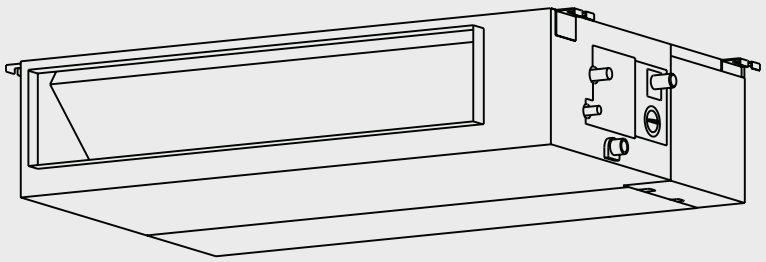
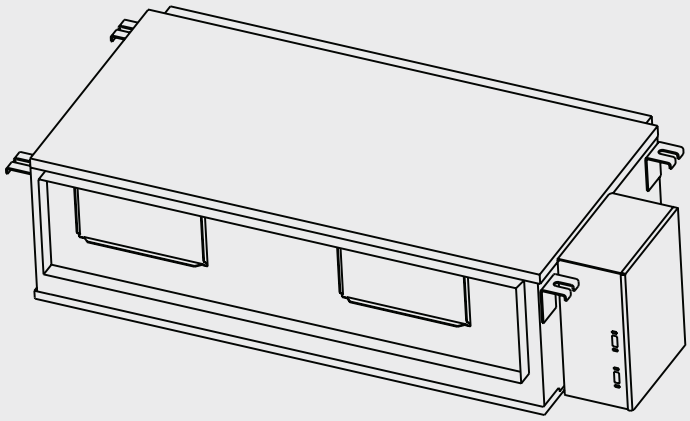
BOSCH

Service Manual

Ducted Type (Medium & High Static) Air Conditioner/Heat Pump

Climate 5000 Series - Gen 4





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Unitary Small HP
AHRI Standard 210/240
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Table of Contents

1 Key to Symbols and Safety Instructions

1.1 Key to Symbols

Warnings

WARNING

Warnings in this document are identified by a warning triangle printed against a grey background.
Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.
In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimizing danger are not taken.

The following keywords are defined and can be used in this document:

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

Important information

The info symbol indicates important information where there is no risk to people or property.

1.2 Explanation of Symbols Displayed on the Unit

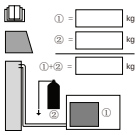
Symbol	
	WARNING This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	WARNING This symbol shows that appliance shall be installed, operated and stored in a room with a floor area not less than the minimum room area.
	CAUTION This symbol shows that the operation manual should be read carefully.
	CAUTION This symbol shows that a service personnel should be handling this equipment with reference to the installation manual.
	CAUTION This symbol shows that information is available such as the operating manual or installation manual.
	CAUTION This symbol shows that when addition of charge is required by the manufacturer installation instructions for completing the REFRIGERATING SYSTEM. Recorded the resulting total REFRIGERANT CHARGE for each REFRIGERATING SYSTEM.

Table 1

1.3 Safety

Please read safety precautions before installation

WARNING

Electrical hazard!

- Do not modify the length of the power supply cord or use an extension cord to power the unit.
- Do not share the electrical outlet with other appliances. Improper or insufficient power supply can cause fire or electrical shock.

WARNING

Installation requirements

- Installation must be performed by a licensed contractor, and per the instructions in the installation manual. Improper installation can cause water leakage, electrical shock, or fire.
- In North America, installation must be performed in accordance with the requirement of NEC (National Electric Code) and CEC (Canadian Electric Code) by licensed and qualified personnel only.
- Only contact a licensed contractor for repair or maintenance of this unit.
- Only use the included accessories, parts, and specified parts for installation. Using non-standard parts can cause water leakage, electrical shock, fire, and can cause the unit to fail.
- Install the unit in a solid location that can support the unit's weight. If the chosen location cannot support the unit's weight, or the installation is not done properly, the unit may drop and cause serious injury and/or damage.

WARNING

This product can expose you to chemicals including Lead and Lead components, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

WARNING

Electrical hazard!

- For all electrical work, follow all local and national wiring standards, regulations, and the Installation Manual. The power supply to the outdoor unit requires a service disconnect at the unit. Only use a dedicated circuit. Never share a power source connected to this system. Insufficient electrical capacity or defects in electrical work can cause electrical shock or fire.
- For all electrical work, use the specified cables. Connect cables tightly, and clamp them securely to prevent external forces from damaging the terminal. Improper electrical connections can overheat and cause fire, and may also cause shock.
- All wiring must be properly arranged to ensure that the control board cover can close properly. If the control board cover is not closed properly, it can lead to corrosion and cause the connection points on the terminal to heat up, catch fire, or cause electrical shock.
- In certain functional environments, such as kitchens, server rooms, etc., the use of specially designed air-conditioning units is highly recommended.
- If the power supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons such as a licensed electrician in order to avoid a hazard.
- The product must be properly grounded at the time of installation, or electrical shock may occur.

CAUTION

Burn hazard!

- For units that have an auxiliary electric heater, do not install the unit within 1 meter (3 feet) of any combustible materials.
- Do not install the unit in a location that may be exposed to combustible gas leaks. If combustible gas accumulates around the unit, it may cause fire.
- Do not operate your air conditioner in a wet room such as a bathroom or laundry room. Too much exposure to water can cause electrical components to short circuit.

NOTICE

Property damage!

Install condensate drainage piping according to the instructions in this manual. Improper condensate drainage may cause water damage to your home and property.

CAUTION

Contains refrigerant!

- This air-conditioning unit contains fluorinated gases. For specific information on the type of gas and the amount, please refer to the relevant label on the outdoor unit itself.
- Installation, service, maintenance and repair of this unit must be performed by a certified technician.
- Product removal and recycling must be performed by a certified technician.
- If the system has a leak-detection system installed, it must be checked for leaks at least every 12 months.
- When the unit is checked for leaks, proper record-keeping of all checks is strongly recommended.

2 Part Names and Model Numbers

2.1 Model Numbers

Voltage	Indoor Type	Capacity	Indoor Units	Regular Outdoor Units	Max Performance Outdoor Units	Light Commercial Outdoor Units
208-230V	Ducted	9k	BMS500-AAU009-1AHDXD	BMS500-AAS009-1CSXRD	BMS500-AAS009-1CSXHD	
		12k	BMS500-AAU012-1AHDXD	BMS500-AAS012-1CSXRD	BMS500-AAS012-1CSXHD	
		18k	BMS500-AAU018-1AHDXD	BMS500-AAS018-1CSXRD	BMS500-AAS018-1CSXHD	
		24k	BMS500-AAU024-1AHDXD	BMS500-AAS024-1CSXRD	BMS500-AAS024-1CSXHD	
		36k	BMS500-AAU036-1AHDXD	BMS500-AAS036-1CSXRD		BMS500-AAS036-1CSXLD
		48k	BMS500-AAU048-1AHDXD	BMS500-AAS048-1CSXRD		BMS500-AAS048-1CSXLD
		60k	BMS500-AAU060-1AHDXD			BMS500-AAS060-1CSXLD

Table 2

3 Dimensions & Clearances

3.1 Ducted Indoor Unit

3.1.1 Low Static Pressure (9K, 12K & 18K)

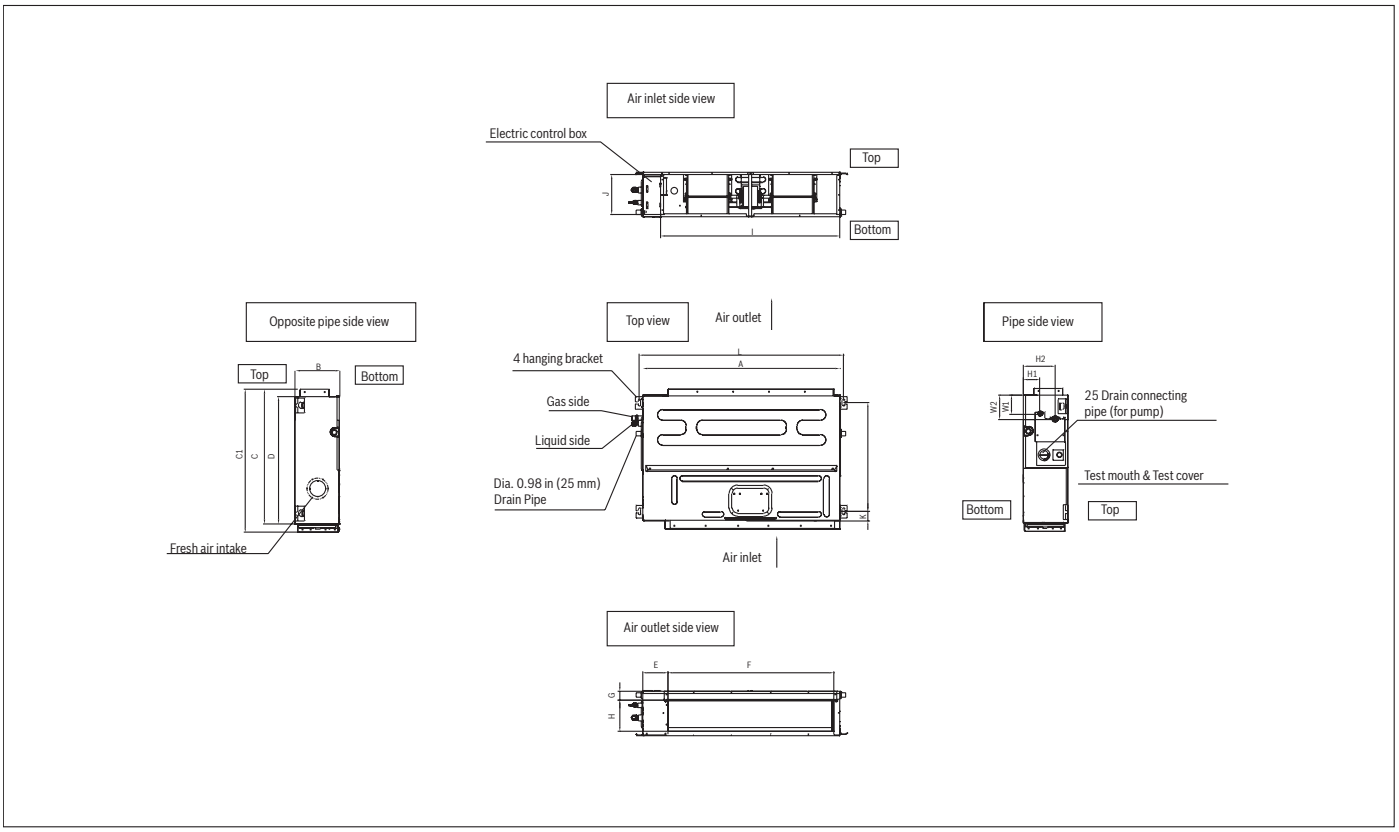


Figure 1

Model	Unit	Outline Dimension				Air Outlet Side Dimension				Air Inlet Side Dimension			Suspension Position		Refrigerant Pipe Location			
		A	B	C	D	E	F	G	H	I	J	K	L	M	H1	H2	W1	W2
9K / 12K	mm	700	200	506	450	137	537	30	152	599	186	50	741	360	84	140	84	84
	in	27.6	7.9	19.9	17.7	5.4	21.1	1.2	6.0	23.6	7.3	2.0	29.2	14.2	3.3	5.5	3.3	3.3
18K	mm	880	210	674	600	140	706	50	136	782	190	40	920	508	78	148	88	112
	in	34.7	8.3	26.5	23.6	5.5	27.8	2.0	5.4	30.8	7.5	1.6	36.2	20.0	3.1	5.8	3.5	4.4

Table 3

3.1.2 High Static Pressure (60K)

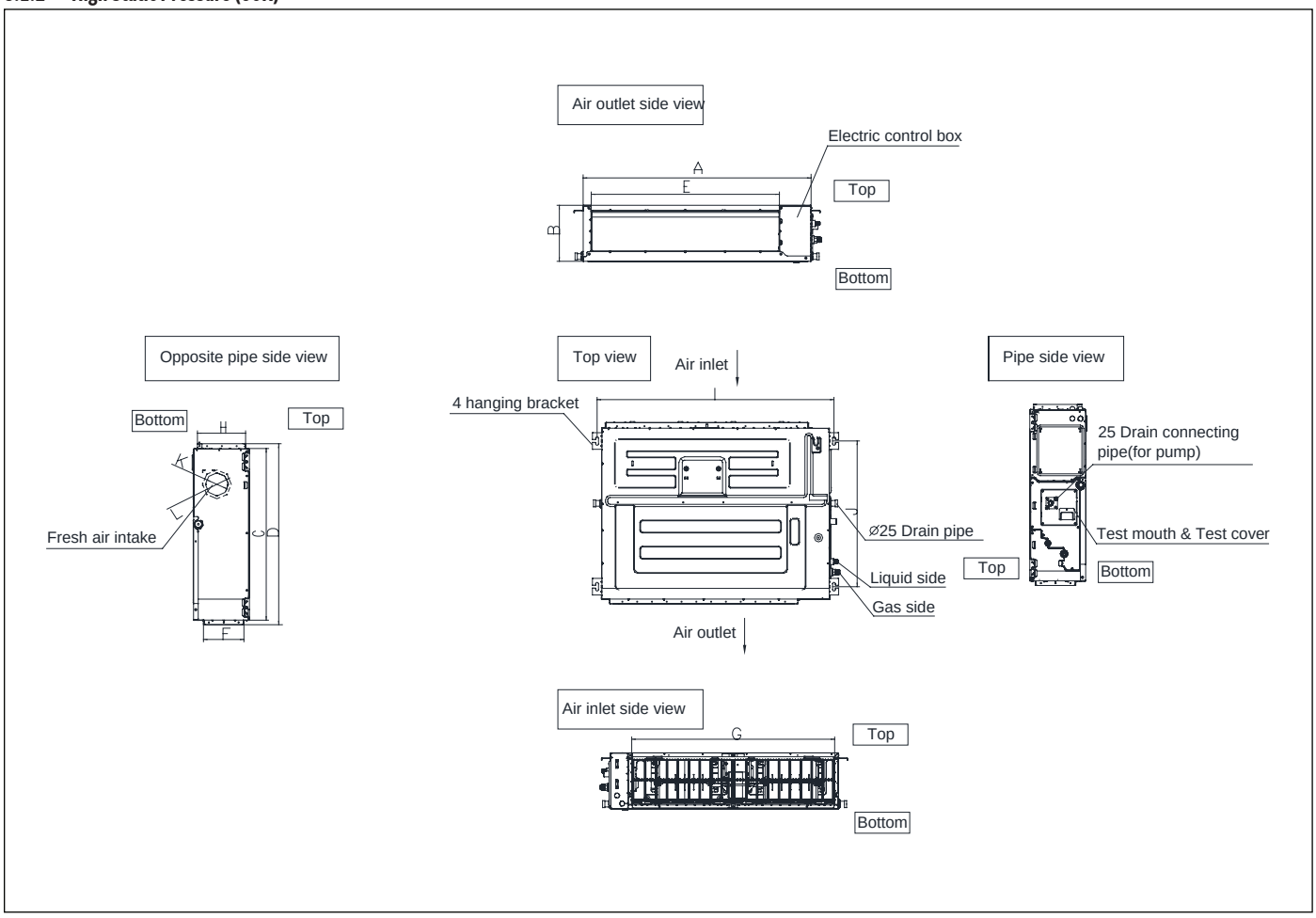


Figure 2

Model	Unit	Outline Dimension				Air Outlet Opening Size		Air Return Opening Size		Size of Mounted Lug		Fresh Air Intake Opening Size	
		A	B	C	D	E	F	G	H	I	J	K	L
24k	mm	1000	245	750	795	827	178	892	212	1040	640	100	126
	in	27.6	9.6	29.5	31.3	32.6	7.0	35.1	8.3	40.9	25.2	3.9	5.0
36k / 48k	mm	1200	300	750	795	1027	233	1092	267	1240	640	125	160
	in	47.2	11.8	29.5	31.3	40.4	9.2	43.0	10.5	48.8	25.2	4.9	6.3
60k	mm	1400	380	800	845	1223	320	1272	330	1440	668	125	160
	in	55.1	14.9	31.5	33.3	48.1	12.6	50.1	13.0	56.7	26.3	4.9	6.3

Table 4

Number	Name	Description
1	Gas pipe connection	19 Dia.
2	Liquid pipe connection	9.5 Dia.
3	Drain pipe connection	OD 25 Dia. ID 20 Dia.
4	Drain pump	—
5	Power supply connection	—
6	Air discharge flange	—

Table 5

3.2 Outdoor Unit

The following is a list of different outdoor unit sizes and the distance between their mounting feet. Prepare the installation base of the unit according to the dimensions below.

NOTICE

Product damage!

Never mount this unit directly on the ground. It must be anchored according to the guidance provided in these instructions, and/or local building codes.

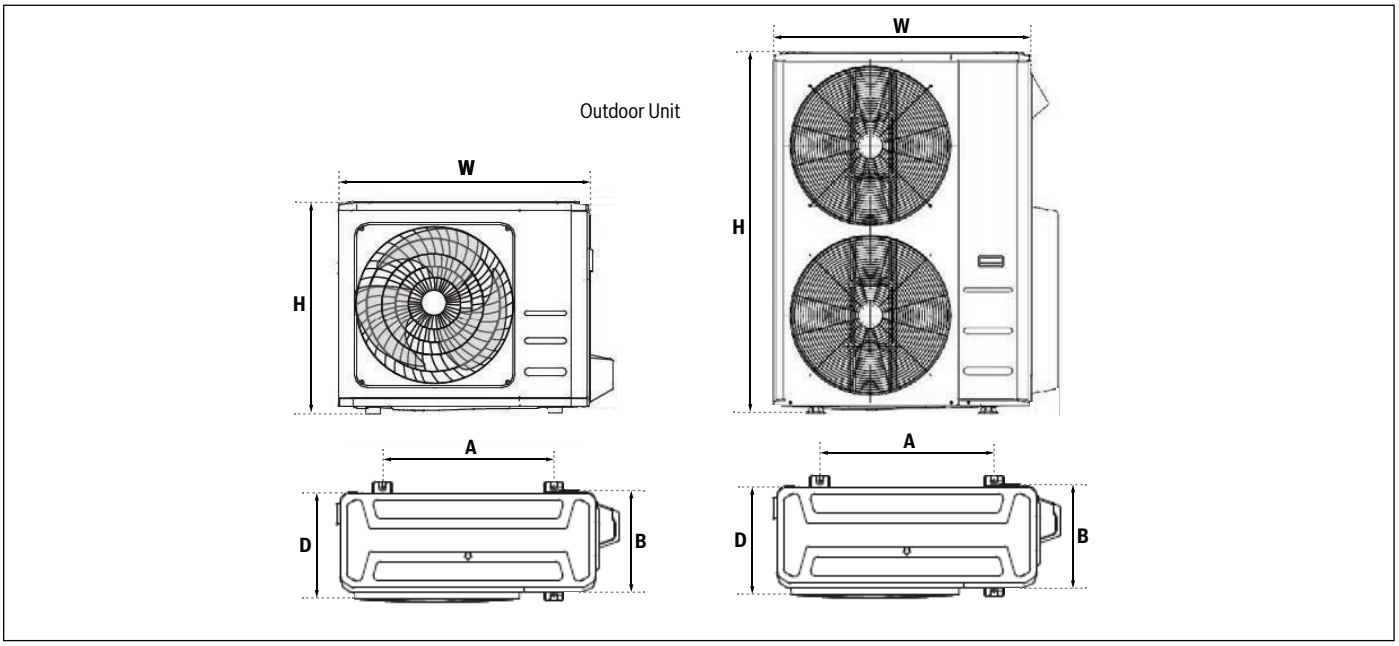


Figure 3

Outdoor Model	Outdoor Unit Dimensions mm (in)	Mounting Dimensions	
	W x H x D	Distance A mm (in)	Distance B mm (in)
BMS500-AAS012-0CSXRD, BMS500-AAS009-1CSXRD, BMS500-AAS012-1CSXRD	765x555x303 (30.1"x 21.8"x 11.9")	454 (17.8")	286(11.3")
BMS500-AAS009-1CSXHD, BMS500-AAS012-1CSXHD	805x554x330 (31.7"x 21.8"x 13.0")	511 (20.1")	317(12.5")
BMS500-AAS018-1CSXRD, BMS500-AAS018-1CSXHD, BMS500-AAM018-1CSXRD	890x673x342 (35.0"x 26.5"x 13.5")	663 (26.1")	348 (13.7")
BMS500-AAS030-1CSXRD, BMS500-AAS036-1CSXLD, BMS500-AAS036-1CSXRD, BMS500-AAS024-1CSXRD, BMS500-AAS024-1CSXHD, BMS500-AAM027-1CSXRD, BMS500-AAM036-1CSXRD, BMS500-AAM018-1CSXHD BMS500-AAM027-1CSXHD	946x810x410 (37.2"x 31.9"x 16.1")	673 (26.5")	403 (15.9")
BMS500-AAS060-1CSXLD, BMS500-AAS048-1CSXLD, BMS500-AAM048-1CSXRD, BMS500-AAM036-1CSXHD, BMS500-AAM048-1CSXHD	952x1333x415 (37.5"x 52.5"x 16.34")	634 (25.0")	404 (15.9")

