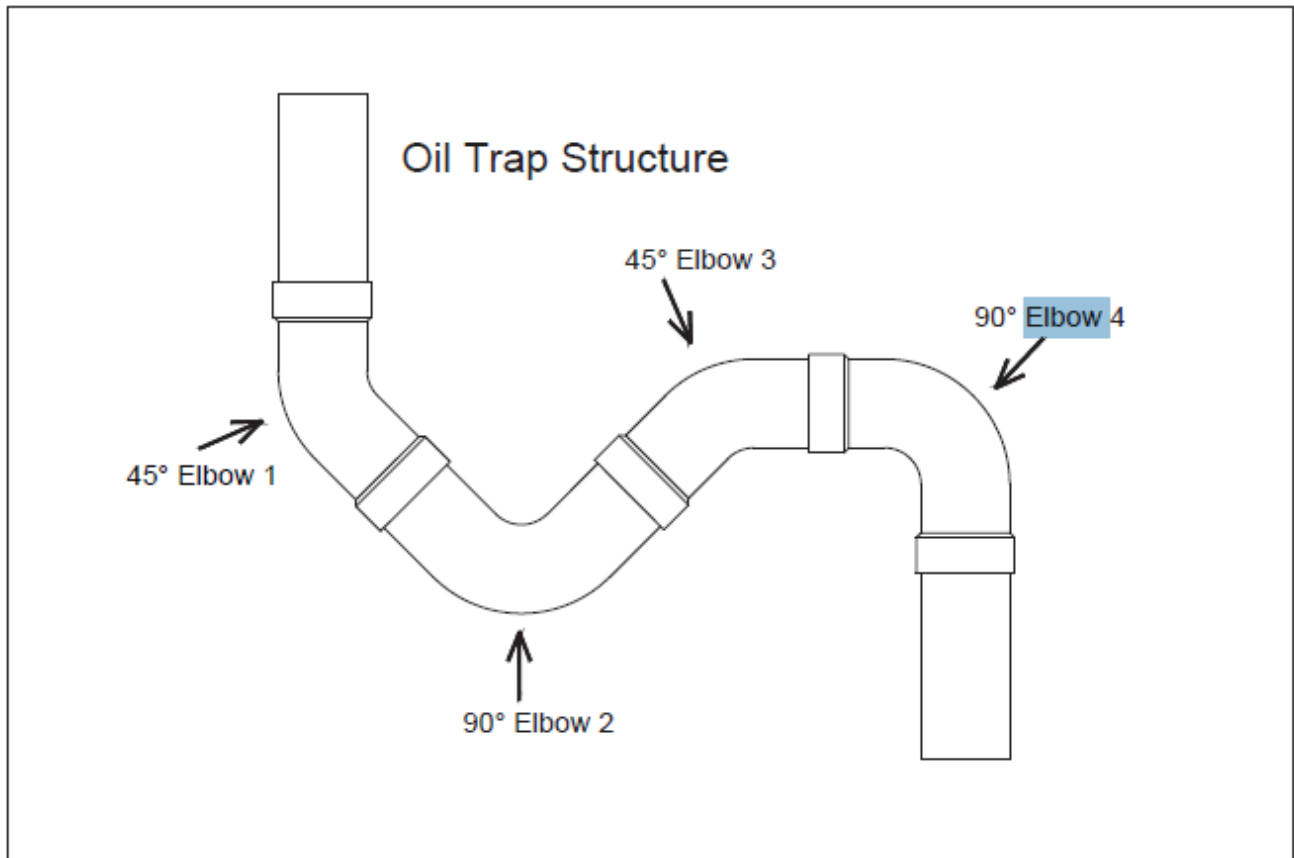
- If all long lines are in a horizontal state, no additional measures are required;
- If there is a vertical height difference in the long line, it needs to be installed according to the following requirements:

requirements:

- When the vertical height difference is $0 < h \leq 16.5$ feet, no additional measures are required;
- When the vertical height difference is $16.5 \text{ feet} < h \leq 33 \text{ feet}$, an oil return bend needs to be added in the middle of the height difference.
- When the vertical height difference is $33 \text{ feet} < h \leq 50 \text{ feet}$, two oil return bends need to be added at an equal distance in the height difference.