Table 6

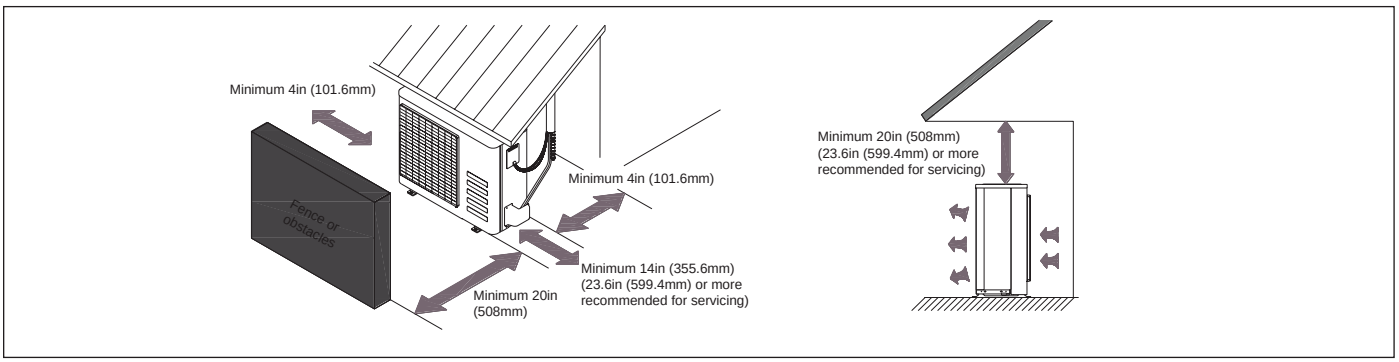


Figure 4

4 Refrigerant Cycle Diagrams

4.1 115V 12K System, Regular 9K, 12K Systems, Max Performance 9K, 12K Systems

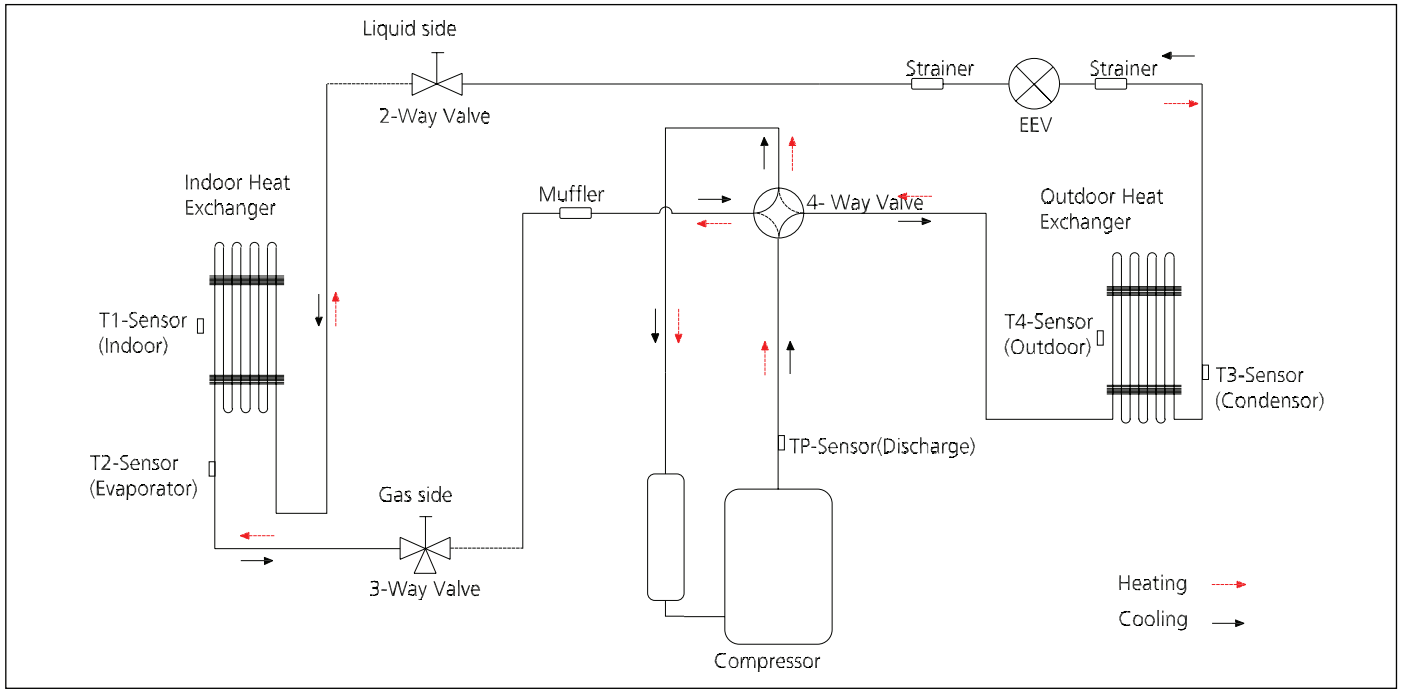


Figure 5

4.2 Regular and Max Performance 18K Systems

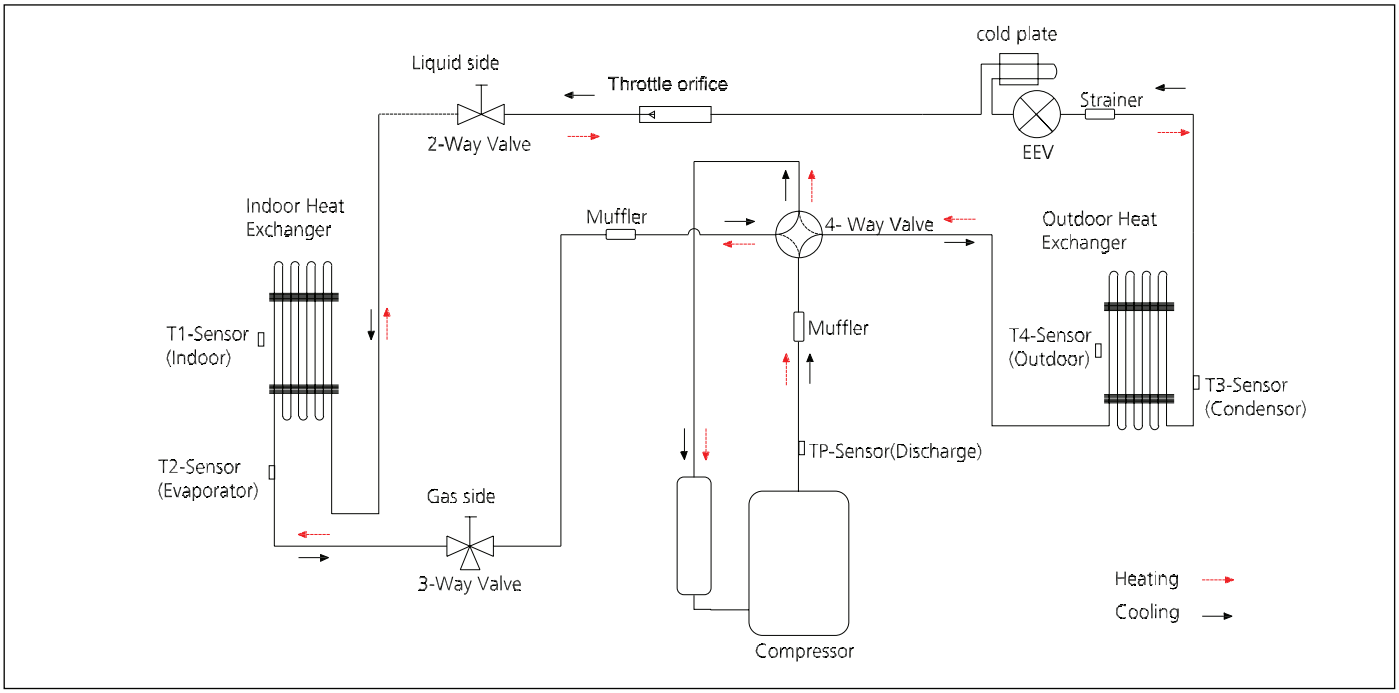


Figure 6

For Max Performance 9K, 12K, 18K System, there is no Accumulator.

4.3 Regular 24K, 30K Systems, Max Performance 24K System

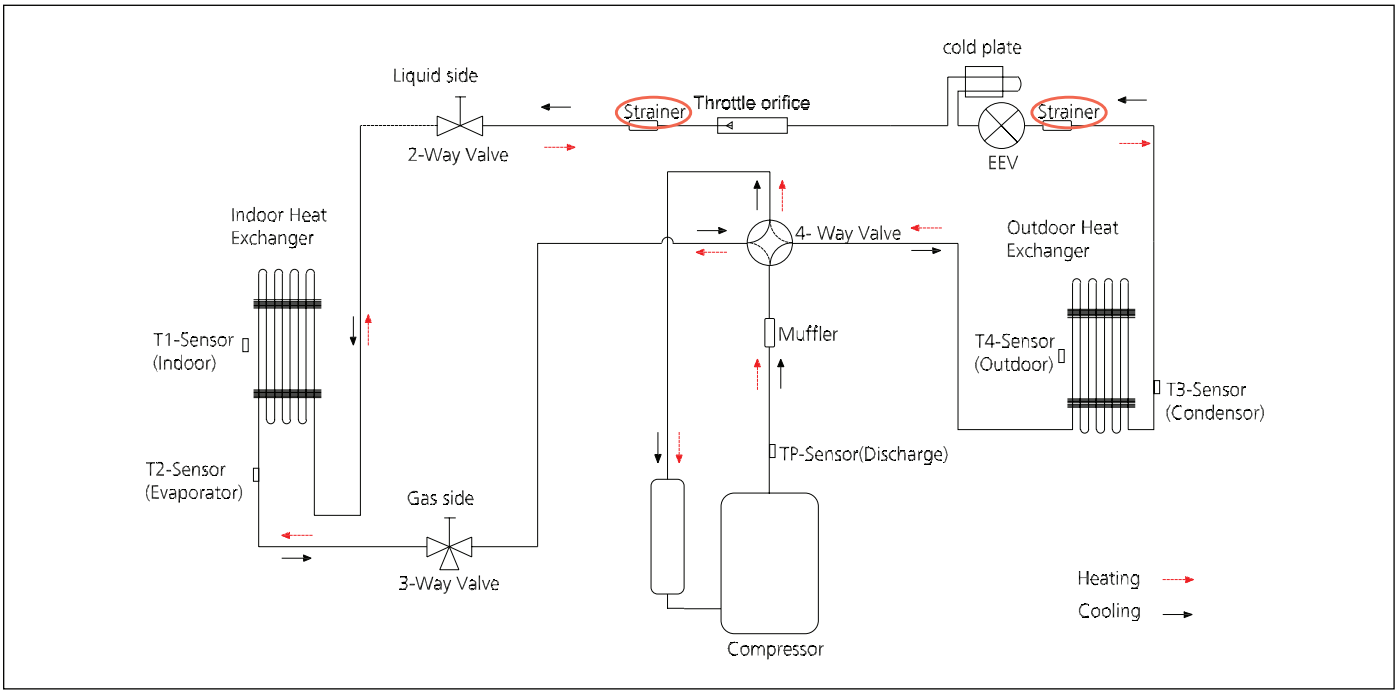


Figure 7

4.4 Regular 36K System

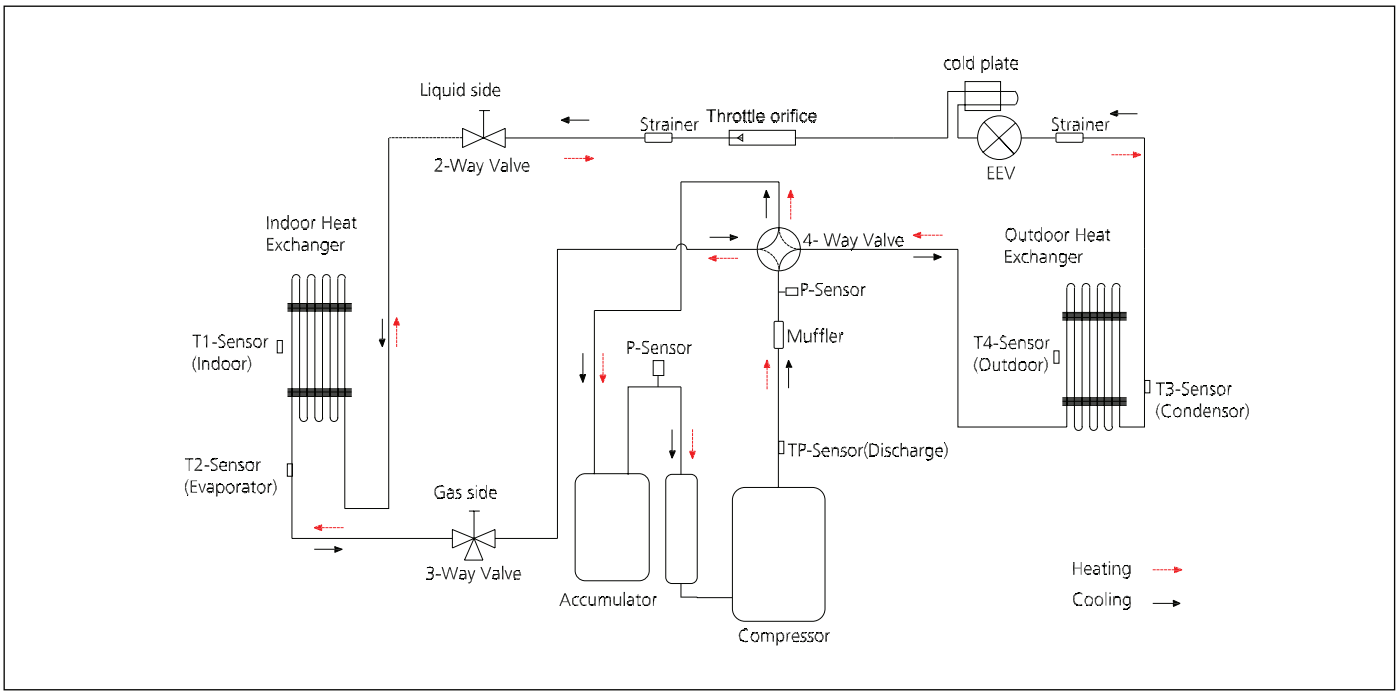


Figure 8

4.5 Light Commercial 36K, 48K, 60K Systems

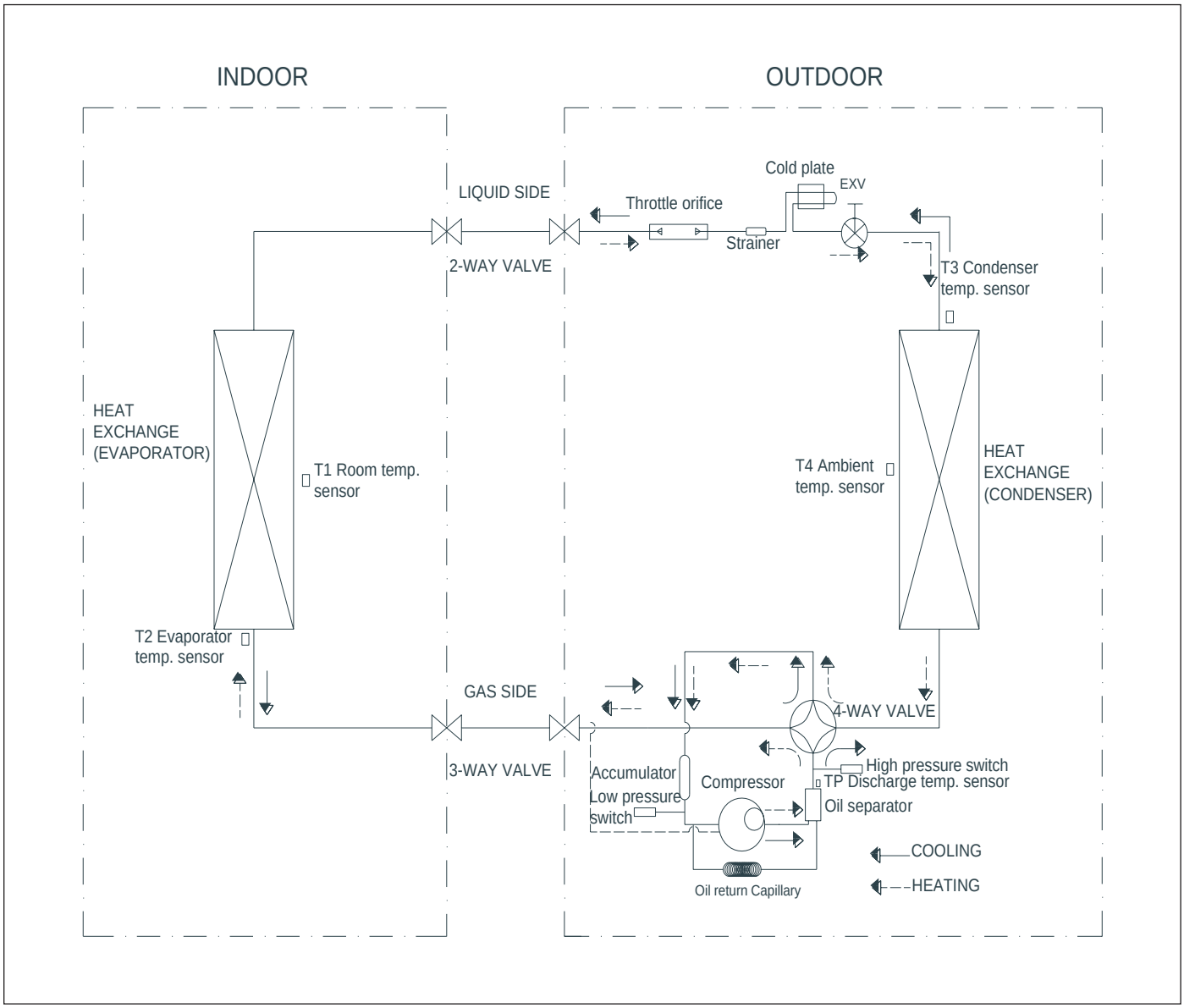


Figure 9

5 Installation Details

5.1 Torque Requirements

Pipe Diameter inch (mm)	Torque lb•ft (N•m)
1/4 (6.35)	13.3~14.8 (18~20)
3/8 (9.52)	23.6~28.8 (32~39)
1/2 (12.7)	36.1~43.5 (49~59)
5/8 (15.9)	42.0~52.4 (57~71)
3/4 (19)	49.4~74.5 (67~101)
7/8 (22)	62.7~81.1 (85~110)

Table 7

5.2 Connecting the Cables

The power cord should be selected according to the following specifications sheet.

- Cable type: SOOW type

Appliance Amps	AWG Wire Size
10	18
13	16
18	14
25	12
30	10

Table 8

The cable size and the current of the fuse or switch are determined by the maximum current indicated on the nameplate which is located on the side panel of the unit. Please refer to the nameplate before selecting the cable, fuse and switch. Recommended: A means of disconnecting the power, should be within 10 feet of the outdoor unit.

5.3 Pipe Length and Elevation

Capacity	Pipe size	
	Liquid Side Diameter (in / mm)	Gas Side Diameter (in / mm)
9K	1/4" / 6.35 Dia.	3/8" / 9.52 Dia.
12K		
18K	1/4" / 6.35 Dia.	1/2" / 12.7 Dia.
24K	3/8" / 9.52 Dia.	5/8" / 15.9 Dia.
36K	3/8" / 9.52 Dia.	3/4" / 19 Dia.
48K		
60K		

Table 9

Capacity	Precharged length (ft / m)	Max Pipe Length (ft / m)	Max difference in height (ft / m)	Additional charge for each ft (oz)
9K	25 / 7.6	82/25	49.2 / 15	0.16
12K				
18K		98 / 30	65.6 / 20	
24K		164 / 50	82 / 25	0.32
36K		246/ 75	98.4/ 30	
48K				
60K				

Table 10

5.4 First Time Installation

5.4.1 Air Purging with Vacuum Pump

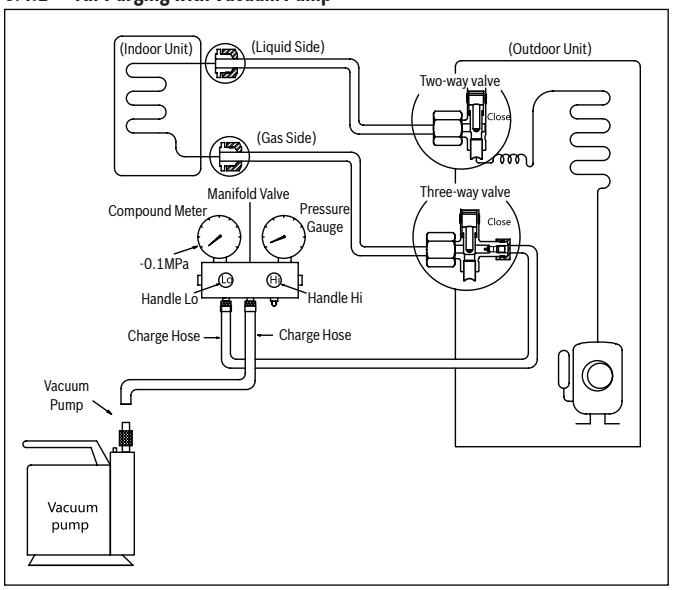


Figure 10

1. Tighten the flare nuts of the indoor and outdoor units, and confirm that both the 2- and 3-way valves are closed.
2. Connect the charge hose with the push pin of Handle Low to the gas service port of the 3-way valve.
3. Connect another charge hose to the vacuum pump.
4. Fully open the Handle Low manifold valve.
5. Evacuate until the micron gauge reads no higher than 350 microns, then close the valve to the vacuum pump.

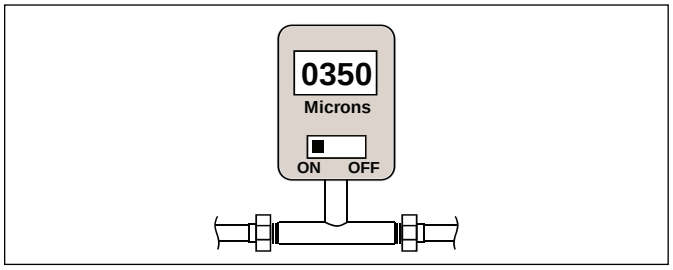


Figure 11

6. Observe the micron gauge. Evacuation is complete if the micron gauge does not rise above 500 microns in one (1) minute.

   Once evacuation is complete, turn off the vacuum pump and micron gauge, and close the valves on the manifold gauge set.

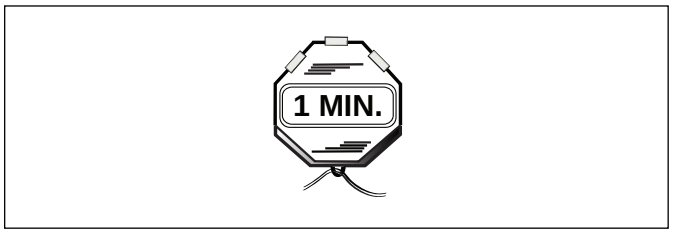


Figure 12

7. Fully open the 2- and 3-way valves and tighten the cap of the 2- and 3-way valves.

Gas leak check (Use soap bubble method): Apply soapy water or a liquid neutral detergent on the indoor unit connections or outdoor unit connections by a soft brush to check for leakage of the connecting points of the piping. If bubbles come out, the pipes are leaking.

5.5 Adding the Refrigerant to an Existing System

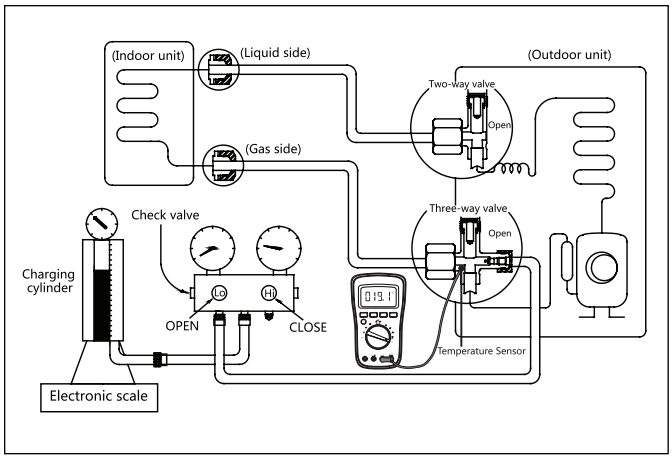


Figure 13

Procedure

1. Close both 2- and 3-way valves.
2. Slightly connect the Handle Lo charge hose to the 3-way service port.
3. Connect the charge hose to the valve at the bottom of the cylinder.
4. If the refrigerant is R410A/R32, invert the cylinder to ensure a complete liquid charge.
5. Open the valve at the bottom of the cylinder for 5 seconds to purge the air in the charge hose, then fully tighten the charge hose with push pin Handle Lo to the service port of 3-way valve.
6. Place the charging cylinder onto an electronic scale and record the starting weight.
7. Fully open the Handle Lo manifold valve, 2- and 3-way valves.
8. Operate the air conditioner in cooling mode to charge the system with liquid refrigerant.
9. When the electronic scale displays the correct weight (refer to the gauge and the pressure of the low side to confirm, the value of pressure refers to chapter **Appendix**), turn off the air conditioner, then disconnect the charge hose from the 3-way service port immediately.
10. Mount the caps of service port and 2- and 3-way valves.
11. Use a torque wrench to tighten the caps to a torque of 18 N.m.
12. Check for gas leakage.

5.6 Re-Installation While the Outdoor Unit Needs to be Repaired

Evacuation for the whole system

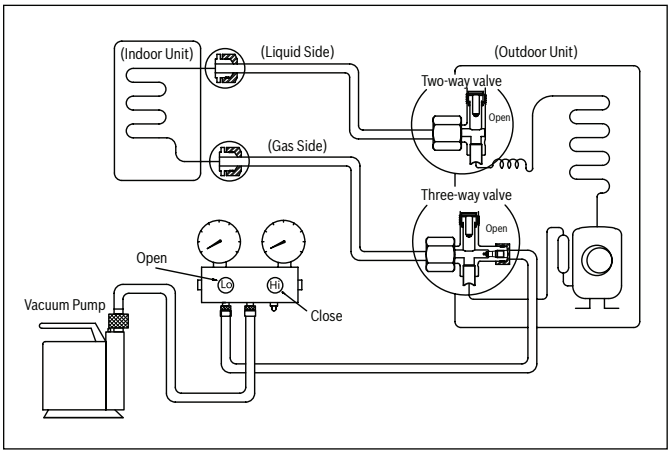


Figure 14

Procedure

1. Confirm that the 2- and 3-way valves are opened.
2. Connect the vacuum pump to the 3-way valve's service port.
3. Evacuate the system at 350 micron or for 1 minute, if it does not rise above 500 micron in 1 minute, it is leak free.
4. Close the valve (Low side) on the charge set and turn off the vacuum pump.
5. Disconnect the charge hose from the vacuum pump.
6. Mount the caps of service port and 2- and 3-way valves.
7. Use a torque wrench to tighten the caps to a torque of 18 N.m.

5.7 Operation Characteristics

			COOL operation	HEAT operation	DRY operation
Room Temperature			63ºF - 90ºF 17ºC - 32ºC	32ºF - 75ºF 0ºC - 24ºC	50ºF - 90ºF 10ºC - 32ºC
Outdoor Temperature	Regular	BMS500-AAS009-1CSXRD BMS500-AAS012-1CSXRD BMS500-AAS018-1CSXRD BMS500-AAS024-1CSXRD BMS500-AAS036-1CSXRD BMS500-AAS048-1CSXRD	-13ºF - 122ºF -25ºC - 50ºC	-13ºF - 75ºF -25ºC - 24ºC	32ºF - 122ºF 0ºC - 50ºC
	Max Performance	BMS500-AAS009-1CSXHD BMS500-AAS012-1CSXHD BMS500-AAS018-1CSXHD BMS500-AAS024-1CSXHD	-22ºF - 122ºF -30ºC - 50ºC	-22ºF - 75ºF -30ºC - 24ºC	32ºF - 122ºF 0ºC - 50ºC
	Light Commercial	BMS500-AAS036-1CSXLD BMS500-AAS048-1CSXLD BMS500-AAS060-1CSXLD	-13ºF - 122ºF -25ºC - 50ºC	-13ºF - 75ºF -215ºC - 24ºC	32ºF - 122ºF 0ºC - 50ºC

Table 11

Equation to convert Celsius to Fahrenheit

(°F) = 1.8 x (°C) + 32

NOTICE

- If the system is used beyond the above conditions, certain safety protection features may come into operation and cause the unit to operate abnormally.
- The room relative humidity should be less than 80%. If the system operates beyond this figure, the surface of the air conditioner may attract condensation. Please set the vertical air flow louver to its maximum angle (vertically to the floor), and set HIGH fan mode.
- The optimum performance will be achieved during this operating temperature zone.

6 Electronic Functions

6.1 Abbreviation

Abbreviation	Element
T1	Indoor room temperature
T2	Coil temperature of evaporator
T3	Coil temperature of condenser
T4	Outdoor ambient temperature
Tsc	Adjusted setting temperature
TP	Compressor discharge temperature
CDIFTEMP	Cooling shutdown temperature
HDIFTEMP2	Heating shutdown temperature
TCDI1	Enter defrost temperature
TCDE1	Exit defrost temperature1
TCDE2	Exit defrost temperature2 (maintain for a period of time)
TIMING_ DEFROST_TIME	Enter defrost time

Table 12

6.2 Display Function

6.2.1 Icon explanation on indoor display board.

6.2.1.1 Compact Cassette Units

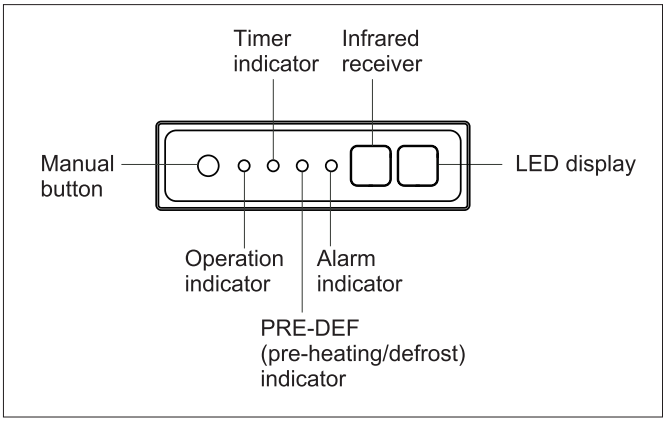


Figure 15

A guide on using the infrared remote is not included in this literature package. A separate user guide is available for the remote operations.

- Display may look different depending on IDU type.
- Display is not available with Compact Cassette (9K, 12K & 18k) indoor model.
- Ducted indoor model may have display; however, due to installation set up, it may not be visible.
- Please use Wired Wall Thermostat (optional accessory) to check system information easily.

6.3 Main Protection

6.3.1 Compressor three-minute delay at restart

Compressor functions are delayed for up to ten seconds upon the first startup of the unit, and are delayed for up to three minutes upon subsequent unit restarts.

6.3.2 Automatic shutoff based on discharge temperature

If the compressor discharge temperature exceeds a certain level for a period of time, the compressor ceases operation.

6.3.3 Inverter module protection

The inverter module has an automatic shutoff mechanism based on the unit's current, voltage, and temperature. If automatic shutoff is initiated, the corresponding error code is displayed on the indoor unit and the unit ceases operation.

6.3.4 Indoor fan delayed operation

- When the unit starts, the louver is automatically activated and the indoor fan will operate after a period of setting time or the louver is in place.
- If the unit is in heating mode, the indoor fan is regulated by the anti-cold wind function.

6.3.5 Compressor preheating

Preheating is automatically activated when T4 sensor is lower than setting temperature.

6.3.6 Sensor redundancy and automatic shutoff

- If one temperature sensor malfunctions, the air conditioner continues operation and displays the corresponding error code, allowing for emergency use.
- When more than one temperature sensor is malfunctioning, the air conditioner ceases operation.

6.4 Operation Modes and Functions

6.4.1 Fan mode

1. Outdoor fan and compressor stop.
2. Temperature setting function is disabled and indoor room temperature is displayed.
3. Indoor fan can be set to 1%~100%, or auto.
4. The louver operates same as in cooling mode.
5. Auto fan: In fan-only mode, AC operates the same as auto fan in cooling mode with the temperature set at 75.2 ℉.(Tsc =75.2℉) / 24℃.(Tsc =24℃)

6.4.2 Cooling mode

6.4.2.1 Compressor running rules

Reach the configured temperature:

1. When the compressor runs continuously for within 120 minutes.

- If the following conditions are satisfied, the compressor ceases operation.
- Calculated frequency(fb) is less than minimum limit frequency (FminC).
  - Compressor runs at FminC more than 10 minutes
  - T1 is lower than or equal to (Tsc-CDIFTEMP-0.5℃) / (Tsc-CDIFTEMP-0.5℃)

CDIFTEMP is EEPROM setting parameter. It is 35.6 ℉ /2℃ usually.

2. When the compressor runs continuously for more than 120 minutes.

- If the following conditions are satisfied, the compressor ceases operation.
  - Calculated frequency(fb) is less than minimum limit
  - Frequency(FminC)
  - Compressor runs at FminC more than 10 minutes.
  - T1 is lower than or equal to (Tsc-CDIFTEMP).

CDIFTEMP is EEPROM setting parameter. It is 35.6 ℉ /2℃ usually.

3. If one of the following conditions is satisfied, not judge protective time.

- Compressor running frequency(fr) is more than test frequency (TestFre).
- Compressor running frequency is equal to test frequency, T4 is more than 59℉ /15℃ or T4 fault.
- Change setting temperature.
- Turbo or sleep function on/off
- Various frequency limit shutdown occurs.

6.4.2.2 Outdoor fan running rules

The outdoor unit will run at different fan speeds according to T4 and compressor running frequency. For different outdoor units, the fan speeds are different.

6.4.2.3 Indoor fan running rules

1. In cooling mode, the indoor fan operates continuously. The fan speed can be set to 1%-100%, or auto.
2. Auto fan

For DC fan motor units:

- Descent curve
  - When T1-Tsc is lower than or equal to 38.3℉ /3.5℃, fan speed reduces to 80%;
  - When T1-Tsc is lower than or equal to 33.8℉ /1℃, fan speed reduces to 60%;
  - When T1-Tsc is lower than or equal to 32.9℉ / 0.5℃, fan speed reduces to 40%;
  - When T1-Tsc is low2er than or equal to 32℉ / 0℃, fan speed reduces to 20%;
  - When T1-Tsc is lower than or equal to 31.1℉ /-0.5℃, fan speed reduces to 1%.
- Rise curve
  - When T1-Tsc is higher than 32℉ / 0℃, fan speed increases to 20%;
  - When T1-Tsc is higher than 32.9℉ / 0.5℃, fan speed increases to 40%;
  - When T1-Tsc is higher than 33.8℉ / 1℃, fan speed increases to 60%;
  - When T1-Tsc is higher than 34.7℉ / 1.5℃, fan speed increases to 80%;
  - When T1-Tsc is higher than 39.2℉ /4℃, fan speed increases to 100%.

6.4.2.4 Condenser temperature protection

When the condenser temperature exceeds a configured value, the compressor ceases operation.

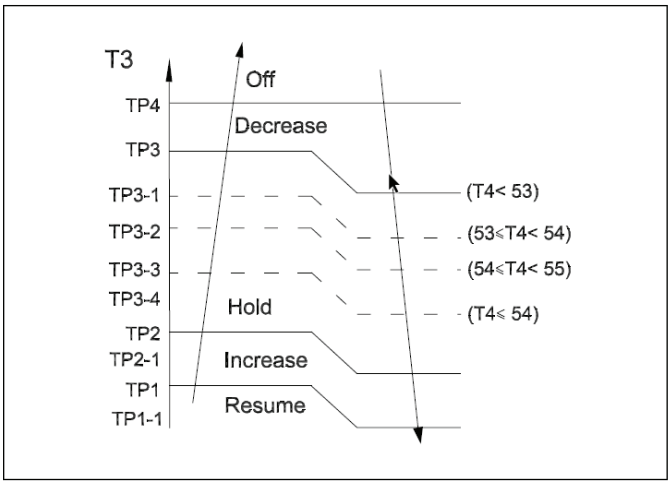


Figure 16

Legend:
TP1 = 129.2°F / 54°C
TP2 = 132.8°F / 56°C
TP3 = 140°F / 60°C
TP4 = 149°F / 65°C

6.4.2.5 Evaporator temperature protection

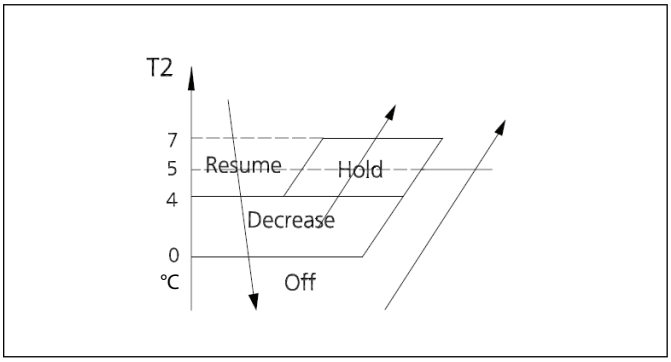


Figure 17

- Off: Compressor stops.
- Decrease: Decrease the running frequency to the lower level per 1 minute.
- Hold: Keep the current frequency.
- Resume: No limitation for frequency.

6.4.3 Heating mode

6.4.3.1 Compressor operation

1. Reach the configured temperature

- If the following conditions are satisfied, the compressor ceases operation.
  - Calculated frequency(fb) is less than minimum limit frequency(FminH).
  - Compressor runs at FminH more than 10 minutes.
  - T1 is higher than or equal to Tsc+ HDIFTEMP2.

HDIFTEMP2 is EEPROM setting parameter. It is 35.6 °F /2°C usually.

- If one of the following conditions is satisfied, not judge protective time.
  - Compressor running frequency(fr) is more than test frequency(TestFre)
  - When compressor running frequency is equal to test frequency, T4 is more than 59°F /15°C or T4 fault
  - Change setting temperature
  - Turbo or sleep function on/off

2. When the current is higher than the predefined safe value, surge protection is activated, causing the compressor to cease operations.

6.4.3.2 Outdoor fan operation

The outdoor unit will be run at different fan speed according to T4 and compressor running frequency.

For different outdoor units, the fan speeds are different.

6.4.3.3 Indoor fan operation

1. In heating mode, the indoor fan operates continuously. The fan speed can be set to 1%-100%, or mute. The anti-cold wind function has the priority.

- Anti-cold function : If the temperature difference of T2 changes during auto fan and causes the fan speed to change, run the current fan speed for 30 seconds first, the default interval is the interval before the fan speed changes, and then judge T2 according to the current interval after 30 seconds to get the final anti cold air interval.

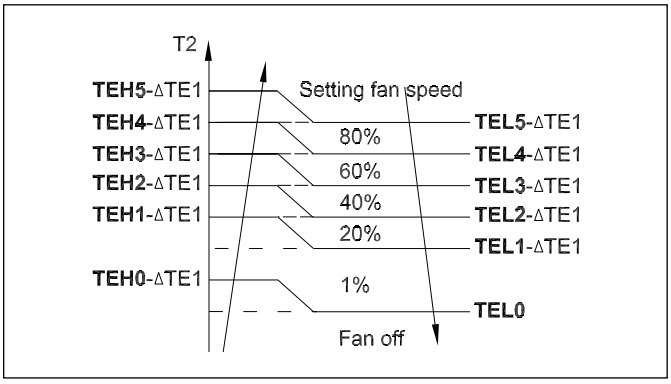


Figure 18

Legend:
TEH0= 77°F / 25°C, TEH1= 32°F / 89.6°C, TEH2= 91.4°F / 33°C,
TEH3= 93.2°F / 34°C, TEH4= 35°F / 95°C, TEH5= 96.8°F / 36°C

Indoor Room Temp. Condition	Indoor Fan Speed
T1 ≥ 66.2℉ (19℃)	ΔTE1=0
59℉ (15℃) ≤ T1 ≤ 66.2℉ (19℃)	ΔTE1=66.2℉ -T1 (19℃-T1)
T1< 59℉ (15℃)	ΔTE1= 39.2 ℉ (4℃)

Table 13

2. Auto fan

For DC fan motor units:

- Rise curve
  - When T1-Tsc is higher than 29.3℉/-1.5℃, fan speed reduces to 80%;
  - When T1-Tsc is higher than 32℉/0℃, fan speed reduces to 60%;
  - When T1-Tsc is higher than 32.9℉ /0.5℃, fan speed reduces to 40%;
  - When T1-Tsc is higher than 33.8℉/1℃, fan speed reduces to 20%.
- Descent curve
  - When T1-Tsc is lower than or equal to 32.9℉ /0.5℃, fan speed increases to 40%;
  - When T1-Tsc is lower than or equal to 32℉ /0℃, fan speed increases to 60%;
  - When T1-Tsc is lower than or equal to 29.3℉/-1.5℃, fan speed increases to 80%;
  - When T1-Tsc is lower than or equal to 26.6℉/-3℃, fan speed increases to 100%.

6.4.4 Defrost mode

System will enter the defrost mode according to the value of T3 ,T4 and also the compressor running time.

During the defrost mode, the compressor will run, indoor and outdoor motor will stop and defrost indicator lamp of the indoor unit will be lighted

"dF" will be displayed.

If any one of the following items is satisfied, the defrost cycle will finish and the system will turn to normal heating mode.

- T3 rises to be higher than TCDE 33.8℉ (1℃).
- T3 keeps to be higher than TCDE 35.6℉ (2℃) for 80 seconds.
- The machine has run for 15 minutes in defrosting mode.

If T4 is lower than or equal to -7.6℉ (-22℃) and compressor running time is more than TIMING_DEFROST_TIME, if any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:

- Unit runs for 10 minutes consecutively in defrosting mode.
- T3 rises above 50℉(10℃).

For some models:

- If any one of the following conditions is satisfied, the unit enters defrosting mode
  - If T3 or T4 is lower than 26.6℉ (-3℃) for 30 seconds,Ts-T1 is lower than 41℉ (5℃) and compressor running time is more than EE_TIME_DEFROST7.
  - If T3 or T4 is lower than 26.6℉ (-3℃) for 30 seconds and compressor running time is more than EE_TIME_DEFROST7+30.
- If any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - T3 rises above TCDE1+ 39.2℉ (4℃). (TCDE1= 53.6℉)/ (TCDE1=12℃).
  - T3 maintained above TCDE2+ 39.2℉(4℃) for 80 seconds. (TCDE2= 35.6 ℉) / (TCDE2=2℃)
  - Unit runs for 15 minutes consecutively in defrosting mode.

6.4.4.1 Evaporator coil temperature protection

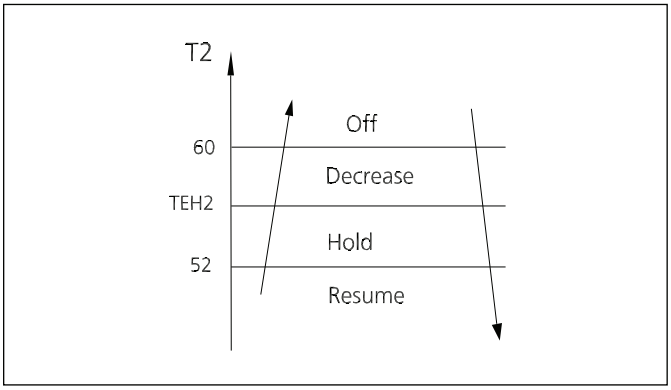


Figure 19

Off: Compressor stops.
Decrease: Decrease the running frequency to the lower level per 20 seconds.
Hold: Keep the current frequency.
Resume: No limitation for frequency.

6.4.5 Auto-mode

This mode can be chosen with the remote controller and the setting temperature can be changed between 61℉~86℉ (16℃~30℃)

In auto mode, the machine will choose cooling, heating or fan-only mode according to T1,Ts, T4 and relative humidity.

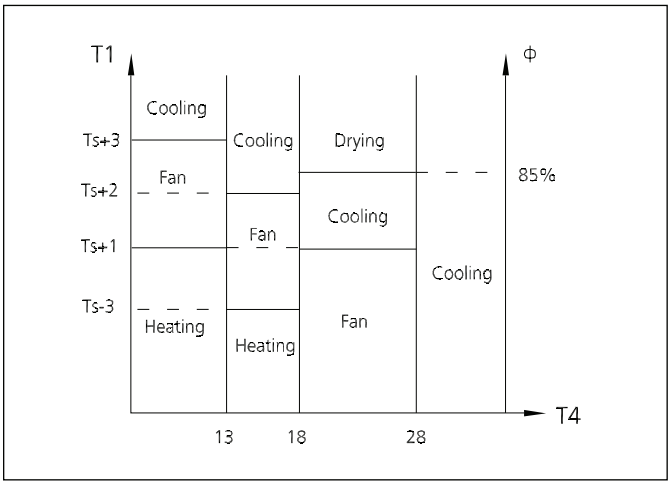


Figure 20

If the setting temperature is modified, the machine selects a new running function.

6.4.6 Dry mode

- In dry mode, AC operates the same as auto fan in cooling mode.
- All protections are activated and operate the same as they do that in cooling mode.
- Low Room Temperature Protection

If the room temperature is lower than 50℉ (10℃), the compressor ceases operations and does not resume until room temperature exceeds 53.6 ℉ (12℃).

6.4.7 Forced operation function

- **Forced cooling mode:** The compressor and outdoor fan continue to run(fixed at rated frequency), and the indoor fan runs at rated speed. After running for 30 minutes, the AC will switch to auto mode with a preset temperature of 75.2℉ (24℃).
- **Forced auto mode:** Forced auto mode operates the same as normal auto mode with a preset temperature of 75.2 ℉ (24℃).
  When AC receives signals, such as switch on, switch off, timer on, timer off, mode setting, temperature setting, fan speed setting, sleeping mode setting, follow me setting, it will quit the forced operation.
- **Forced defrosting mode:** Press AUTO/COOL button continuously for 5s under forced cooling mode to enter this mode. Indoor fan will stop, defrosting lamp will light on. Quit this mode and turn off the unit when: either quit normal defrosting, turn off by RC or Press AUTO/COOL button continuously for 5s again.

6.4.8 Timer function

- Timing range is 24 hours.
- Timer on. The machine will turn on automatically when reaching the setting time.
- Timer off. The machine will turn off automatically when reaching the setting time.
- Timer on/off. The machine will turn on automatically when reaching the setting “on” time, and then turn off automatically when reaching the setting “off” time.
- Timer off/on. The machine will turn off automatically when reaching the setting “off” time, and then turn on automatically when reaching the setting “on” time.
- The timer function will not change the system operation mode.
- The setting time is relative time.
- The system will quit the timer function when it has malfunction.

6.4.9 Sleep function

- The sleep function is available in cooling, heating or auto mode.
- Operation process in sleep mode is as follows:
- When cooling, the setting temperature rises 1.8°F (1°C) (be lower than 86°F (30°C)) every one hour, 2 hours later the setting temperature stops rising and the indoor fan is fixed at low speed.
- When heating, the setting temperature decreases 1.8°F (1°C) (be higher than 62.6°F (17°C)) every one hour, 2 hours later the setting temperature stops rising and indoor fan is fixed at low speed. (Anti-cold wind function has the priority).
- Operation time in sleep mode is 8 hours. After 8 hours, after which, the unit exits this mode.
- Timer setting is available

6.4.10 Auto-restart function

The indoor unit has an auto-restart module that allows the unit to restart automatically. The module automatically stores the current settings and, in the case of a sudden power failure, will restore those setting automatically within 3 minutes after power returns.

If there is a power failure while the unit is running, the compressor starts 3 minutes after the unit restarts. If the unit was already off before the power failure, the unit stands by.

6.4.11 Refrigerant leakage detection

The indoor unit will automatically display "EL0C" when it detects refrigerant leakage.

6.4.12 Louver position memory function

When turning on your unit, the louver will automatically resume its former angle.

6.4.13 46.4°F (8°C) heating

In heating mode, the temperature can be set to as low as 46.4°F (8°C), preventing the indoor area from freezing if unoccupied during severe cold weather.

6.4.14 Active Clean function (Optional)

The Active Clean Technology washes away dust, mold, and grease that may cause odors when it adheres to the heat exchanger by automatically freezing and then rapidly thawing the frost. The internal wind wheel then keeps operating to blow-dry the evaporator, thus preventing the growth of mold and keeping the inside clean.

When this function is turned on, the indoor unit display window appears “CL”, after 20 to 45 minutes, the unit will turn off automatically and cancel Active Clean function.

6.4.15 Follow me

- If you press “Follow Me” on the remote, the indoor unit will beep. This indicates the follow me function is active.
- Once active, the remote control will send a signal every 3 minutes, with no beeps. The unit automatically sets the temperature according to the measurements from the remote control.
- The unit will only change modes if the information from the remote control makes it necessary, not from the unit’s temperature setting.
- If the unit does not receive a signal for 7 minutes or you press “Follow Me,” the function turns off. The unit regulates temperature based on its own sensor and settings.

6.4.16 Silence operation (Optional) (Single Zone only)

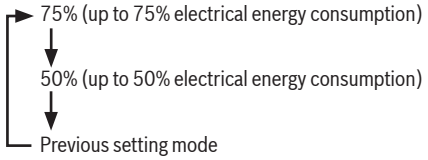
Press “Silence” on the remote control to enable the SILENCE function or keep pressing the FAN button for more than 2 seconds on the remote control. While this function is active, the indoor unit will run at faint breeze(1% fan speed), which reduces noise to the lowest possible level.

6.4.17 ECO intelligent (single zone only)

The system is controlled intelligently under Intelligent eye mode. It can detect the people’s activities in the room. In cooling/Heating/Auto mode, when you are away for 30 minutes, the unit will automatically lower the frequency to save energy. And the unit will automatically start and resume operation if sensing human activity again.

6.4.18 Electrical energy consumption control function (optional)

Press the “Gear” button on remote controller to enter the energy efficient mode in a sequence of following:



Turn off the unit or activate ECO, sleep, Super cool, 46.4°F (8°C) Heating, Silence or self clean function will quit this function.

This feature is available under cooling mode, fan-only mode and drying mode.

6.4.19 Point check function (engineering troubleshooting mode)

To enter engineer mode, in power-on or standby mode, and in non-locked state, press the key combination “ON/OFF + Air Speed POWER + FAN” for 7seconds until the remote controller screen shows "0".

After entering the engineer mode, the remote control will display icons of “Auto, Cool, Dry, Heat”, and the Battery icon; at the same time, it will also display the numeric code of the current engineer mode (for the initial engineer mode, the numeric code displayed is 0), and all other icons are inactive.

In engineer mode, the value of the current numeric code can be adjusted circularly through the Up/Down key, with the setting range of 0 to 30.

Code	Code	Query Content	Additional Notes
0		Error Code	Refer to error code list
1	T1	Room Temperature	T1 temperature
2	T2	Indoor coil temperature	T2 temperature
3	T3	Outdoor coil temperature	T3 temperature
4	T4	Ambient temperature	T4 temperature
5	TP	Discharge temperature	TP temperature
6	FT	Compressor Target Frequency	Targeted Frequency
7	Fr	Compressor Running Frequency	Actual Frequency
8	dL	Unit Current	N/A
9	Ac	Outdoor AC Voltage	N/A
10	Sn	Reserve	N/A
11	od	Indoor Operating Mode	0-OFF; 1-Cooling; 2-Heating; 3-Fan; 4-Drying; 5-Auto; 7-Defrosting; 12-Active Clean
12	Pr	Set Speed of the outdoor fan	Outdoor fan speed=value/8
13	Lr	Opening Lr of EEV	EXV opening angle-value/8
14	Ir	Actual Running Speed ir of the indoor fan	Indoor fan speed=value/8
15	Hu	Indoor Humidity Hu	%
16	TT	Set Temperature TT after compensation	N/A
17	nA	Reserve	N/A
18	nA	Reserve	N/A
19	Uo	Outdoor DC Bus voltage	N/A
20	oT	Indoor Target Frequency	Without limitation
21	nA	Reserve	
22	nA		
23	nA		
24	nA		
25	nA		
26	nA		
27	nA		
28	nA		
29	nA		
30	AP	Actual Static pressure	

Table 14

Exit of engineer mode:

1. In engineer mode, press the key combination of “On/Off + Air speed” for 2s;
2. The engineer mode will be exited if there are no valid key operations for continuous 60s.

The engineering mode will be exited if there is no valid input data for 60s.