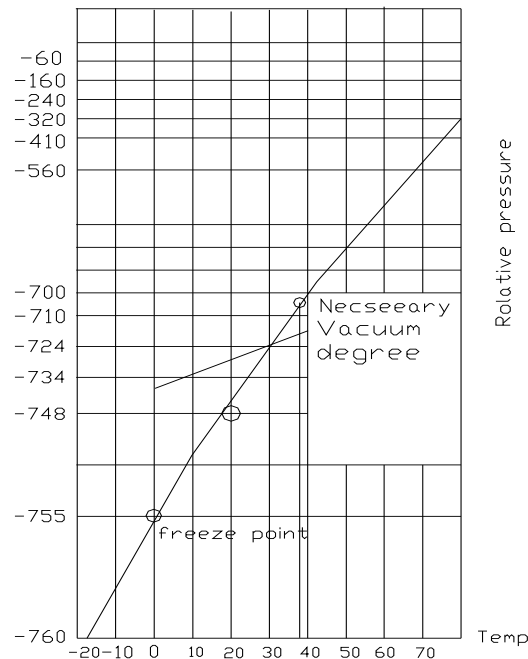
NOTE: The vertical height difference between the outdoor unit and the indoor unit cannot exceed 50 feet.

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)

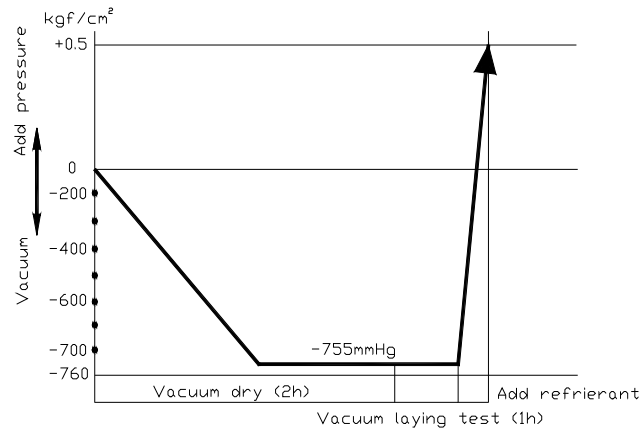
If the pump can't achieve below -755mmHg after pumping 2 hours, moisture or leakage point will still exist in the pipe. At this time, it should be pumped 1 hour more.

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.

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

Sketch map of common vacuum dry procedure.



② Special vacuum dry procedure

a. Vacuum dry for the first time 2h pumping

b. Fill nitrogen to 0.5Kgf/cm²

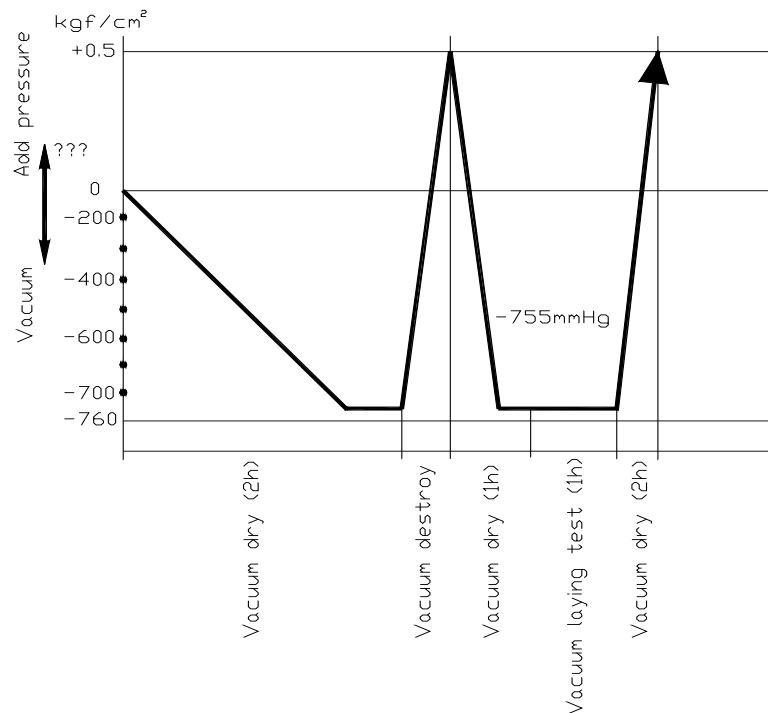
Because nitrogen is for drying gas, it has vacuum drying effect during vacuum destroy. But if the moisture is too much, this method can't dry thoroughly. So, please pay more attention to prevent water entering and forming condensation water.

c. Vacuum dry for the second time for 1h pumping

If -755mmHg can't be achieved in 2h, repeat procedure "b" and "c".

d. Vacuum placing test 1h

e. 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 25 feet of standard size interconnecting liquid line. Additional 0.54 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)
25 / (7.62)	0
75 / (22.86)	27.00/(0.76)
100 / (30.48)	40.50/(1.14)
131 / (39.93)	56.7/(1.62)
147 / (44.81)	65.88/(1.86)

superheat Method

Check the ambient temperature. superheat method (cooling mode) is only for outdoor temperature between 60°F and 110°F, and indoor temperature between 70°F and 90°F. For temperature out of the range, use the weighing method mentioned above.