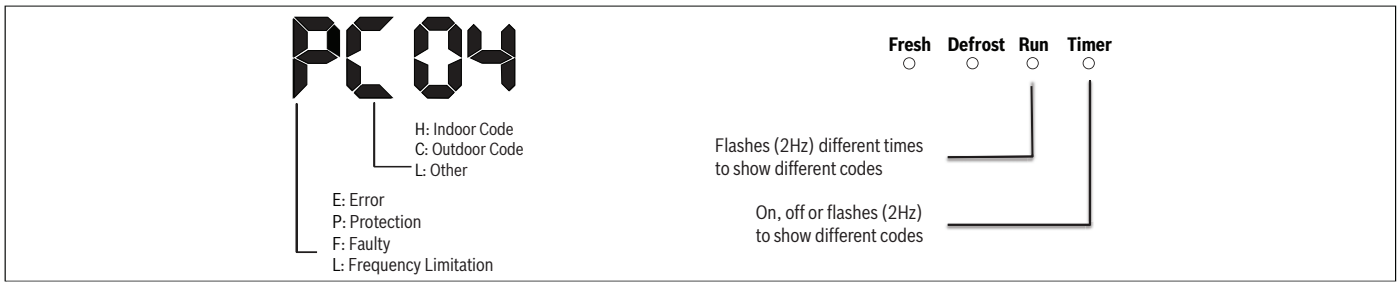


Figure 21

Error Codes of Engineering Mode

Display	Error Information
EH00	IDU EEPROM malfunction
EH0A	IDU EEPROM parameter error
EL01	IDU & ODU communication error
EH A	Communication error between indoor unit and external fan module
EH30	Parameters error of indoor external fan
EH35	Phase failure of indoor external fan
EH36	Indoor external fan current sampling bias fault
EH37	Indoor external fan zero speed failure
EH38	Indoor external fan stall failure
EH39	Out of step failure of indoor external fan
EH3A	Low voltage protection of indoor external fan DC bus
EH3b	Indoor external fan DC bus voltage is too high fault
EH3E	Indoor external fan overcurrent fault
EH3F	Indoor external fan module protection/hardware overcurrent protection
EH03	IDU fan speed out of control
EC51	ODU EEPROM parameter error
EC52	ODU coil temp. sensor(T3) error
EC53	ODU ambient temp. sensor(T4) error
EC54	COMP. discharge temp. sensor(TP) error
EC55	IGBT temperature sensor TH is in open circuit or short circuit
EC0d	Outdoor unit malfunction
EH60	IDU room temp. sensor (T1) error
EH61	IDU evaporator coil temp. sensor (T2) error
EC71	Outdoor external fan overcurrent fault
EC75	Outdoor external fan module protection/hardware overcurrent protection
EC72	Outdoor external fan phase failure
EC74	Outdoor external fan current sampling bias fault
EC73	Zero speed failure of outdoor unit DC fan
EC07	ODU fan speed out of control(
EHb5	Intelligent eye communication failure
EL0C	Refrigerant leak detected
EH0E	Water-level alarm malfunction
EH0F	Intelligent eye malfunction

Display	Error Information
FH07	Communication malfunction between indoor unit and auto-lifting panel
PC00	ODU IPM module protection
PC10	Over low voltage protection
PC11	Over voltage protection
PC12	DC voltage protection
PC02	Top temperature protection of compressor or High temperature protection of IPM module
PC40	Communication error between outdoor main chip and compressor driven chip
PC41	Current Input detection protection
PC42	Compressor start error
PC43	Lack of phase (3 phase) protection
PC44	Outdoor unit zero speed protection
PC45	341PWM error
PC46	Compressor speed malfunction
PC49	Compressor over current protection
PC06	Compressor discharge temperature protection
PC08	Outdoor current protection
PH09	Anti-cold air in heating mode
PC0F	PFC module malfunction
PC30	System overpressure protection
PC31	System pressure is too low protection
PC03	Pressure protection
PC0L	Outdoor low ambient temperature protection
PH90	Evaporator coil temperature over high protection
PH91	Evaporator coil temperature over low Protection
PC0A	Condenser high temperature protection
PH0C	Indoor unit humidity sensor failure
LH00	Frequency limit caused by T2
LH30	Indoor external fan current limit
LH31	Indoor external fan voltage limit
LC01	Frequency limit caused by T3
LC02	Frequency limit caused by TP
LC05	Frequency limit caused by voltage
LC03	Frequency limit caused by current
LC06	Frequency limit caused by PFC
LC30	Frequency limit caused by high pressure
LC31	Frequency limit caused by low pressure
LH07	Frequency limit caused by remote controller
----	IDUs mode conflict(match with multi outdoor unit)
nA	No malfunction and protection

Table 15

6.5 Advanced Function Setting

In order to enter to the engineering mode, and check the advanced function settings, Please make the following steps:

If you want to check the current functions set value (Presetting Page):

1. Firstly, you need to disconnect the power supply from the unit, and wait for 1 minute.
2. Then connect the power supply again to the unit (the unit should be under the standby state).
3. Press “Power” + “Fan” buttons together for 7s until the remote controller screen shows “0”, and also “Auto, Cool, Dry, Heat, Battery “icons will be displayed at the same time.
4. Press “Up” or “Down” button to choose different channel number that you want to check (from 0-30) on the remote controller.
5. Then Press “Power” button for 2s until the remote controller screen shows “CH”.
6. Press “OK” button to query the current function set value while the remote controller shows “CH”, and the function set value will be shown on the indoor unit display.

If you want to change the current functions set value:

1. Firstly, you need to disconnect the power supply from the unit, and wait for 1 minute.
2. Then connect the power supply again to the unit (the unit should be under the standby state).
3. Press “Power” + “Fan” buttons together for 7s until the remote controller screen shows “0”, and also “Auto, Cool, Dry, Heat, Battery “icons will be displayed at the same time.
4. Press “Up” or “Down” button to choose different channel number that you want to change (from 0-30) on the remote controller.
5. Then Press “Power” button for 2s until the remote controller screen shows “Ch”.
6. Press “Up” or “Down” button to choose the desired set value from the screen of the remote control.
7. Then Press “OK” to send the new set value to the indoor unit, and the indoor unit will display “CS”, which means that the new set value is uploaded successfully.
8. Finally, disconnect the power supply again from the unit, and wait for 10 minutes, then connect it again.

Please note that:

1. The Channel number indicates a certain function, and each number will be showed on the indoor unit screen indicates the current function set value (Check the below table).
2. In the engineering mode, the other keys or operations are invalid except for the following buttons “Power”, “Up”, “Down” , and “Ok”.
3. In order to set a new set value successfully, you need to finish the steps (from 2 to 7) within 1 minute only.
4. The engineering mode will be exited if there is no valid input data for 60s.
5. In order to exit from the engineering mode, Pleas follow the following steps:
    - Press “Power” button for 2s press until the remote controller screen shows “0”.
    - Then Press “Power” + “Fan” buttons together for 2s to quit the engineering mode and back to the home screen.

Channel	Function	Paramter Value Meaning	Remark
0	Capacity Setting (Btu/h)	1 - 100K	
1	Auto-Restart function	0 - Inactive 1 - Active	
2	Fan control when Ts reached	1 - Fan Stop 2 - Fan runs at lowest RPM 3 - Fan runs at setting RPM 4-11 - Fan stops for 4 mins and runs for 1 min	
3	Mode Lock	"CH - Cooling and Heating (All Modes) HH - Heating only (Heating + Fan only) CC - Cooling only (Cooling + Drying + Fan only) nU - Cooling and Heating without Auto"	Remote controller will change as well.
4	Lowest Setting temperature	16-24	Remote controller will change as well.
5	Highest Setting temperature	25-30	Remote controller will change as well.
6	Reserved		
7	Twins Selection	"0 - No twins 1 - Master Unit 2 - Secondary Unit"	
8	Static Pressure / Constant Air Volume	"0-8 - Static Pressure AF - Constant Air volume"	
9	/	Nothing to Set	
10	/	Nothing to Set	
11	Min. Frequency limitation in Cooling Mode	10, 11, 12, ..., 49, 50, -- (Cancel)	
12	Min. Frequency limitation in Heating Mode	10, 11, 12, ..., 49, 50, -- (Cancel)	
13	Max. Frequency selection in T4 limitation of Zone6	20, 21, 22, ..., 149, 150, --- (Cancel)	
14	/	Nothing to Set	
15	Frequency Selection of Outdoor forced operation	10, 11, 12, ..., 249, 250, --- (Cancel)	
16	One Button reset	rS - Reset	
17	nA	Nothing to Set	
18	Capacity Setting (kW)	23, 26, 32, 35, 51, 72, 120, --- (Cancel)	
19	Max. Frequency selection in Cooling Mode	40, 41, 42, ..., 83, 84, --, (Cancel)	
20	Max. Frequency selection in Heating Mode	40, 41, 42, ..., 83, 84, --, (Cancel)	Without limitation
21	Cooling Temperature compensation	-3.0, -2.5, -2.0, ..., 3.0, 3.5, --- (Cancel)	
22	Heating Temperature Compensation	-6.5, -6.0, -5.5, ..., 0.5, 1.0, 1.5, ..., 7.0, 7.5, --- (Cancel)	
23	Max. Fan Speed selection in Cooling	-41, -40, -39, ..., 19, 20, -- (Cancel)	
24	Min. Fan Speed selection in Cooling	-41, -40, -39, ..., 19, 20, -- (Cancel)	
25	Max. Fan Selection in Heating	-41, -40, -39, ..., 19, 20, -- (Cancel)	
26	Min. Fan Speed Selection in Heating	-41, -40, -39, ..., 19, 20, -- (Cancel)	
27	Reserved	Nothing to Set	
28	Anti-Cold Air Stop Fan temperature	16 - 28	
29	Reserved	Nothing to Set	
30	0-FF	Nothing to Set	

Table 16

7 Troubleshooting

Safety

WARNING

Electrical hazard!

Electricity power is still kept in capacitors even if the power supply is shut off. Do not forget to discharge the electricity power in capacitor before servicing the system.

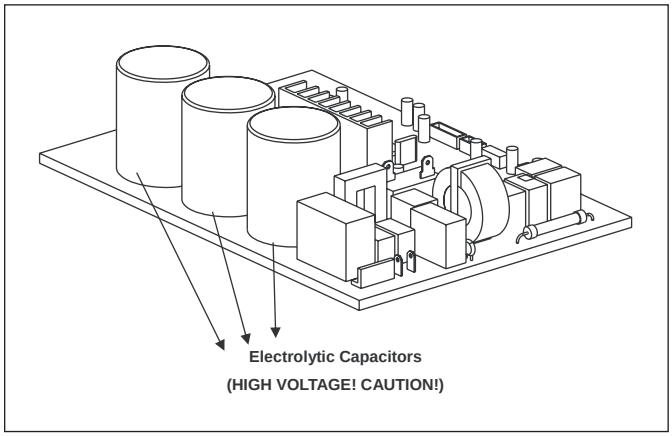


Figure 22

For other models, please connect discharge resistance (approx.100Ω 40W) between +, - terminals of the electrolytic capacitor on the opposite side of the outdoor PCB. A screwdriver will also work as a resistive element.

For reference the most common error codes are E1, P0, and P3.

7.1 Quick Check by Error Codes

If you do not have the time to test which specific parts are faulty, you can directly change the required parts according the error code. You can find the parts to replace by error code in the following table.

The table below is applicable for Single Zone system only. For detailed trouble shooting guide, please refer to Diagnosis and Solution section.

Part requiring replacement	Error Code								
	EH 00/ EH 0A	EL 01	EH 03	EH 60	EH 61	EL 0C	EHC1 / EHC2	EH0E	EH0b/FH07
Indoor PCB	●	●	●	●	●	●		●	●
Outdoor PCB		●							
Display board									●
Indoor fan motor									
T1 sensor				●					
T2 Sensor					●	●		●	
Reactor		●							
Additional refrigerant						●	●	●	
Water-level Switch								●	
Water pump								●	

Table 17

Part requiring replacement	Error Code											
	EC51	EC52	EC53	EC54	EC56	EC07	PC00	PC01	PC02	PC03	PC04	FHCC/EHC3
Indoor PCB												●
Outdoor PCB	●	●	●	●	●	●	●	●	●	●	●	
Outdoor fan motor						●	●		●		●	
T3 Sensor		●										
T4 Sensor			●									
TP Sensor				●								
T2B Sensor					●							
Refrigerant Sensor												●
Reactor								●				
Compressor							●				●	
IPM module board							●	●	●		●	
Pressure protector										●		
Additional refrigerant										●		

Table 18

For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

7.2 ODU PCB & IPM

7.2.1 PCB: Regular 115V Single Zone 12K

BMS500-AAS012-0CSXRC

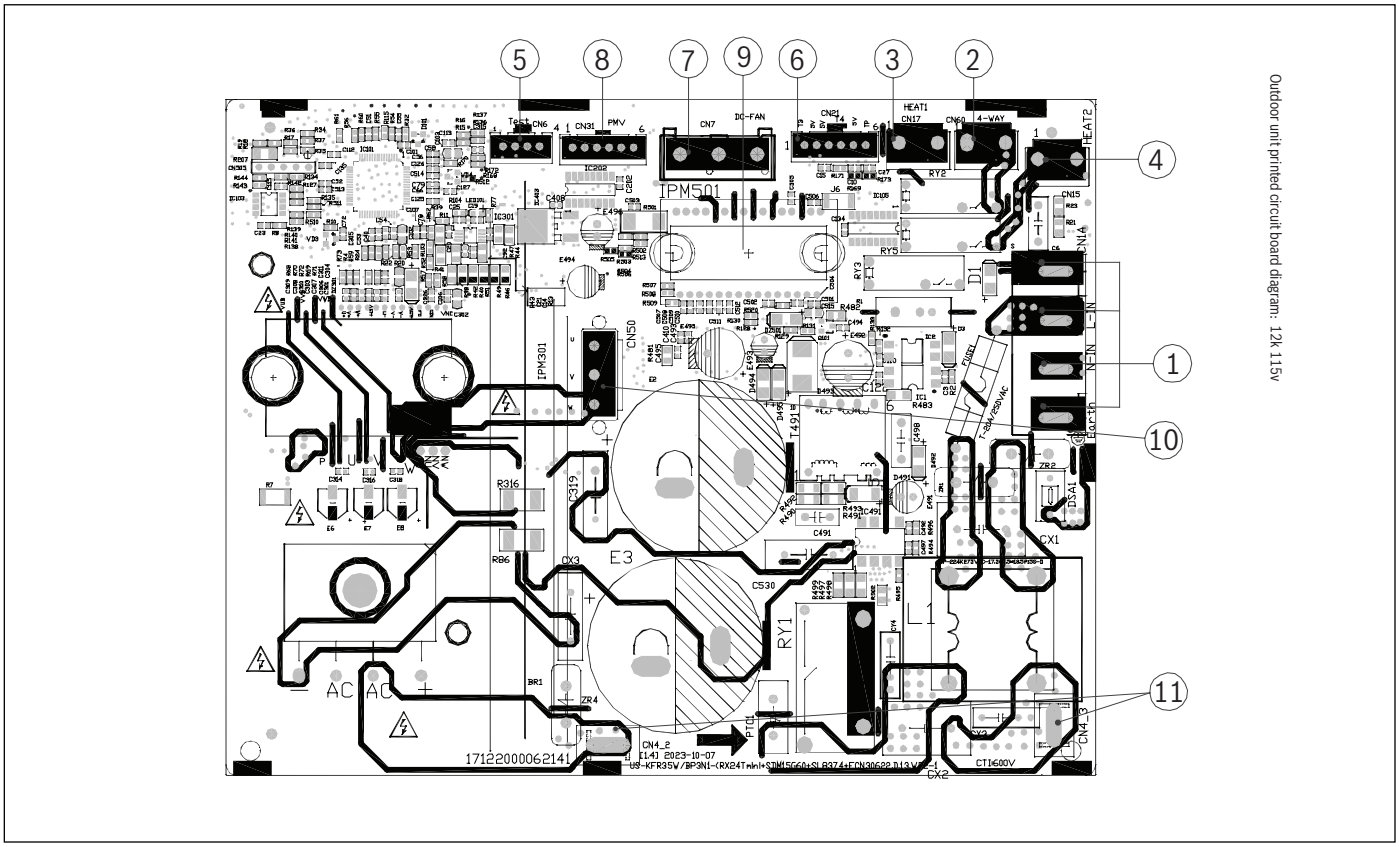


Figure 23

Number	Name	CN#	Description
1	Power Supply	CN3	Earth: connect to Ground
		CN1	N_in: connect to N-line (100-130V AC input)
		CN2	L_in: connect to L-line (100-130V AC input)
		CN16	S: connect to indoor unit communication
2	4-WAY	CN60	Connect to 4 way valve, 100-130V AC when is ON.
3	HEAT1	CN17	Connect to compressor heater, 100-130V AC when is ON
4	HEAT2	CN15	Connect to chassis heater, 100-130V AC when is ON
5	TESTPORT	CN6	Used for testing
6	TP T4 T3	CN21	Connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP
7	DC-FAN	CN7	Connect to DC fan
8	PMV	CN31	Connect to Electric Expansion Valve
9	FAN_IPM	IPM 501	IPM for DC fan
10	W	CN28	Connect to compressor
	V	CN29	0V AC (standby)
	U	CN30	10-230V AC (running)
11	CN4	CN4_2	Connect to transformer
		CN4_3	

Table 19

7.2.2 PCB: Regular and Max Performance Single Zone 9K & 12K
BMS500-AAS009-1CSXRD, BMS500-AAS009-1CSXHD, BMS500-AAS012 1CSXRD, BMS500-AAS012-1CSXHD

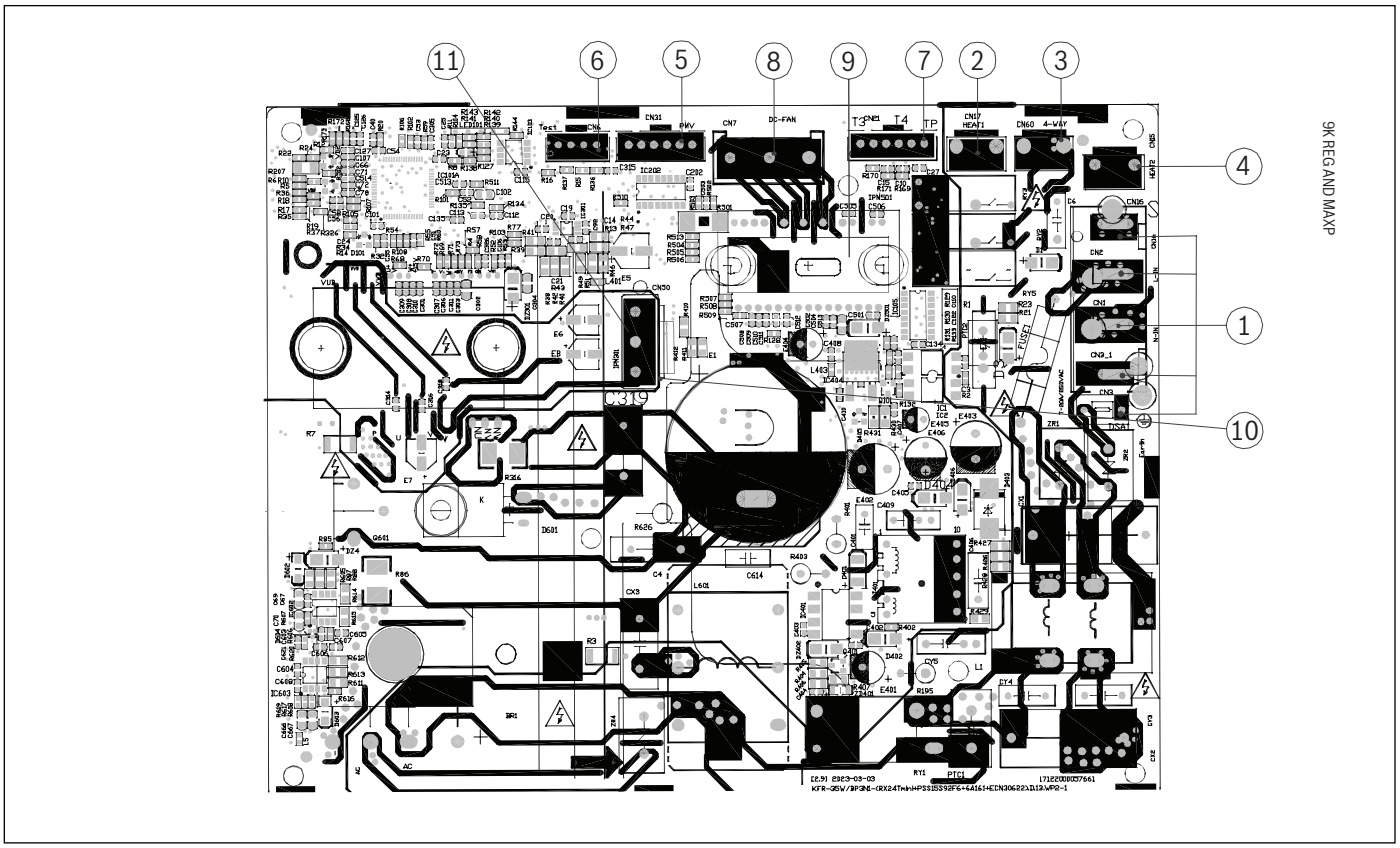


Figure 24

Number	Name	CN#	Description
1	Power Supply (CN1A)	CN3	Earth: connect to Ground
		CN1	N_in: connect to N-line (208-230V AC input)
		CN2	L_in: connect to L-line (208-230V AC input)
		CN16	S: connect to indoor unit communication
2	HEAT1	CN17	Connect to compressor heater, 208-230V AC when is ON
3	4-WAY	CN60	Connect to 4 way valve, 208-230V AC when is ON.
4	HEAT2	CN15	Connect to chassis heater, 208-230V AC when is ON
5	PMV	CN31	Connect to Electric Expansion Valve
6	TESTPORT	CN6	Used for testing
7	T5 T4 T3	CN21/CN22	Connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor T5
8	DC-FAN	CN7	Connect to DC fan
9	FAN_IPM	IPM 501	IPM for DC fan
10	W	CN28	Connect to compressor
	U	CN29	0V AC (standby)
	V	CN30	10-200V AC (running)
11	COMP_IPM	IPM 301	IPM for compressor

Table 20

7.2.3 PCB: Regular & Max Performance Single Zone 18K, Regular Single Zone 24K BMS500-AAS018-1CSXRD, BMS500-AAS018-1CSXHD, BMS500-AAS024-1CSXRD

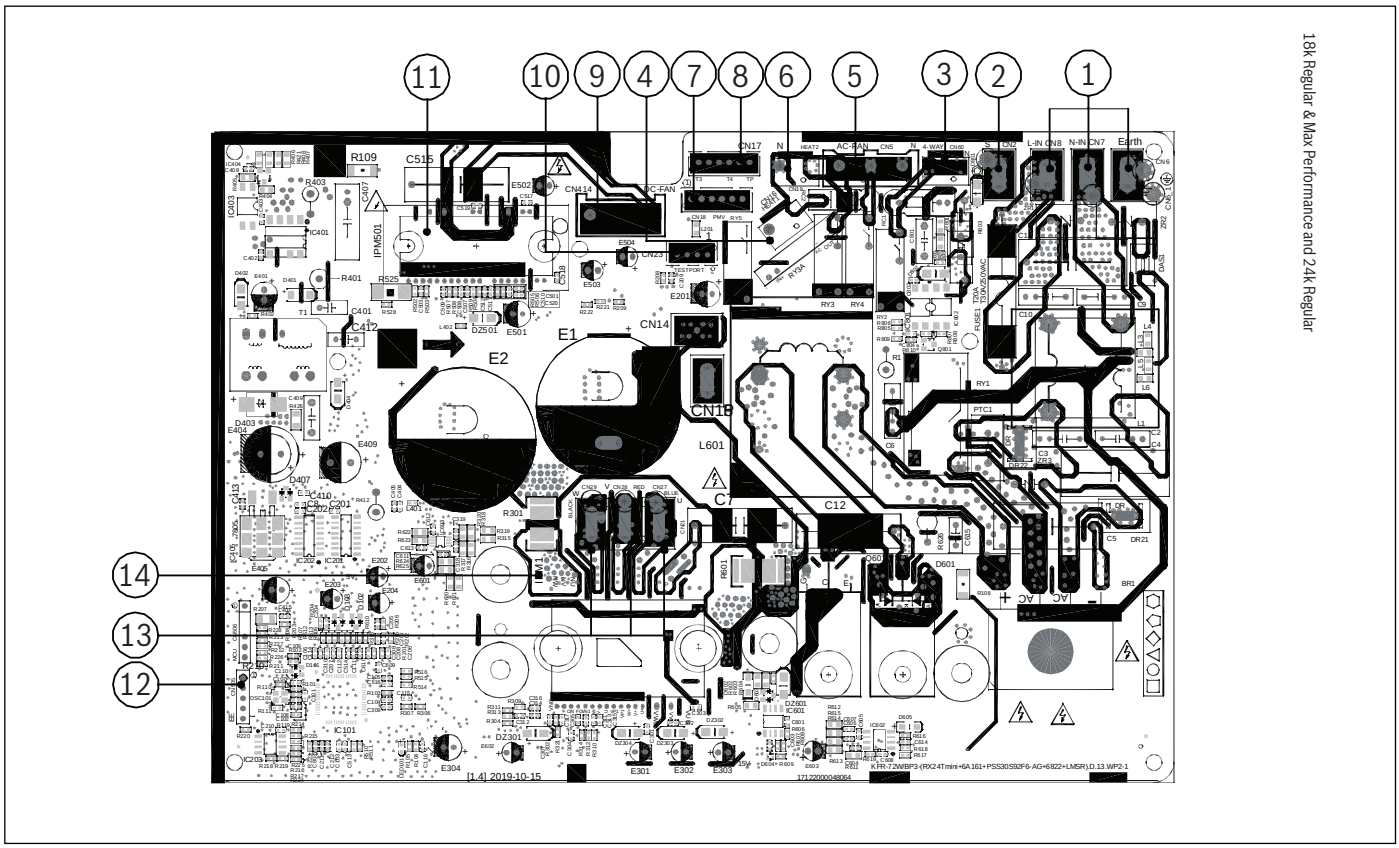


Figure 25

Number	Name	CN#	Description
1	Power Supply (CN3)	CN6	Earth: connect to Ground
		CN7	N_in: connect to N-line (208-230V AC input)
		CN8	L_in: connect to L-line (208-230V AC input)
2	S	CN2	S: connect to indoor unit communication
3	4-WAY	CN60	Connect to 4 way valve, 208-230V AC when is ON.
4	HEAT1	CN16	Connect to compressor heater, 208-230V AC when is ON
5	AC-FAN	CN5	Connect to AC fan
6	HEAT2	CN19	Connect to chassis heater, 208-230V AC when is ON
7	PMV	CN18	Connect to Electric Expansion Valve
8	TP T4 T3	CN17	Connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP
9	DC-FAN	CN414	Connect to DC fan
10	TESTPORT	CN23	Used for testing
11	FAN_IPM	IPM501	IPM for DC fan
12	EE_PORT	CN505	EEPROM programmer port
13	U	CN27	Connect to compressor
	V	CN28	0V AC (standby)
	W	CN29	200-300V AC (running)
14	COMP_IPM	IPM 301	IPM for compressor

Table 21

7.2.4 PCB: Max Performance Single Zone 24K
BMS500-AAS024-1CSXHD

7.2.5 PCB: Regular Single Zone (for Wall Mounted IDU) 30K & 36K
BMS500-AAS030-1CSXRD, BMS500-AAS036-1CSXRD

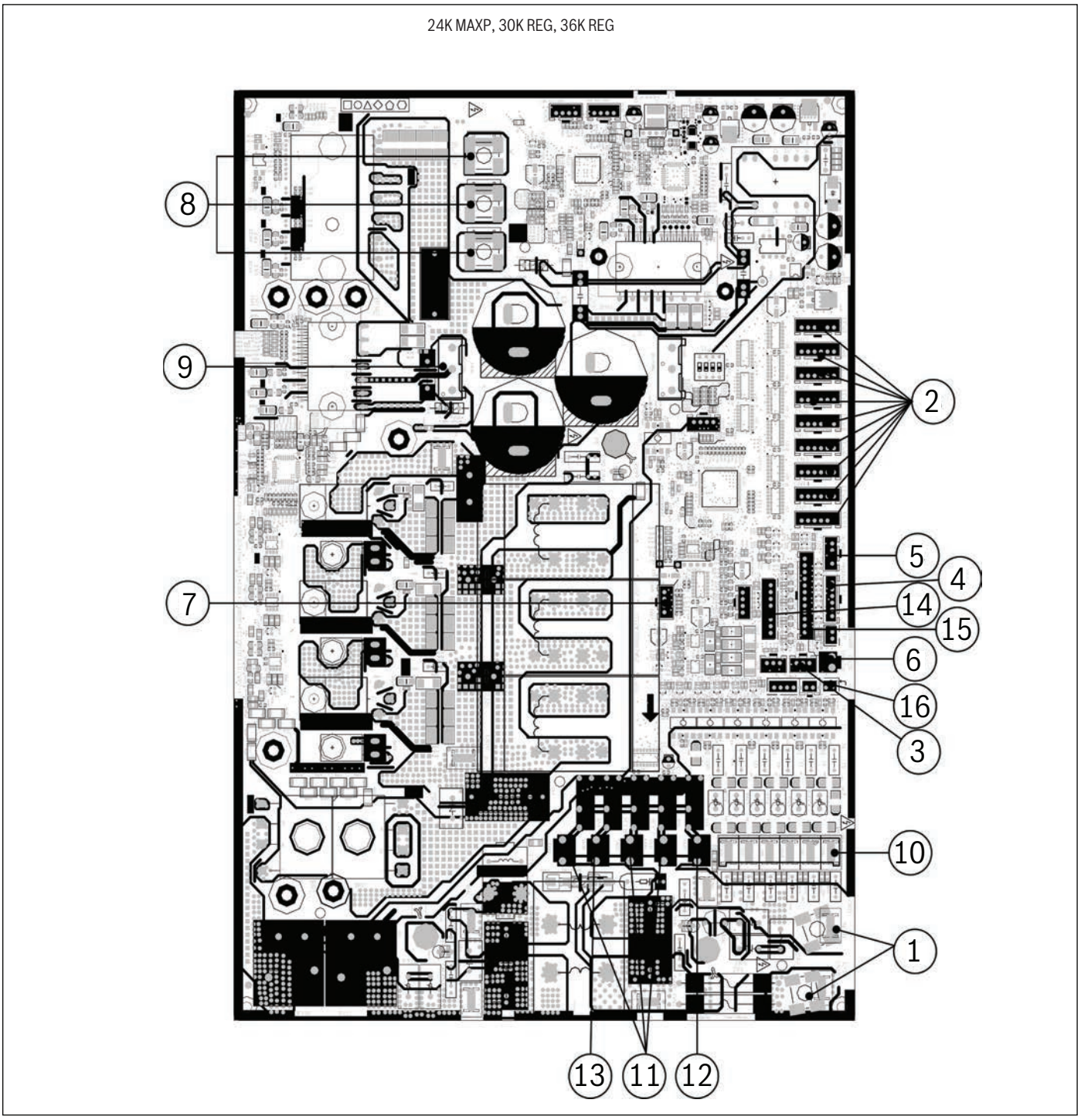


Figure 26

Number	Name	CN#	Description
1	Power Supply	CN11	N_in: connect to N-line (208-230V AC input)
		CN12	L_in: connect to L-line (208-230V AC input)
2	EEV-A	CN17	Connect to 12V electric expansion valve
	EEV-B	CN16	
	EEV-C	CN22	
	EEV-D	CN14	
	EEV-E	CN13	
	EEV-F	CN1	
	EEV1	CN53	
	EEV2	CN44	
	EEV3	CN3	
3	H_YL	CN49	Connect to high pressure sensor
4	T3 T4 TP	CN26	Connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP
5	H-PRO, L-RPO	CN29	Connect to high and low pressure swtich (pin1-pin2&pin3-pin4:5VDC pulse wave)
6	OLP TEMP. SENSOR	CN30	Connect to compressor top temp. sensor (5VDC Pulse wave)
7	TESTPORT	CN45	Used for testing
8	COMPRESSOR	U	Connect to compressor
		V	0V AC (standby)
		W	10-200V AC (running)
9	DC-FAN	CN32	Connect to DC fan
10	S-A	CN43	S: connect to indoor unit communication(pin1-pin2: 24VDC Pulse wave; pin2-pin3: 208 230V AC input)
	S-B		
	S-C		
	S-D		
	S-E		
	S-F		
11	4-WAY	CN37	Connect to 4 way valve 1, 208-230V AC when is ON
		CN25	Connect to 4 way valve 2, 208-230V AC when is ON
		CN42	Connect to 4 way valve 3, 208-230V AC when is ON
12	HEAT_D	CN24	Connect to chassis heater, 208-230V AC when is ON
13	HEAT_Y	CN38	Connect to compressor heater, 208-230V AC when is ON
14	/	CN27	Connect to key board CN1
15	T2B	CN28	Connect to evaporator coil outlet temperature sensor T2B
16	TBH-IN TBH-OUT T3B TF	CN9	Connect to cold plate inlet temperature sensor TBH-IN, cold plate outlet temperature sensor TBH-OUT, condenser coil middle temperature sensor T3B, refrigerant tube inlet temperature sensor TF

Table 22

7.3 Indoor Wiring Diagram

7.3.1 Low-Static Unit 9K, 12K, & 18K

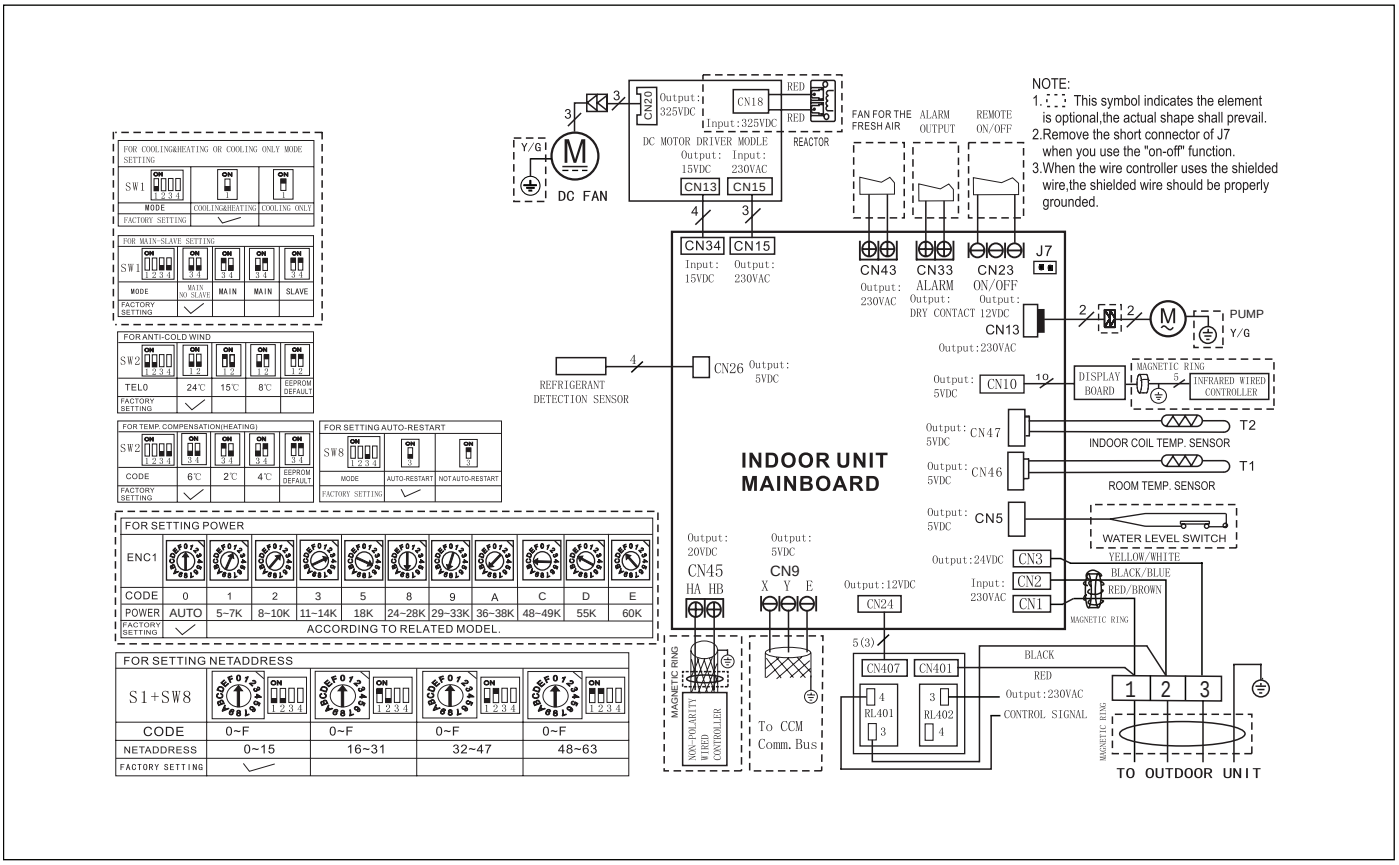


Figure 27

7.3.2 High-Static Unit 24, 36K, 48K & 60K models

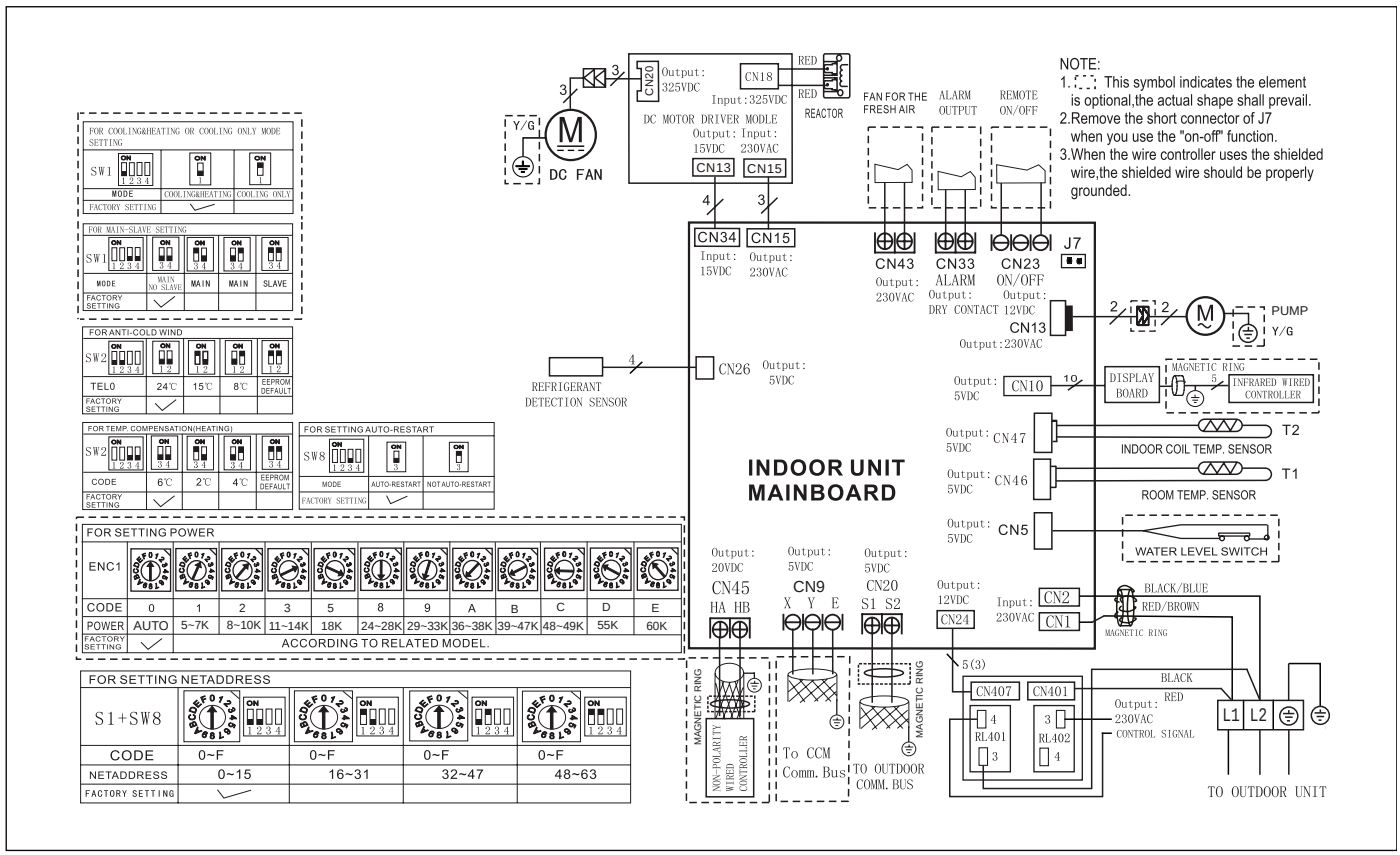


Figure 28

7.3.3 4-Way Cassette & Ducted IDU Connector & Dip-Switch Introduction

For ALARM terminal port CN33:

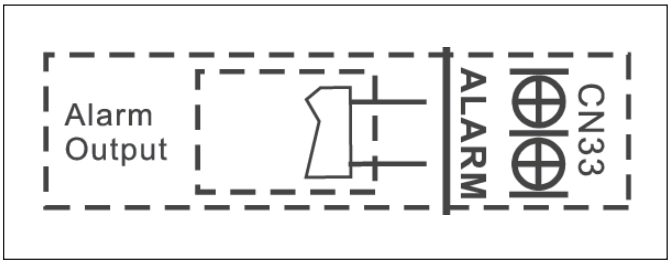


Figure 29

1. The terminal port is available to connect ALARM, but power supply is not from the Indoor Unit (Figure 30).
2. Although design voltage can support higher voltage, it is strongly recommended to connect the power less than 24V, current less than 0.5A.
3. When there is a problem, the relay will close and ALARM will be activated.

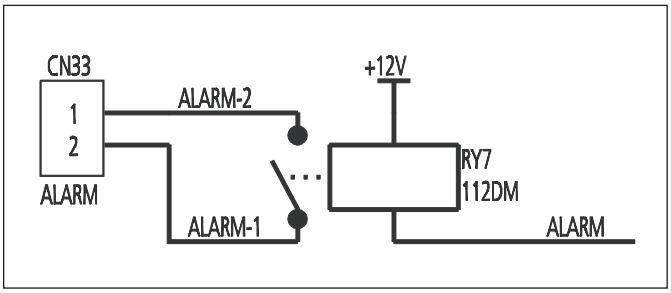


Figure 30

For fresh air intake motor (NEWFAN) terminal port CN8:

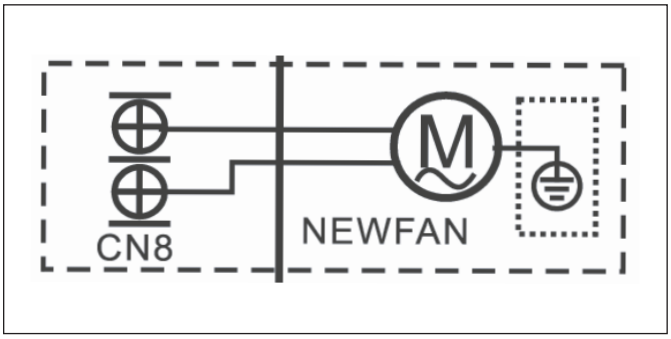


Figure 31

1. Connect the fan motor to the port;
2. The output voltage is the power supply;
3. The fresh air intake motor cannot exceed 200W or 1A, follow the smaller one;
4. The fresh air intake motor will only work with the indoor fan motor is in operation;
5. When the system is in force cooling or capacity testing mode, the fresh air intake motor will not work.

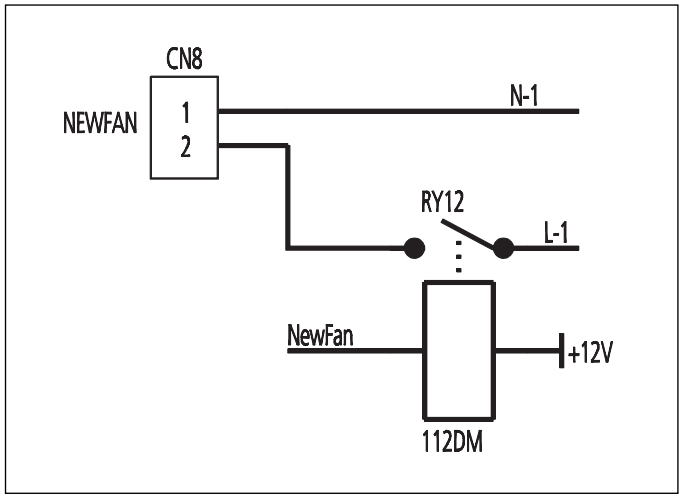


Figure 32

4-Way Cassette Unit Dip-Switch (9K ~ 24K)

Micro-switch SW1 is for selection of indoor fan stop temperature (TEL0) when it is in anti-cold wind action in heating mode.

- Range: 75.2 °F (24°C), 59°F (15°C), 46.4°F (8°C), according to EEROM setting (reserved for special customizing).

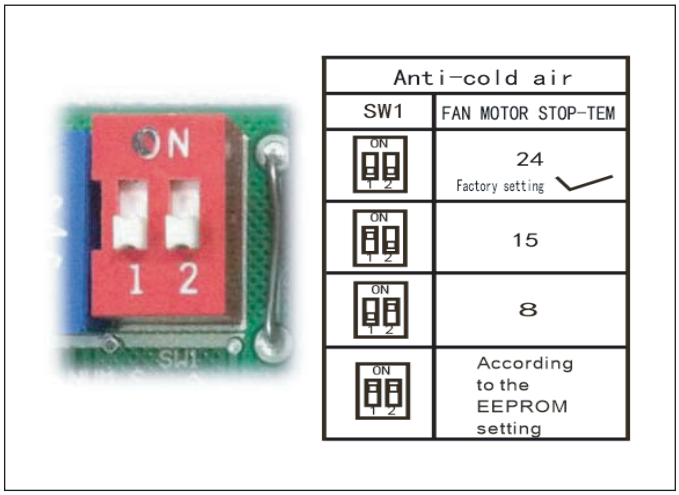


Figure 33

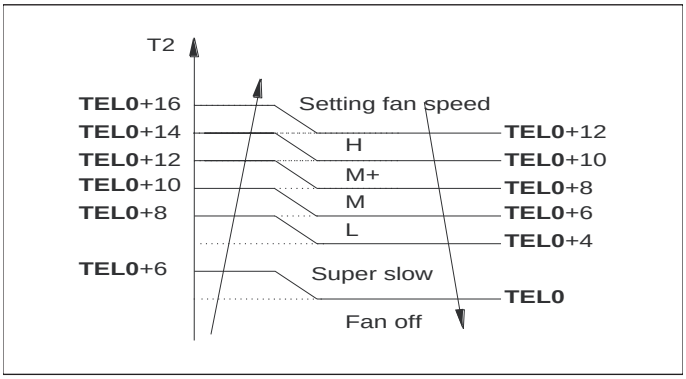


Figure 34

Legend:
TELO = fan stop temperature

Micro-switch SW2 is for selection of indoor FAN ACTION if room temperature reaches the set point and the compressor stops.

- Range: OFF (in 127s), Keep running

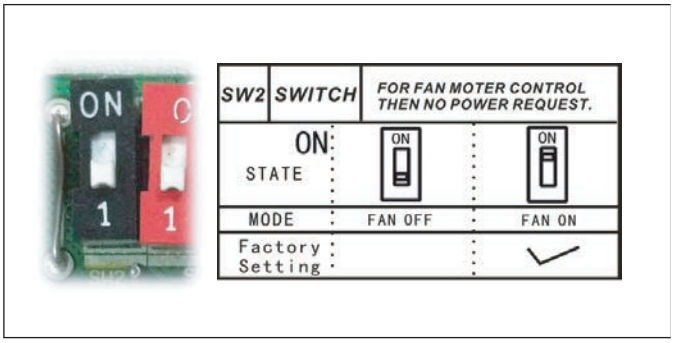


Figure 35

Micro-switch SW3 is for selection of auto-restart function.

- Range: Active, inactive

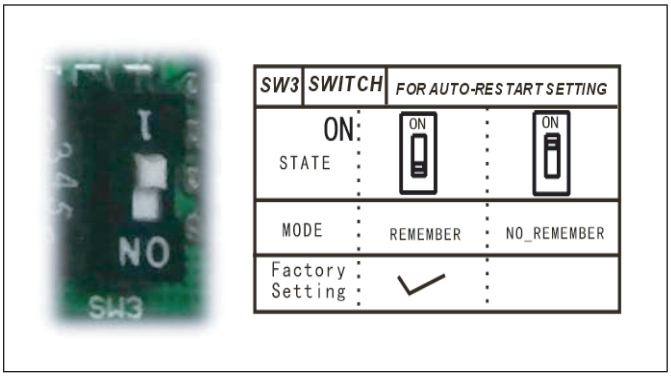


Figure 36

Micro-switch SW5 is for setting mode priority of multi connection.

- Range: Heat, cool

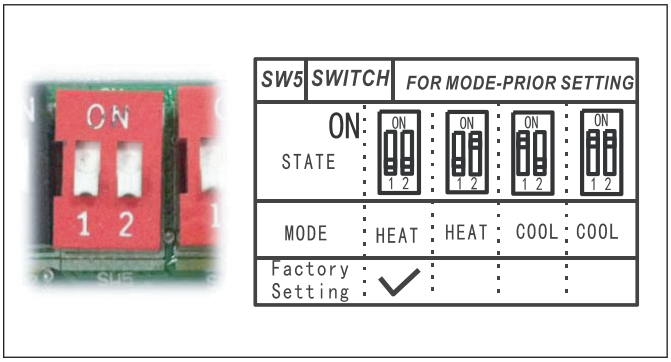


Figure 37

Micro-switch SW6 is for selection of temperature compensation in heating mode. This helps to reduce the real temperature difference between ceiling and floor so that the unit could run properly. If the height of installation is lower, a smaller value could be chosen.

- Range: 42.8℉ (6℃), 39.2℉ (4℃), 35.6℉ (2℃), E function (reserved for special customizing)

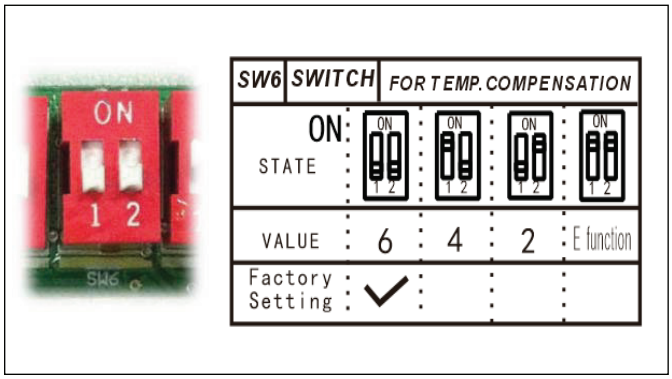


Figure 38

Micro-switch S1 and dial-switch S2 are for address setting when you want to control this unit by a central controller.

- Range: 00-63

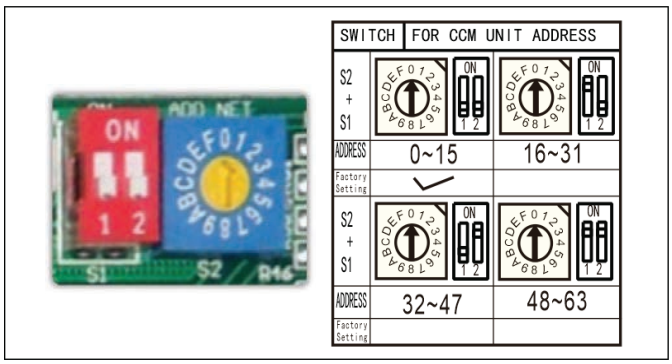


Figure 39

Ducted Unit connector (9K ~ 60K)

For fresh air intake motor (NEWFAN) terminal port (also for Anion generator) CN43:

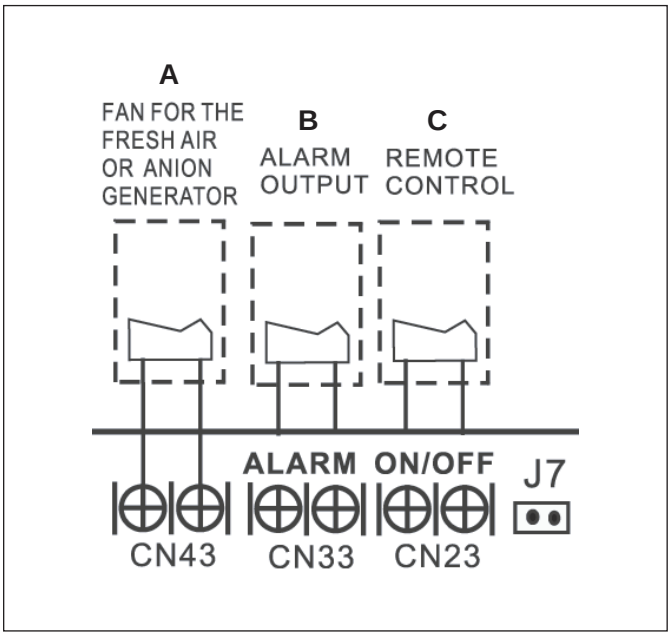


Figure 40

1. Connect the fan motor to the port CN43;
2. The output voltage is the power supply;
3. The fresh air intake motor cannot exceed 200W or 1A, follow the smaller one;
4. The fresh air intake motor will only work with the indoor fan motor is in operation; when the indoor fan motor stops, the fresh air motor will stop.
5. When the system is in force cooling or capacity testing mode, the fresh air intake motor will not work.