1. Start "forced cooling" mode.

Press the "Check" (K4) button for about 5 seconds to enter Force cooling mode. The LED display will show "dC".

2. Wait until the system is basically stable.

Wait for twenty (20) minutes after "forced cooling" mode started. Compressor will maintain a specific frequency in "forced cooling" mode.

3. Calculate superheat value.

Calculate superheat value with measured vapor line temperature and pressure. If calculated superheat value is lower than the design superheat value of Table 4.1, refrigerant should be recovered. If calculated superheat value is higher than the value of Table 4.1, refrigerant should be added.

4. Adjust refrigerant.

Connect service tools to unit and adjust refrigerant according to analysis in step 3.

5. Wait for stabilization of system.

Wait for 5 minutes and repeat steps 3 through 5 until superheat value matches the design superheat value mentioned in step 3.

6. Recover normal mode.

Remove service tools and short press "Check" (K4) " button to quit "forced cooling" mode. Symbol "dC" should disappear when "forced cooling" mode quitted.

Suction Temp (°F)	Superheat Value (°F)								
	6	8	10	12	14	16	18	20	22
	Suction Gauge Pressure (PSI)								
40	95	91	87	84	80	77	74	70	67
42	99	95	91	87	84	80	77	74	70
44	103	99	95	91	87	84	80	77	74
46	107	103	99	95	91	87	84	80	77
48	111	107	103	99	95	91	87	84	80
50	116	111	107	103	99	95	91	87	84
52	120	116	111	107	103	99	95	91	87
54	125	120	116	111	107	103	99	95	91
56	129	125	120	116	111	107	103	99	95
58	134	129	125	120	116	111	107	103	99
60	139	134	129	125	120	116	111	107	103
62	144	139	134	129	125	120	116	111	107
64	149	144	139	134	129	125	120	116	111
66	155	149	144	139	134	129	125	120	116
68	160	155	149	144	139	134	129	125	120
70	166	160	155	149	144	139	134	129	125
72	171	166	160	155	149	144	139	134	129

Table 4.1

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

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℃ in the high-pressure side, no less than 120℃ 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℃)

Cooling only type----Polyethylene foam (withstand above 100℃)

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

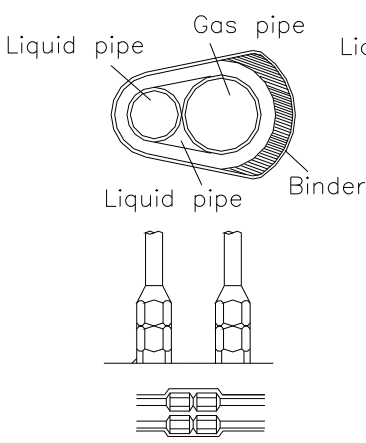
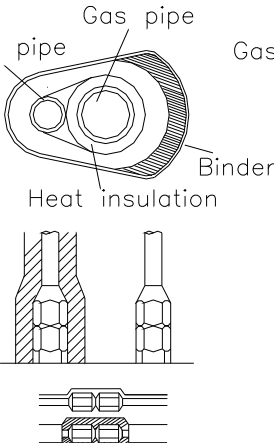
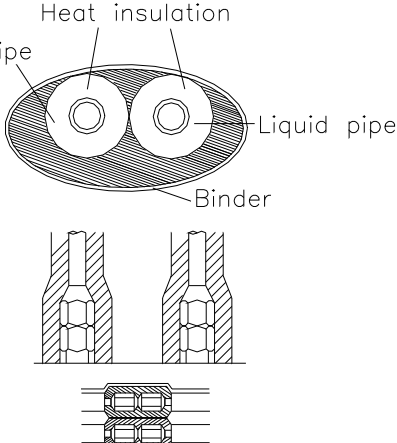
5.2 Refrigerant pipe insulation

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

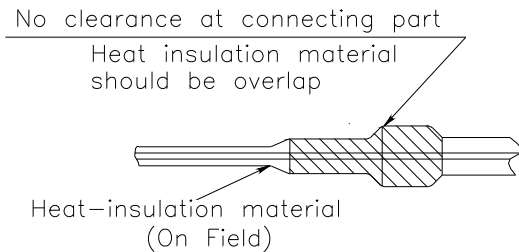
wrong	right	
Gas pipe and liquid pipe should not be put together to insulate	Insulate the gas pipe (cooling only)	Insulate the gas pipe and liquid pipe
		

For construction convenience, before laying pipes, use insulation material to insulate the pipes to be deal 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 valves 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				