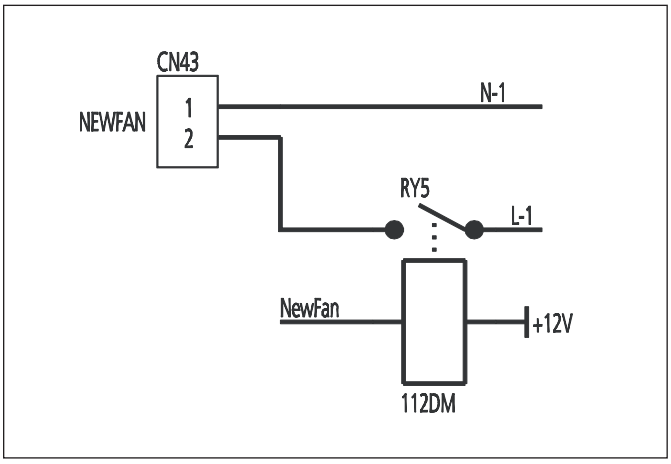


Figure 41

For ALARM terminal port CN33:

1. The terminal port is available to connect ALARM, but power supply is not from the Indoor Unit (Fig. 37).
2. Although design voltage can support higher voltage, it is strongly recommended to connect the power less than 24V, current less than 0.5A.
3. When there is a problem, the relay will close and ALARM will be activated.

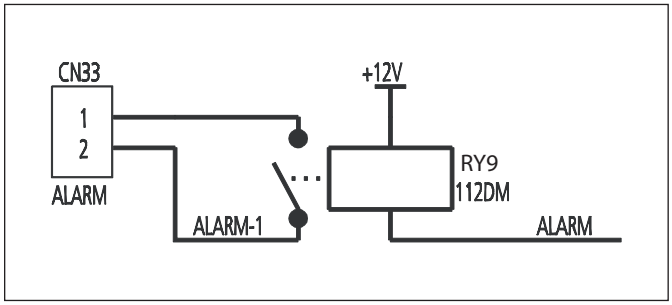


Figure 42

For remote control (ON-OFF) terminal port CN23 and short connector of J7

1. Remove the short connector of J7 when you use ON-OFF function;
2. When remote switch is off (OPEN), the unit will be off;
3. When remote switch is on (CLOSE), the unit will be on;
4. When close/open the remote switch, the unit would respond to the demand within 2 seconds;
5. When the remote switches on, you can use remote controller/wire controller to select the mode that you want; when the remote switches off, the unit will not respond to the demand from remote controller/wire controller. When the remote switch is off, but the remote controller / wire controller are on, CP code would be shown on the display board.
6. The voltage of the port is 12V DC, design Max. current is 5mA.

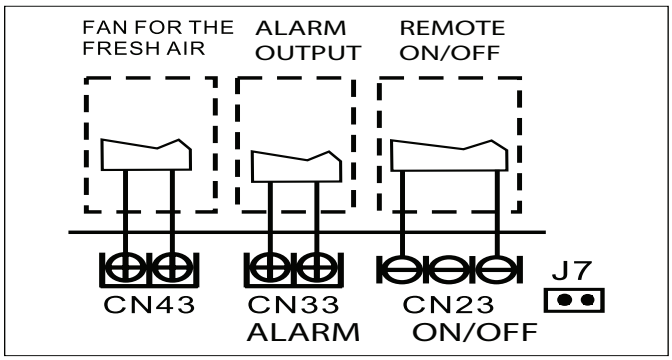


Figure 46

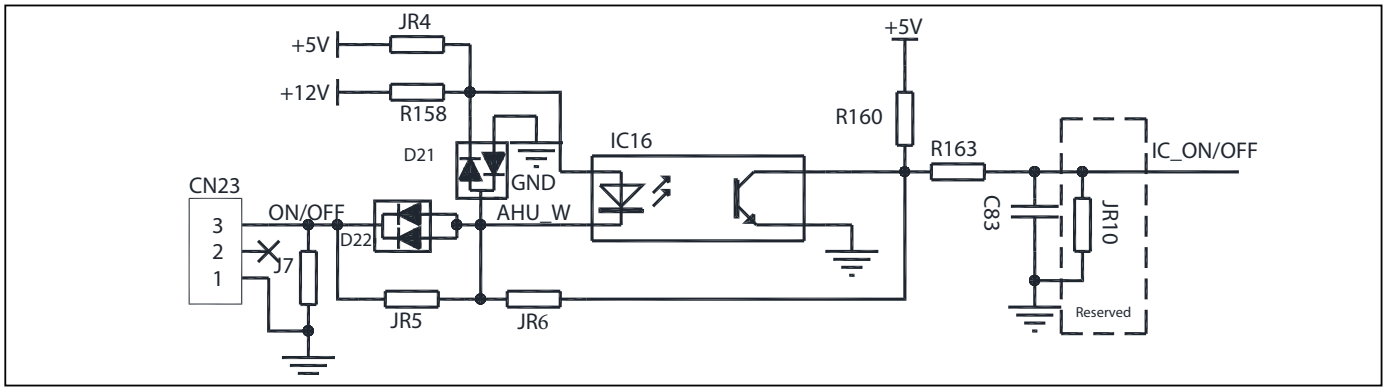


Figure 43

Ducted Unit Dip-Switch (9K ~ 60K)

Micro-switch SW1 is for selection of mode.

- Range: Cooling & Heating, Cooling Only

FOR COOLING&HEATING OR COOLING ONLY MODE SETTING		
SW1 ON 1 2 3 4	ON 1	ON 1
MODE	COOLING&HEATING	COOLING ONLY
FACTORY SETTING	✓	

Figure 44

Micro-switch SW1: is for setting the master or slave unit when the unit is in twin connection.

- Range: Master No Slave (Normal 1 drive 1 connection), Master (2 positions without difference), Slave.

FOR MAIN-SLAVE SETTING				
SW1 ON 1 2 3 4	ON 3 4	ON 3 4	ON 3 4	ON 3 4
MODE	MAIN NO SLAVE	MAIN	MAIN	SLAVE
FACTORY SETTING	✓			

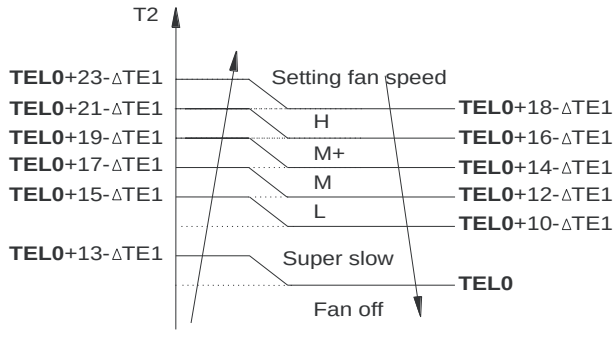
Figure 45

Micro-switch SW2 is for selection of indoor fan stop temperature (TEL0) when it is in anti-cold wind action in heating mode.

- Range: 75.2°F (24°C), 59°F (15°C), 46.4°F (8°C), according to EEROM setting (reserved for special customizing).

FOR ANTI-COLD WIND				
SW1	ON 1 2	ON 1 2	ON 1 2	ON 1 2
TEL0	24℃	15℃	8℃	EEPROM DEFAULT
FACTORY SETTING	✓			

Figure 47



Legend:
TE1: T1 ≥ 19℃, ΔTE1=0; 15 ≤ T1 ≤ 18℃, ΔTE1=19 − T1, T1 − 15℃, ΔTE1=4

Figure 48

Micro-switch SW8 is for selection of auto-restart function.

- Range: Active, inactive

FOR SETTING AUTO-RESTART		
SW8 		
MODE	AUTO-RESTART	NOT AUTO-RESTART
FACTORY SETTING	✓	

Figure 49

Micro-switch SW6 is for selection of temperature compensation in heating mode. This helps to reduce the real temperature difference between ceiling and floor so that the unit could run properly. If the height of installation is lower, smaller value could be chosen.

- Range: 42.8 ℉ (6℃), 39.2℉ (4℃), 35.6℉ (2℃), E function (reserved for special customizing)

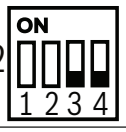
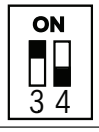
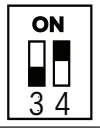
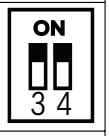
FOR TEMP. COMPENSATION(HEATING)				
SW2 				
CODE	6℃	2℃	4℃	EEPROM DEFAULT
FACTORY SETTING	✓			

Figure 50

Micro-switch S1 and dial-switch SW8 are for address setting when you want to control this unit by a central controller.

- Range: 00-63

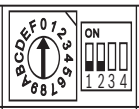
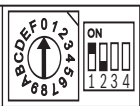
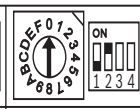
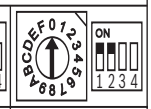
FOR SETTING NETADDRESS				
S1+SW8 			
CODE	0~F	0~F	0~F	0~F
NETADDRESS	0~15	16~31	32~47	48~63
FACTORY SETTING	✓			

Figure 51

Dial-switch ENC1: The indoor PCB is universal designed for whole series units from 9K to 60K.

This ENC1 setting will tell the main program what size the unit is.

Usually there is glue on it because the switch position cannot be changed at random unless you want to use this PCB as a spare part to use in another unit. Then you have to select the right position to match the size of the unit.

FOR SETTING POWER												
ENC1												
CODE	0	1	2	3	5	8	9	A	B	C	D	E
POWER	AUTO	5~7K	8~10K	11~14K	18K	24~28K	29~33K	36~38K	39~47K	48~49K	55K	60K
FACTORY SETTING	✓	ACCORDING TO RELATED MODEL.										

Figure 52

7.4 Outdoor Wiring Diagram

7.4.1 Regular Single Zone (115V 12K)

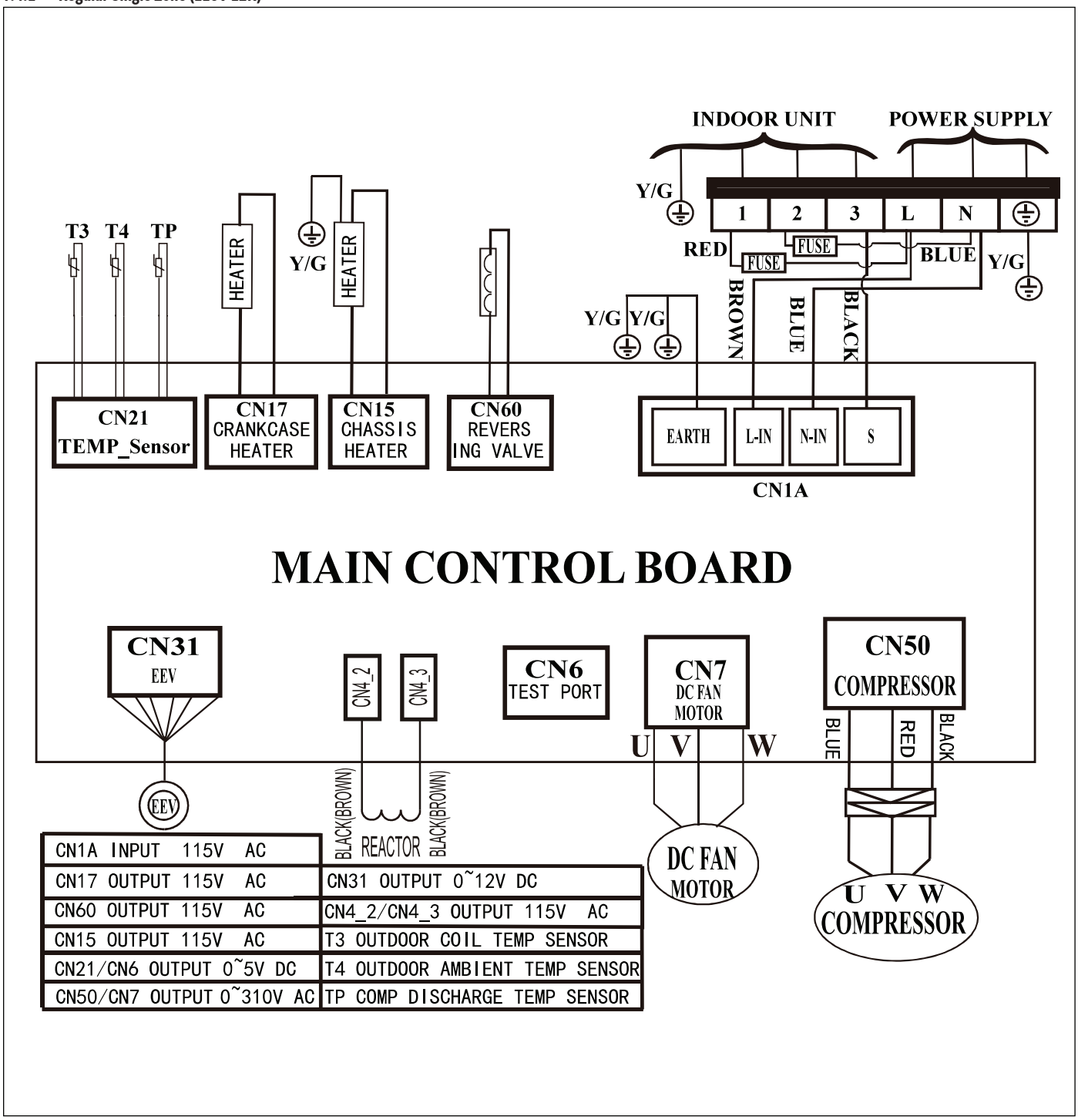


Figure 53

7.4.2 Regular & Max Performance Single Zone (9K & 12K)

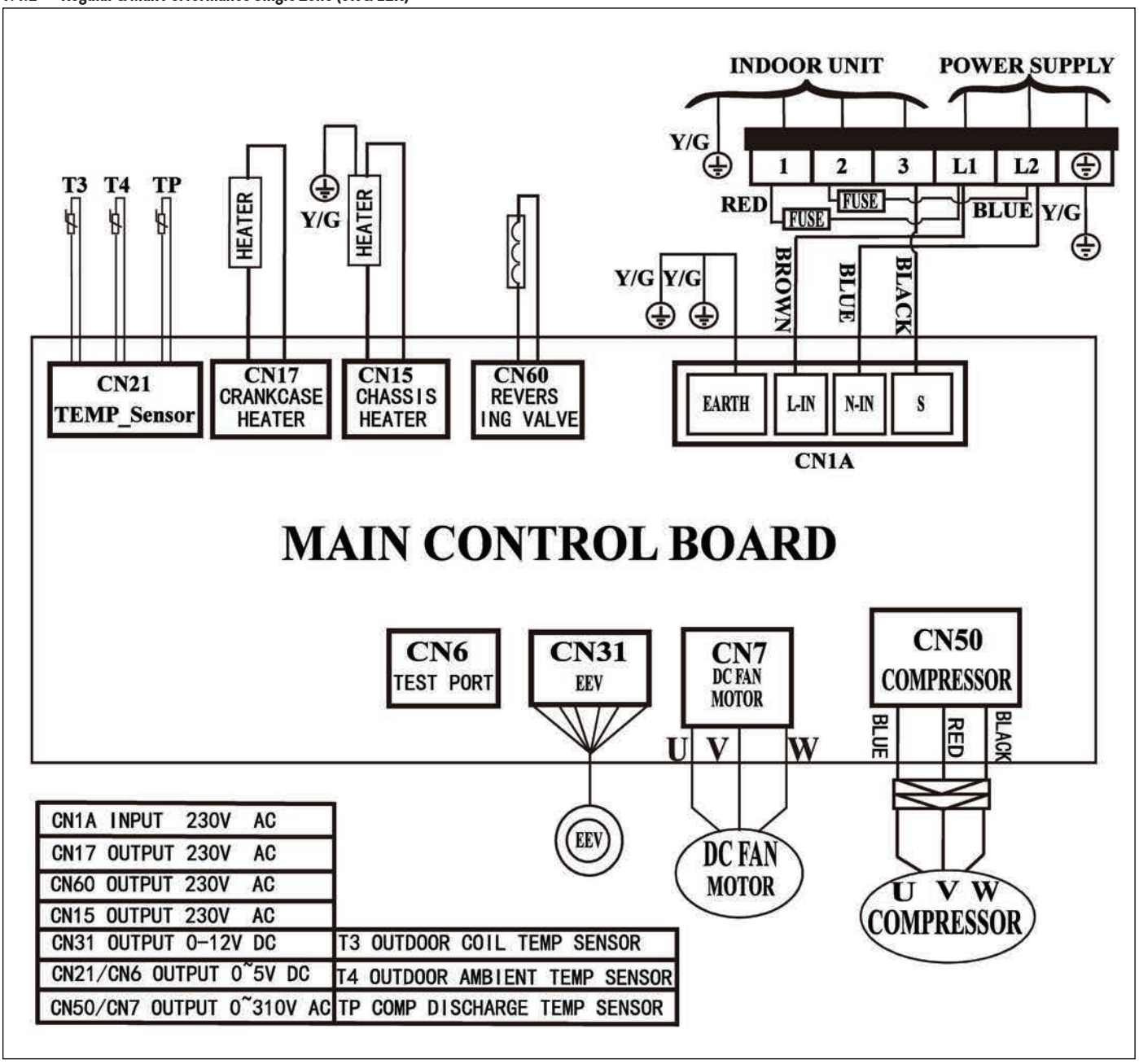


Figure 54

7.4.3 Regular Single Zone (18K & 24K) & Max Performance Single Zone (18K)

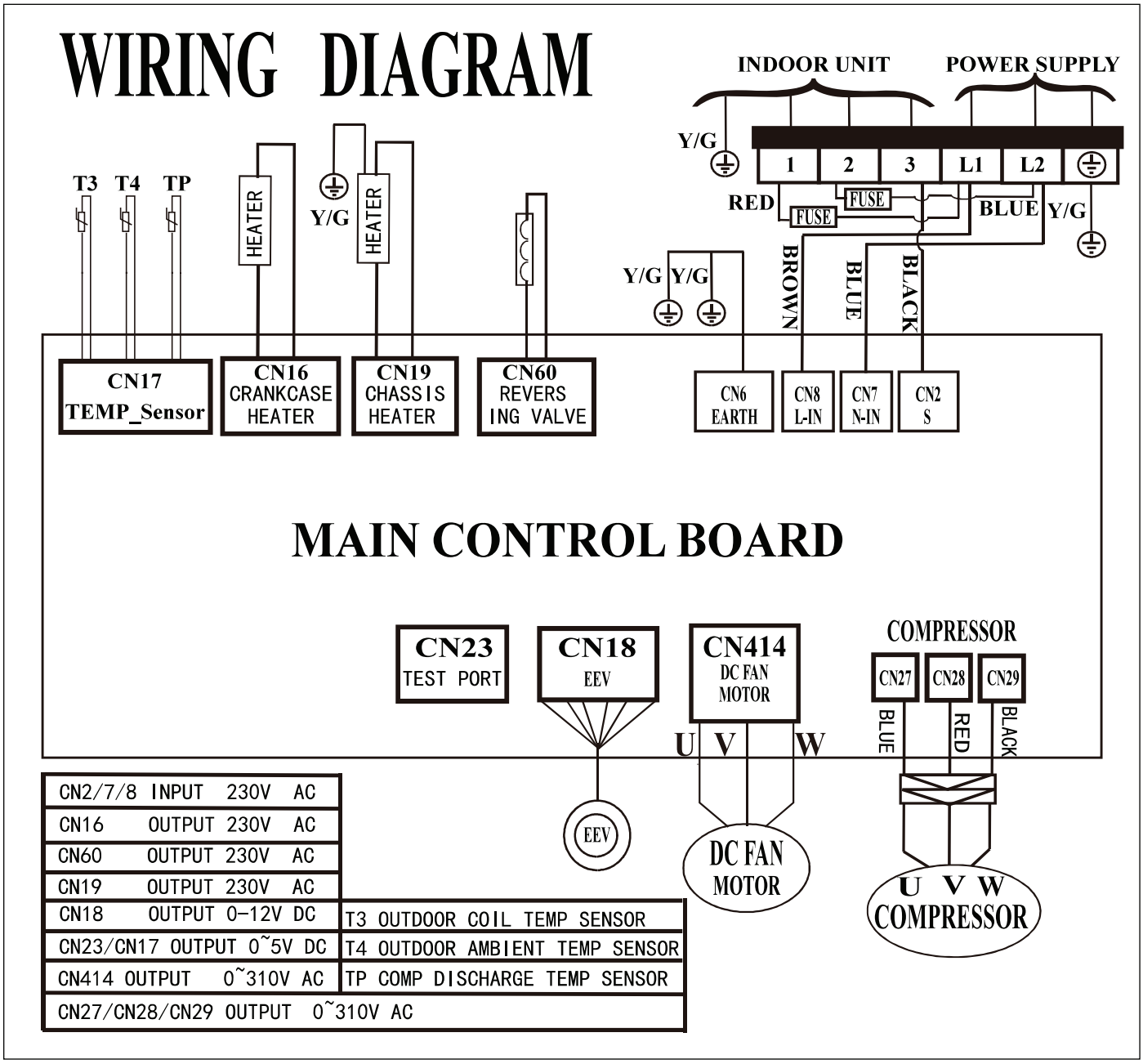
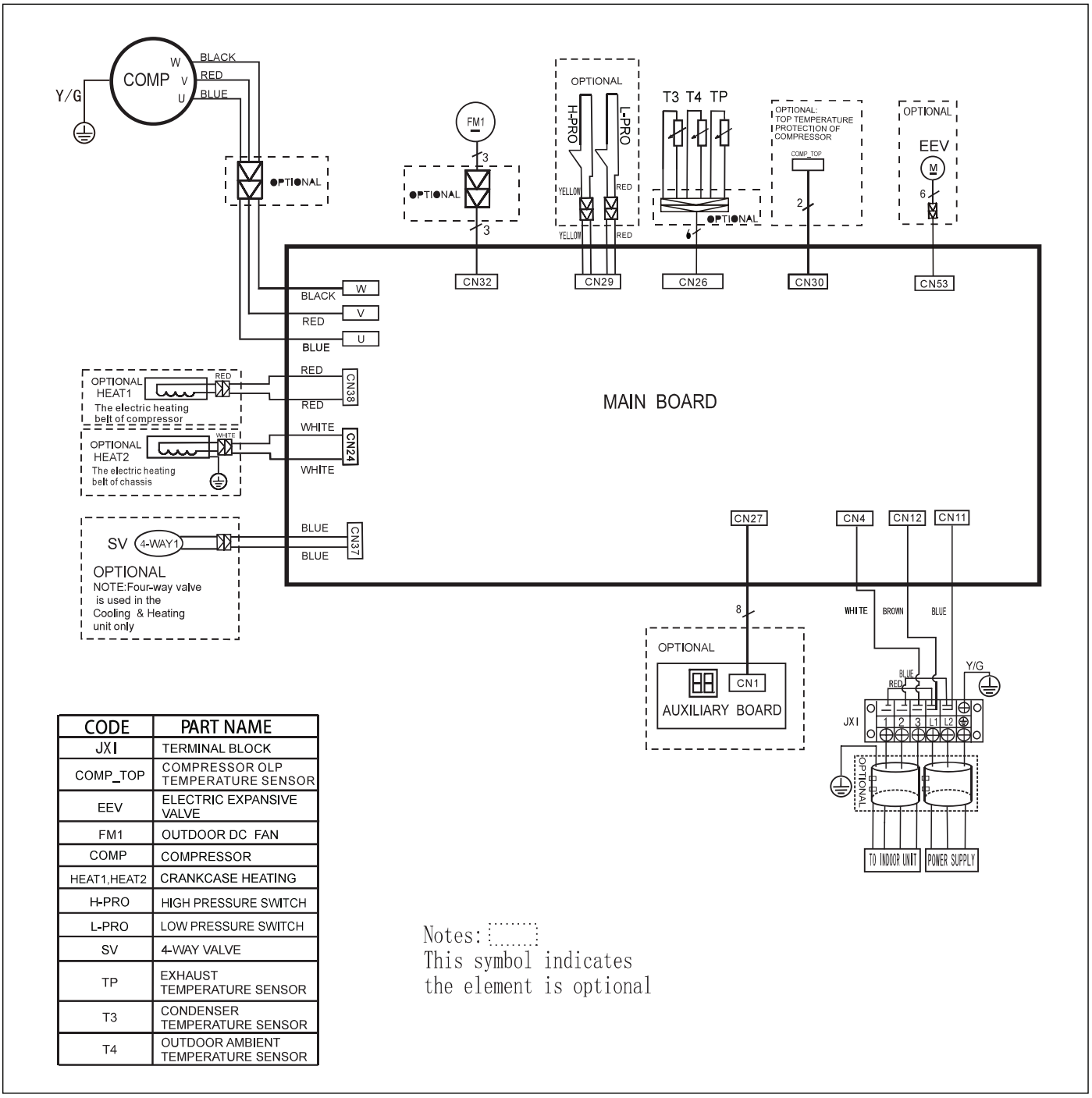


Figure 55

7.4.4 Max Performance Single Zone (24K)
Regular Single Zone (30K)



CODE	PART NAME
JX1	TERMINAL BLOCK
COMP_TOP	COMPRESSOR OLP TEMPERATURE SENSOR
EEV	ELECTRIC EXPANSIVE VALVE
FM1	OUTDOOR DC FAN
COMP	COMPRESSOR
HEAT1,HEAT2	CRANKCASE HEATING
H-PRO	HIGH PRESSURE SWITCH
L-PRO	LOW PRESSURE SWITCH
SV	4-WAY VALVE
TP	EXHAUST TEMPERATURE SENSOR
T3	CONDENSER TEMPERATURE SENSOR
T4	OUTDOOR AMBIENT TEMPERATURE SENSOR

Figure 56

7.5 Wall Mounted Unit (IDU & ODU) Error Code Diagnosis and Solution

Display	Information
FC	Forced cooling(Not an error code)
EC07	ODU fan speed out of control
EC51	ODU EEPROM parameter error
EC52	ODU coil temp. sensor(T3) error
EC53	ODU ambient temp. sensor(T4) error
EC54	COMP. discharge temp. sensor(TP) error
EC56	IDU coil outlet temp. sensor(T2B) error(Multi-zone)
ECC1	Other IDU refrigerant sensor detects leakage (Multi-zone)
EH00	IDU EEPROM malfunction
EH03	IDU fan speed out of control
EH0A	IDU EEPROM parameter error
EH0E	Water-level alarm malfunction
EH12	Main unit or secondary units malfunction
EH bA / Eh3A / Eh3b	Communication error between the indoor unit and the external fan module / External Fan DC Bus is too low/high
EH60	IDU room temp. sensor (T1) error
EH61	IDU evaporator coil temp. sensor (T2) error
EHC1	Refrigerant sensor detects leakage
EHC2	Refrigerant sensor is out of range and leakage is detected
EHC3	Refrigerant sensor is out of range
EL01	IDU & ODU communication error
EL0C	System lacks refrigerant
EL11	Communication malfunction between main unit and secondary units
FHCC	Refrigerant sensor error
PC00	ODU IPM Module protection
PC01	ODU voltage protection
PC02	Compressor top (or IPM) temp. protection
PC03	Pressure protection (low or high pressure) (for some models)
PC04	Inverter compressor drive error
PC0L	Low ambient temperature protection (for some models)
----	IDUs mode conflict (Multi-zone)

Table 23

7.5.1 (EH 00/EH 0R/EC 51) EEPROM parameter error

Error Code	EH 00/EH 0R (Indoor) EC 51 (Outdoor)
Malfunction decision conditions	Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip.
Supposed causes	• Incorrect installation of indoor to outdoor control wire or line voltage wiring • PCB faulty

Table 24

Troubleshooting:

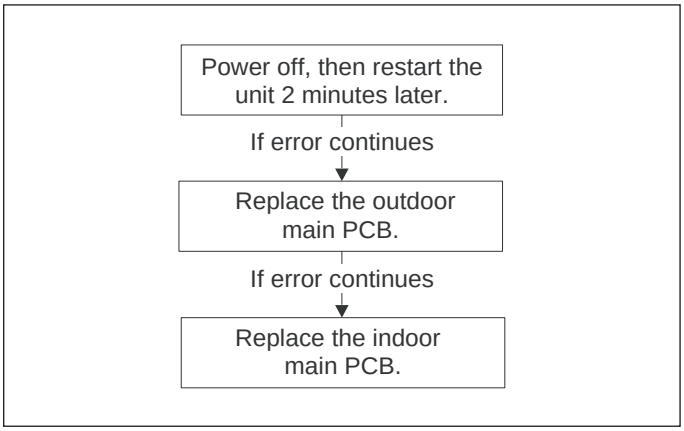


Figure 57

EEPROM: a read-only memory whose contents can be erased and reprogrammed using a pulsed voltage. For the location of EEPROM chip, please refer to the below photos.

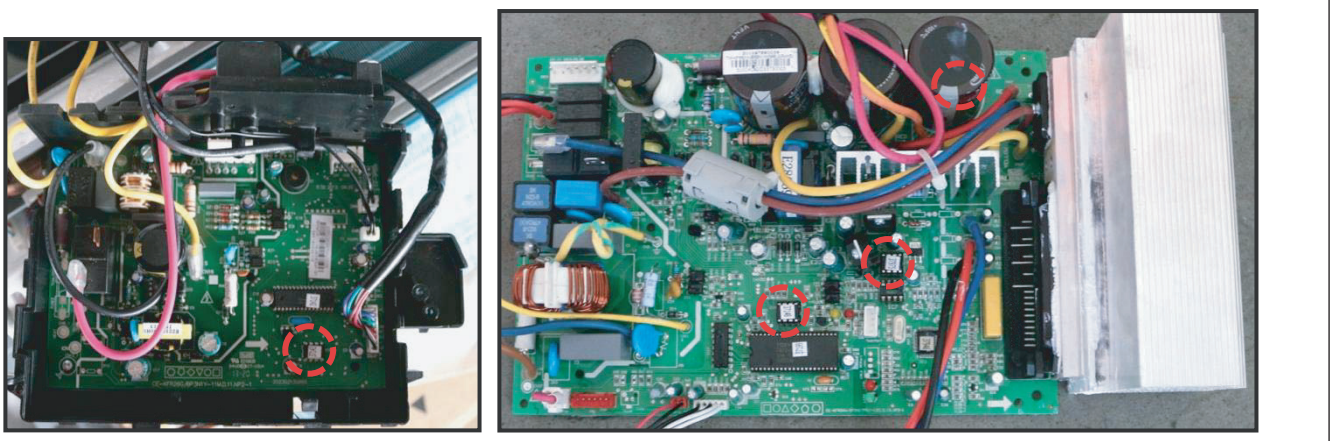


Figure 58

The two photos above are for reference only, they may not be identical to the PCBs shipped with your equipment.

7.5.2 (EL 01) Indoor / outdoor unit's communication

Error Code	EL 01
Malfunction decision conditions	Indoor unit does not receive the feedback from outdoor unit during 110 seconds and this condition happens four times continuously.
Supposed causes	• Incorrect installation of indoor to outdoor control wire • Electromagnetic interference • Indoor or outdoor PCB faulty

Table 25

Troubleshooting:

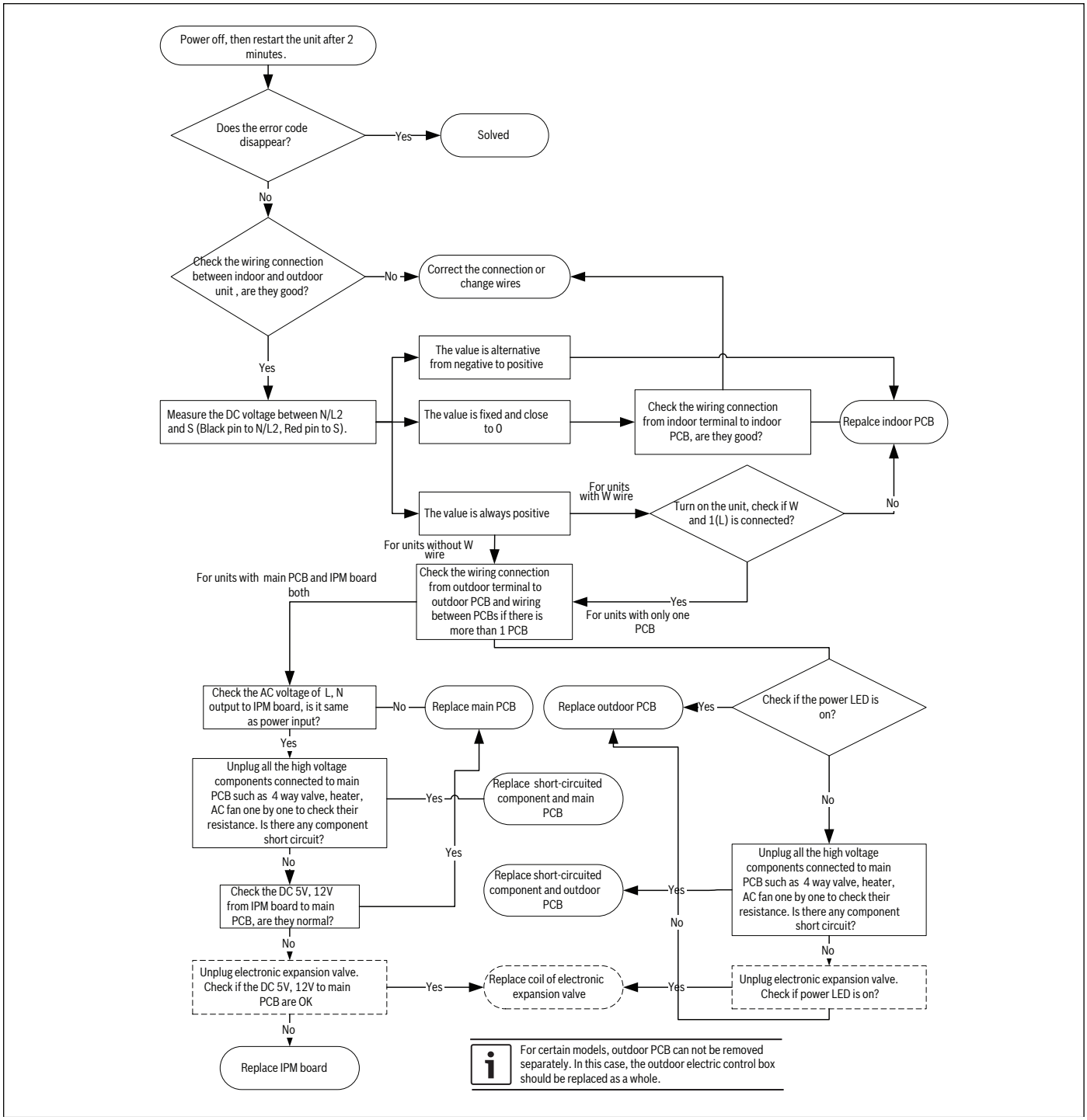


Figure 59

Remark:

- Use a multimeter to test the DC voltage between 2 port and 3 port of outdoor unit. The red pin of multimeter connects with 2 port while the black pin is for 3 port.
- When AC is normal running, the voltage will move alternately between -25VDC to 25VDC.
- If the outdoor unit has malfunctioned, the voltage will move alternately with positive value.
- While if the indoor unit has malfunction, the voltage will be a certain value.

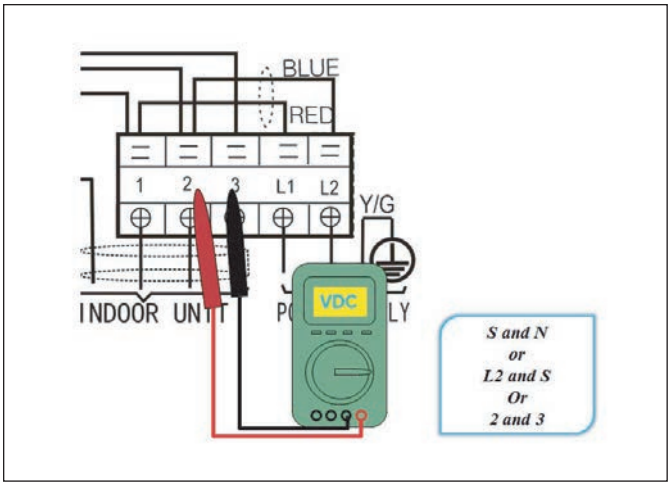


Figure 60

Remark:

- Use a multimeter to test the resistance of the transformer which does not connect with capacitor.
- The normal value should be around zero ohms. Otherwise, the reactor must have malfunctioned and may need to be replaced.

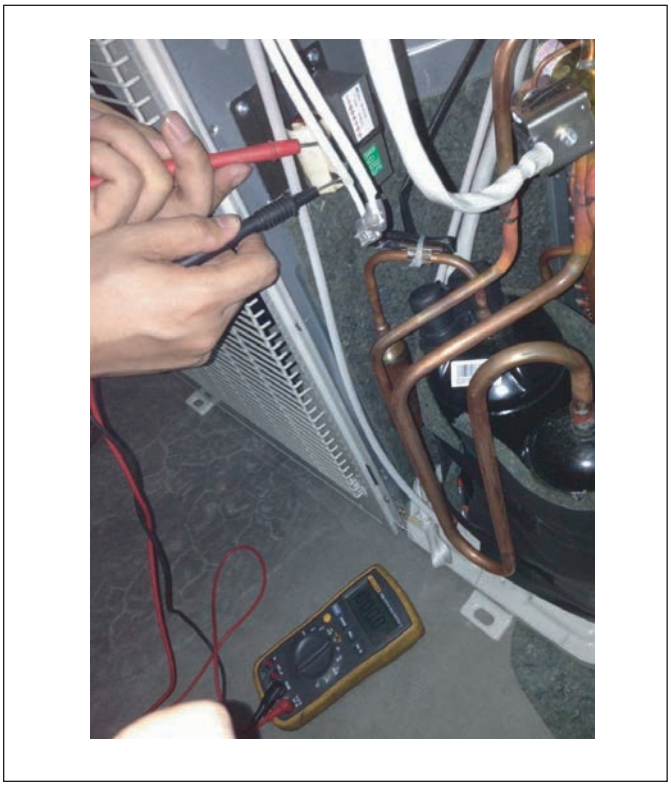


Figure 61

7.5.3 (EH 02) Zero crossing detection error

Error Code	EH 02
Malfunction decision conditions	When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.
Supposed causes	• Connection mistake • Indoor PCB faulty

Table 26

Troubleshooting:

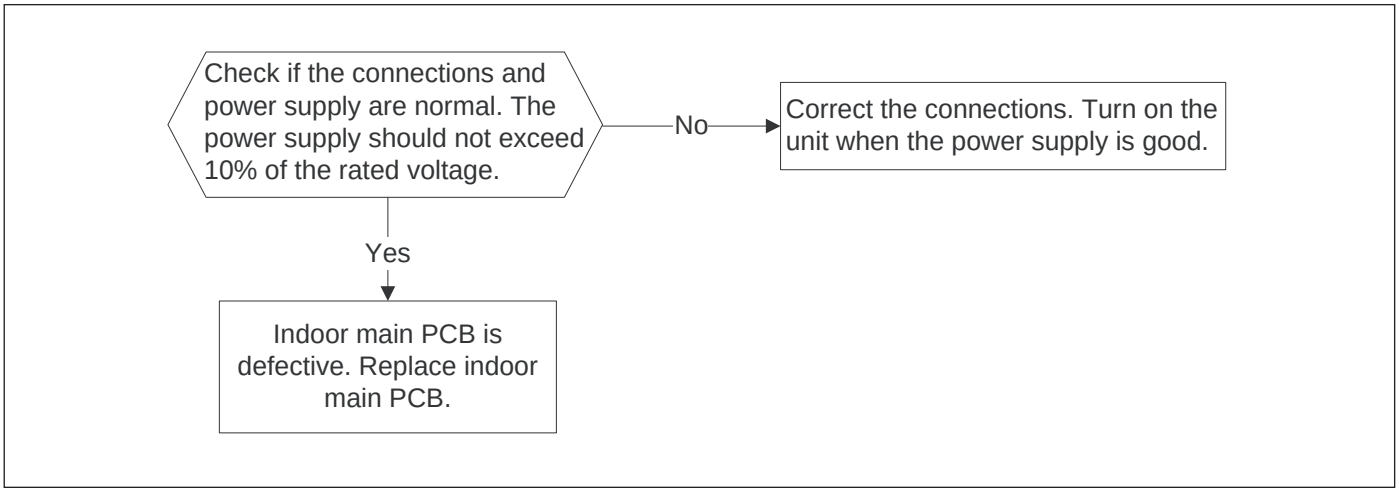


Figure 62

Zero crossing detection error is only valid for the unit with AC fan motor, for other models, this error is invalid

7.5.4 (EH 03 /EC 07) Fan speed has been out of control

Error Code	EH 03 (indoor) / EC 07 (outdoor)
Malfunction decision conditions	When indoor / outdoor fan speed is too low or too high for certain time, the unit will stop and the LED will display the failure.
Supposed causes	• Wiring mistake • Indoor / Outdoor Fan assembly faulty • Indoor / Outdoor Fan motor faulty • Indoor / Outdoor PCB faulty

Table 27

Troubleshooting:

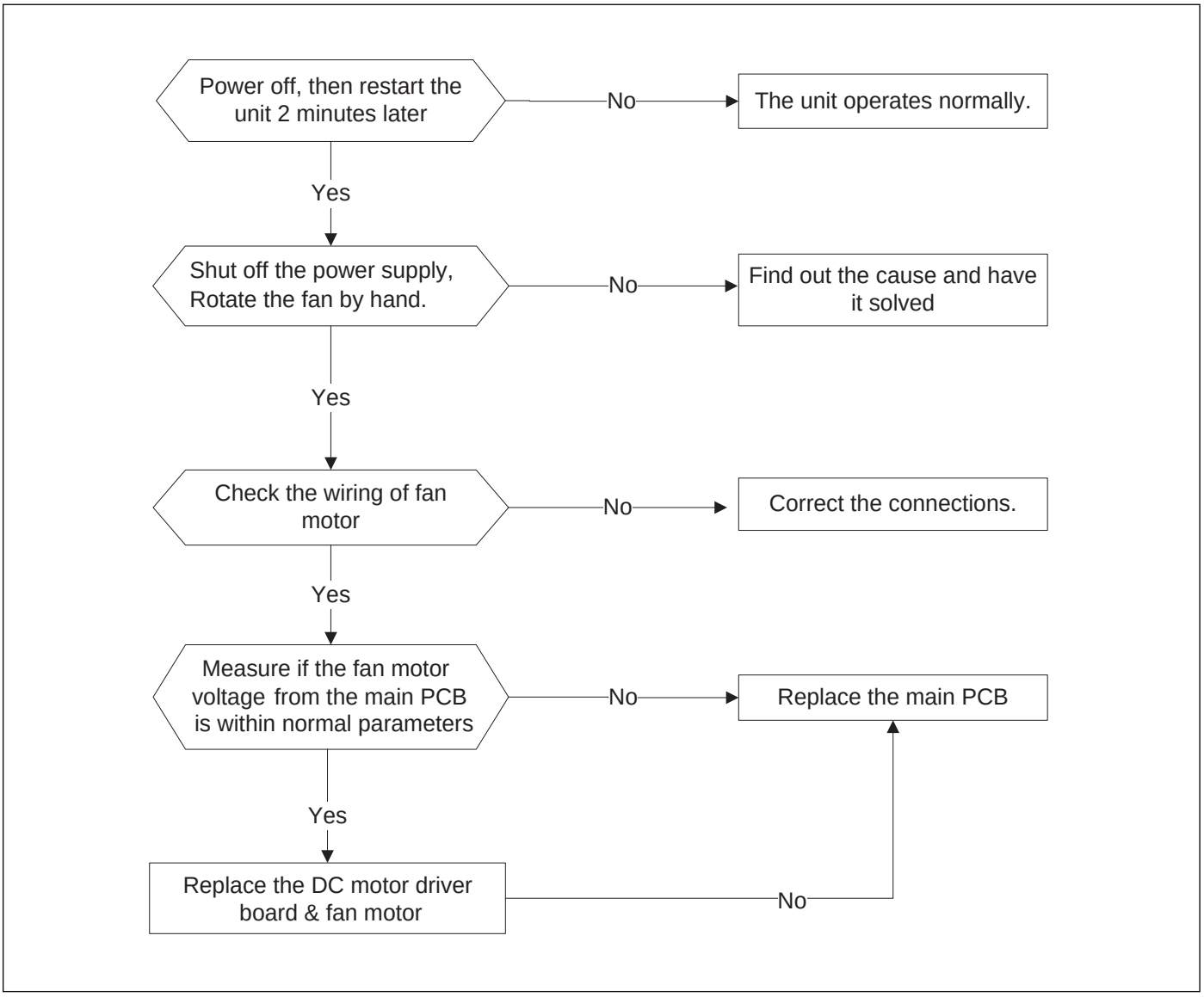


Figure 63

For certain models, outdoor PCB can not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

Index 1:

1. Indoor or Outdoor DC Fan Motor (control chip is in fan motor).Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must have problems and needs to be replaced.

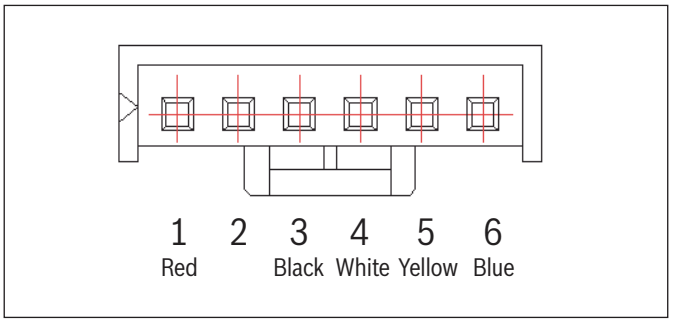


Figure 64

DC motor voltage input and output (voltage: 220-240V~)

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	280V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V

Table 28

DC motor voltage input and output (voltage :115V~)

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	140V~190V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V

Table 29

2. Outdoor DC Fan Motor (control chip is in outdoor PCB)

   Release the UVW connector. Measure the resistance of U-V, U-W and V-W. If the three values are not equal, the fan motor has a problem and needs to be replaced.

   Otherwise, replace the ODU PCB.

3. Indoor AC Fan Motor

   a. Power off and disconnect fan motor power cord from PCB. Measure the resistance value of each winding by using the multi-meter. The normal value show as follows:

Model	YKFG-13-4-38L YKFG-13-4-38L-4	YKFG-15-4-28-1	YKFG-20-4-1 0L	YKFG-20-4-5-11
Brand	Welling	Welling	Welling	Welling
Black - Red Main	345Ω	75Ω	269Ω	388Ω
Blue - Black AUX	348Ω	150Ω	224Ω	360Ω

Table 30

Model	YKFG-20-4-5-19	YKFG-25-4-6-14	YKFG-28-4-3-7 YKFG-28-4-3-14	YKFG-28-4-6-5
Brand	Welling	Welling	Welling	Welling
Black - Red Main	444Ω	287Ω	231Ω	183.6Ω
Blue - Black AUX	470Ω	409Ω	414Ω	206Ω

Table 31

Model	YKFG-45-4-13	YKFG-45-4-22 YKFG-45-4-22-13	YKFG-60-4-2-6	YKFG-60-4-1
Brand	Dongfang	Welling	Welling	Welling
Black - Red Main	125.2Ω	168Ω	96Ω	68Ω
Blue - Black AUX	83.8Ω	141Ω	96Ω	53Ω

Table 32

Model	YKFG-45-4-13
Brand	Dongfang
Black - Red Main	450Ω
Blue - Black AUX	442Ω

Table 33

   b. Power on and set the unit running in fan mode at high fan speed. After running for 15 seconds, measure the voltage of pin1 and pin2. If the value of the voltage is less than 1 OOV(208-240V power supply) or 50V (115V power supply), the PCB must has problems and need to be replaced.

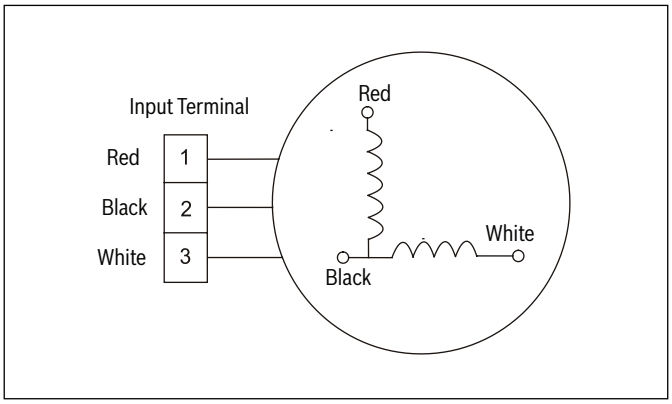


Figure 65

4. DC Fan Motor(for some double fan models)

Power on and when the unit is in standby, measure the voltage of CON1, pin1-pin2 and pin3-pin2 of CN1 in DC motor driver board. If the value of the voltage is not in the range showing in below tables, the outdoor main PCB must has problems and need to be replaced.

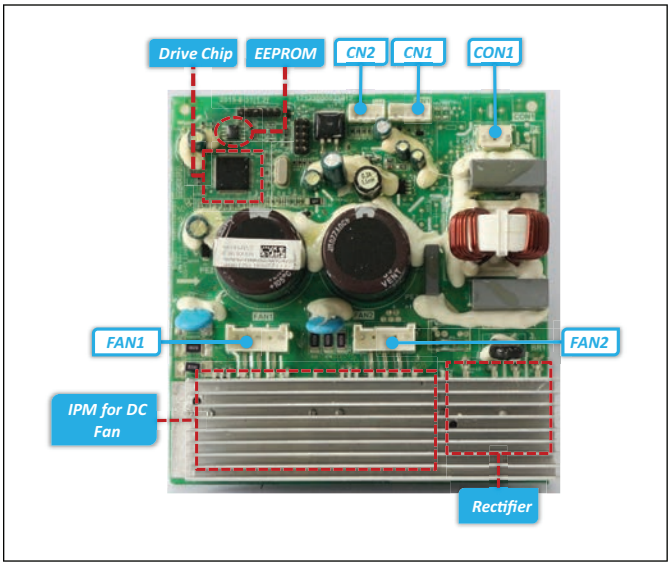


Figure 66

Part	Description	Parameter	Remark
CON1	Power input for the PCB	192-380V/DC	
CN1	Communication with main PCB	DC	
CN2	Test port	5V/DC	For debugging board
FAN1	UVW output for DC fan motor		
FAN2	UVW output for DC fan motor		

Table 34

CN1 Communication with main PCB

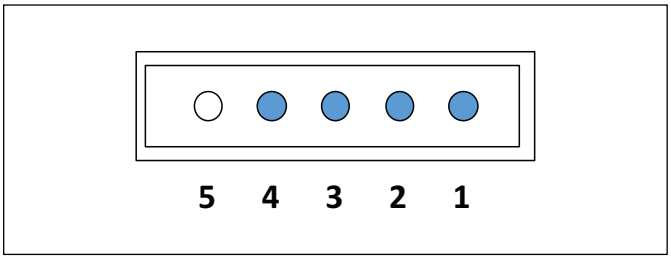


Figure 67

No.	Signal	Voltage
1	Vcc	13.5-16.5V
2	GND	0V
3	Vsp	0~6.5V
4	FG	13.5-16.5V
5	---	---

Table 35

7.5.5 (EC 52/EC 53/EC 54/EC 56/EH 60/EH61) Open circuit or short circuit of temperature sensor

Error Code	EC 52/EC 53/EC 54/EC 56/EH 60/EH61
Malfunction decision conditions	If the sampling voltage is lower than 0.06V DC or higher than 4.94V DC, the LED will display the failure.
Supposed causes	• Wiring mistake • Sensor faulty • Indoor / Outdoor PCB faulty

Table 36

Troubleshooting:

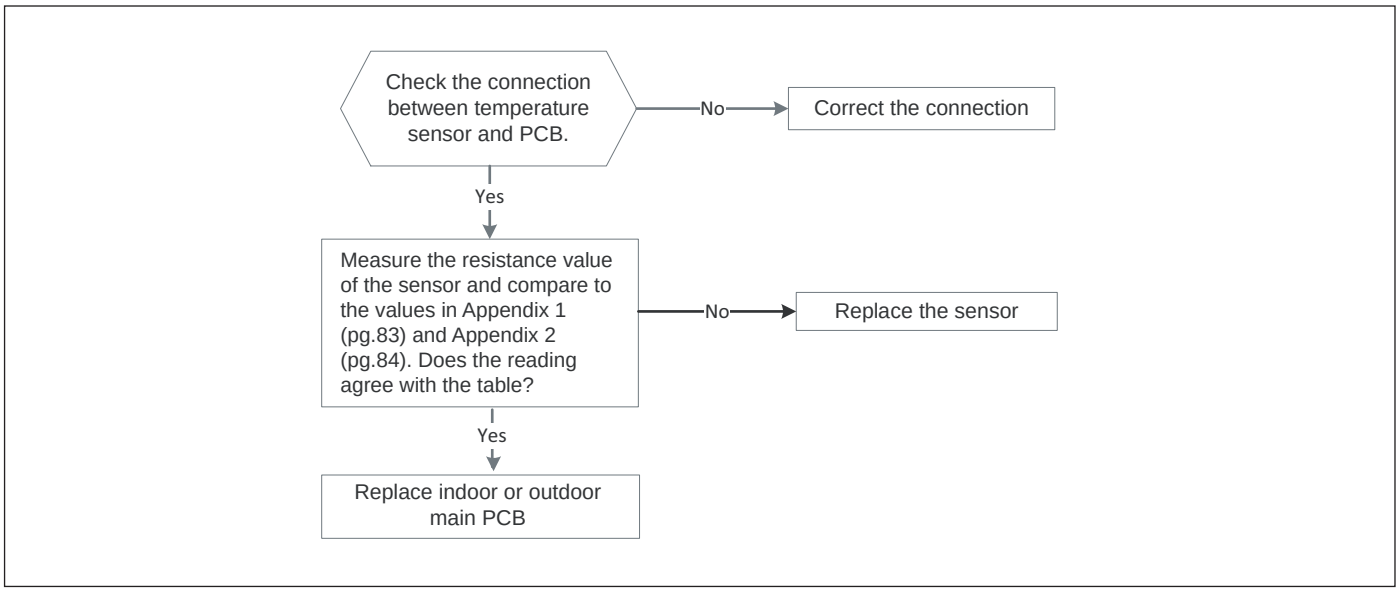


Figure 68

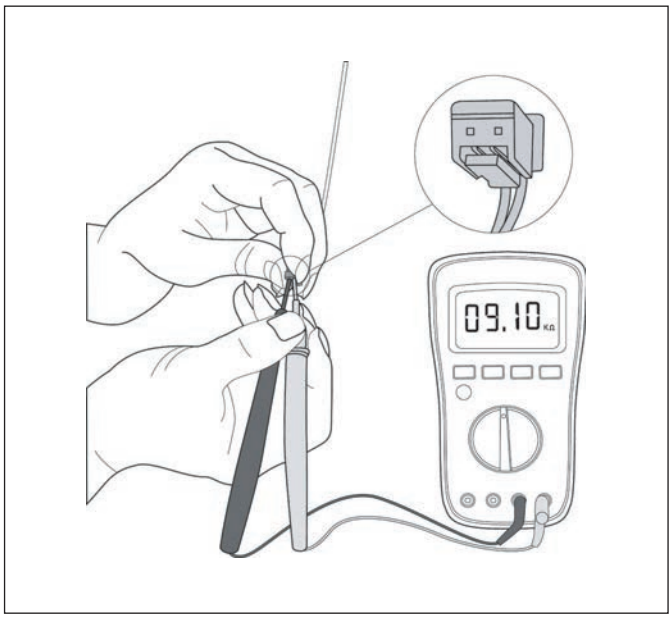


Figure 69

Some models, PCB could not removed separately, then entire outdoor electric control box should be replaced.

For certain models, outdoor unit uses combination sensor, T3,T4 and TP are the same of sensor.

7.5.6 (EL 0C) Refrigerant Leakage Detection

Error Code	EL 0C
Malfunction decision conditions	Judging the abnormality of the refrigeration system according to the number of compressor stops and the changes in operating parameters caused by excessive exhaust temperature.
Supposed causes	• T1 or T2 sensor faulty • Indoor PCB faulty • System problems, such as leakage or blocking

Table 37

Troubleshooting:

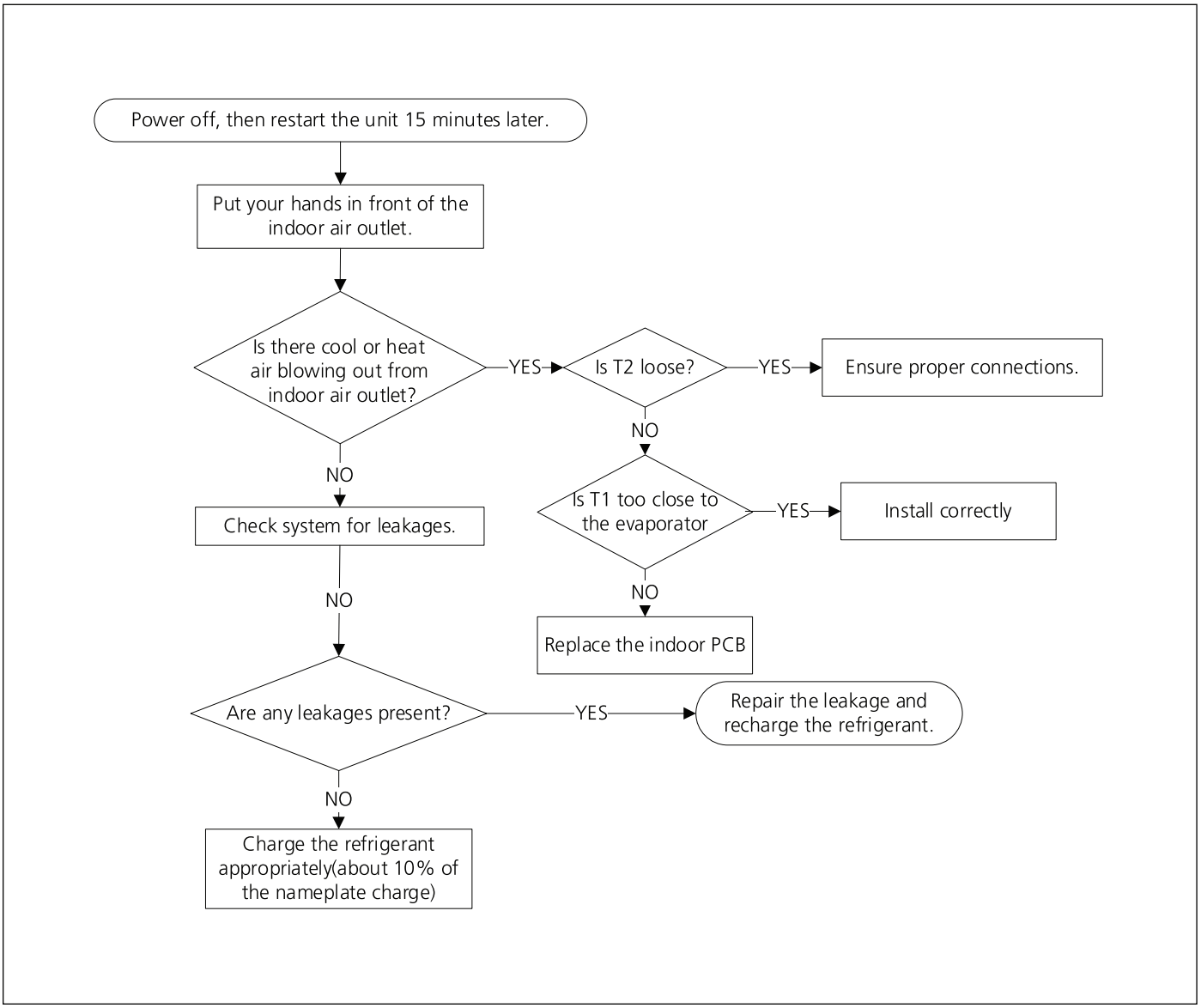


Figure 70

7.5.7 (EH 06) Indoor PCB / Display board communication error

Error Code	EH 06
Malfunction decision conditions	Indoor PCB does not receive feedback from the display board.
Supposed causes	• Wiring mistake • Display board faulty • Indoor PCB faulty

Table 38

Troubleshooting:

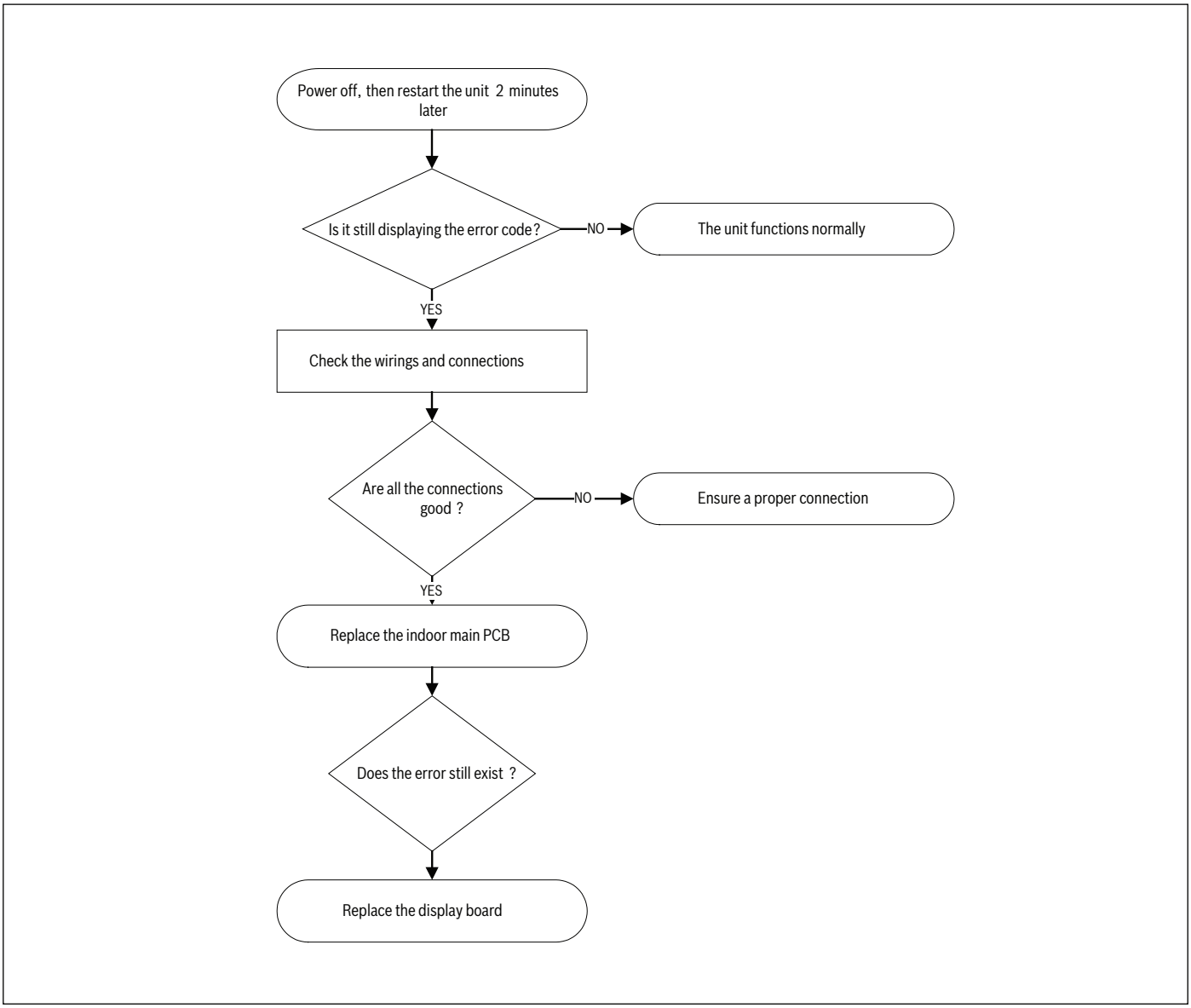


Figure 71

7.5.8 (PC 08) Overload current protection

Error Code	PC 08
Malfunction decision conditions	An abnormal current rise is detected by checking the specified current detection circuit.
Supposed causes	• Power supply problems • System blockage • Outdoor PCB faulty • Wiring mistake • Compressor malfunction

Table 39

Troubleshooting:

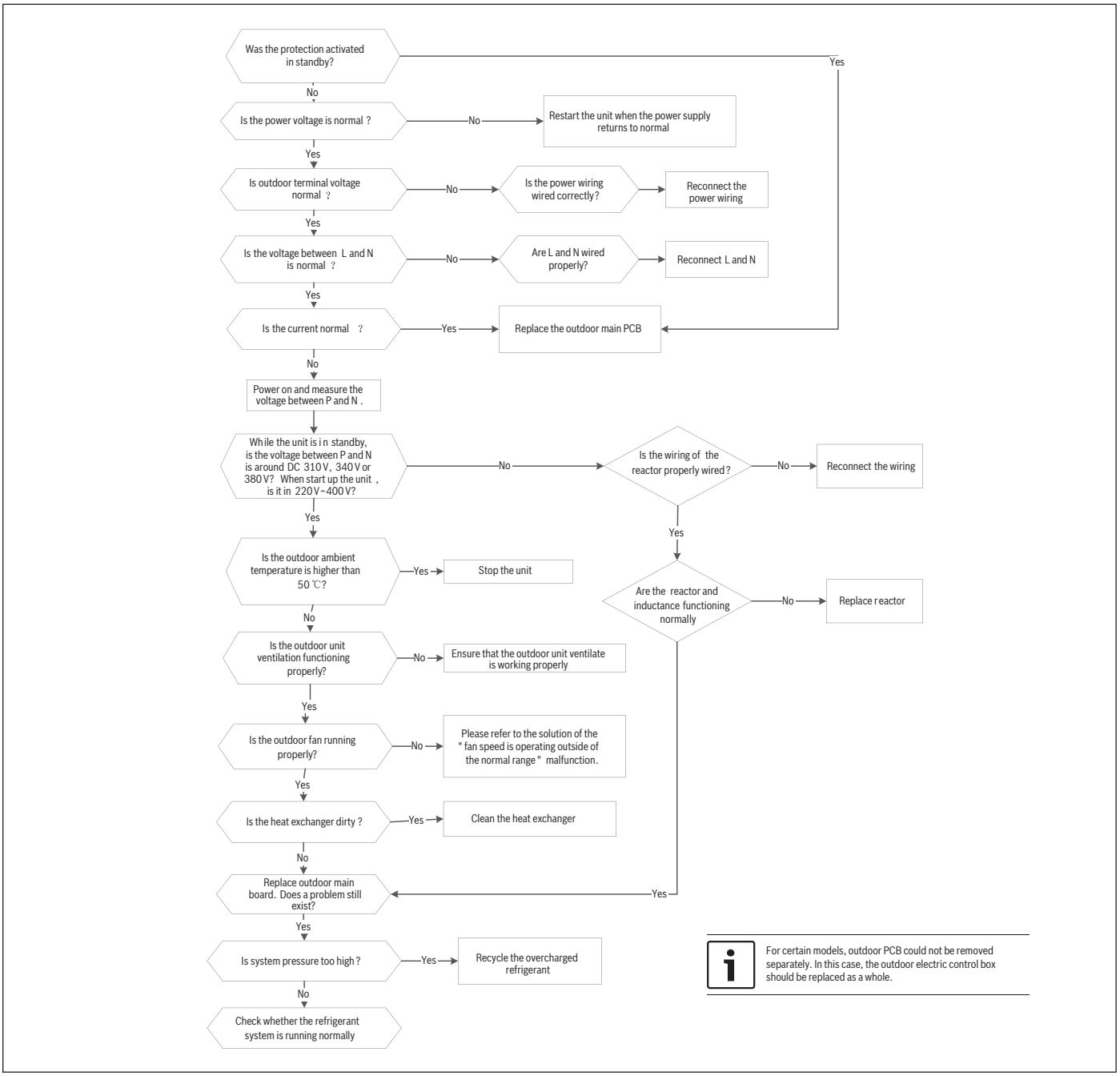


Figure 72

7.5.9 (PC 00) IPM malfunction or IGBT over-strong current protection

Error Code	PC 00
Malfunction decision conditions	When the voltage signal that IPM send to compressor drive chip is abnormal, the display LED will show the failure code and AC will turn off.
Supposed causes	• Wiring mistake • IPM malfunction • Outdoor fan assembly faulty • Compressor malfunction • Outdoor PCB faulty

Table 40

Troubleshooting:

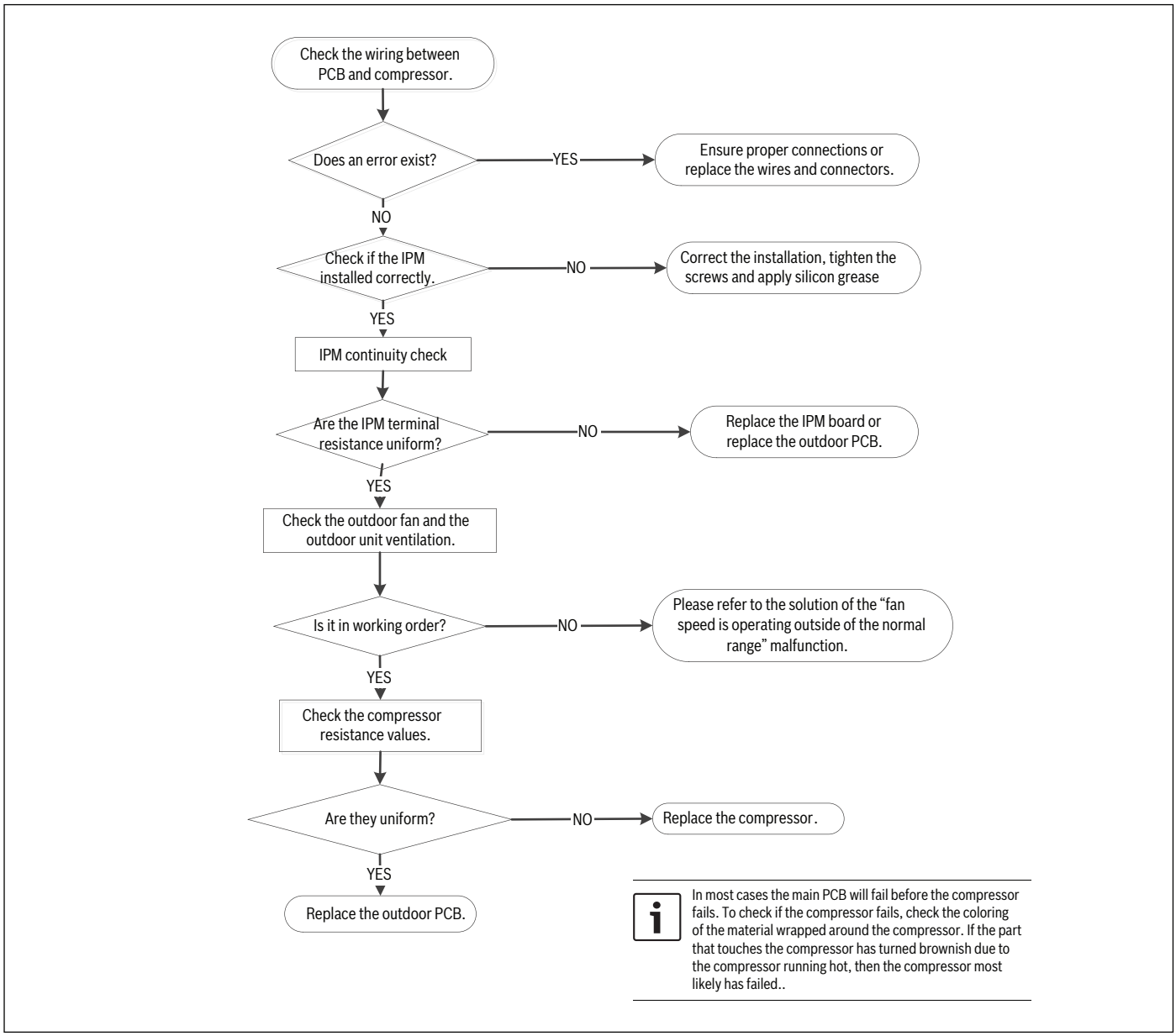


Figure 73

IPM Continuity Check

WARNING

Electrical Shock Hazard!

Electricity remains in capacitors even when the power supply is off.

Ensure the capacitors are fully discharged before troubleshooting.

1. Turn off outdoor unit and disconnect power supply.
2. Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
3. Disassemble outdoor PCB or disassemble IPM board.
4. Measure the resistance value between P and U(V, W, N); U(V, W) and N.

Digital tester		Resistance value	Digital tester		Resistance value
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ (Several MΩ)	U	N	∞ (Several MΩ)
	U		V		
	V		W		
	W		–		

Table 41

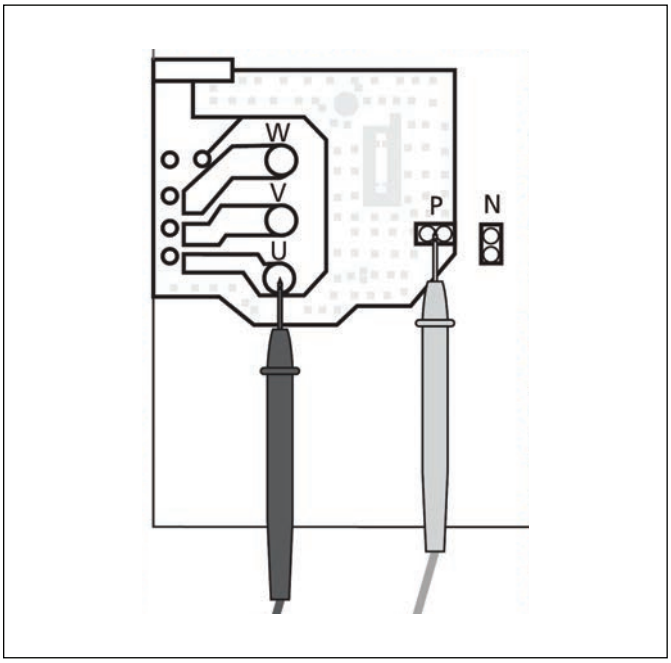


Figure 74

Compressor check

Disconnect the compressor and check the resistance between U-V, V-W and U-W, and all 3 values should be equal. If not, the compressor is faulty and should be replaced.

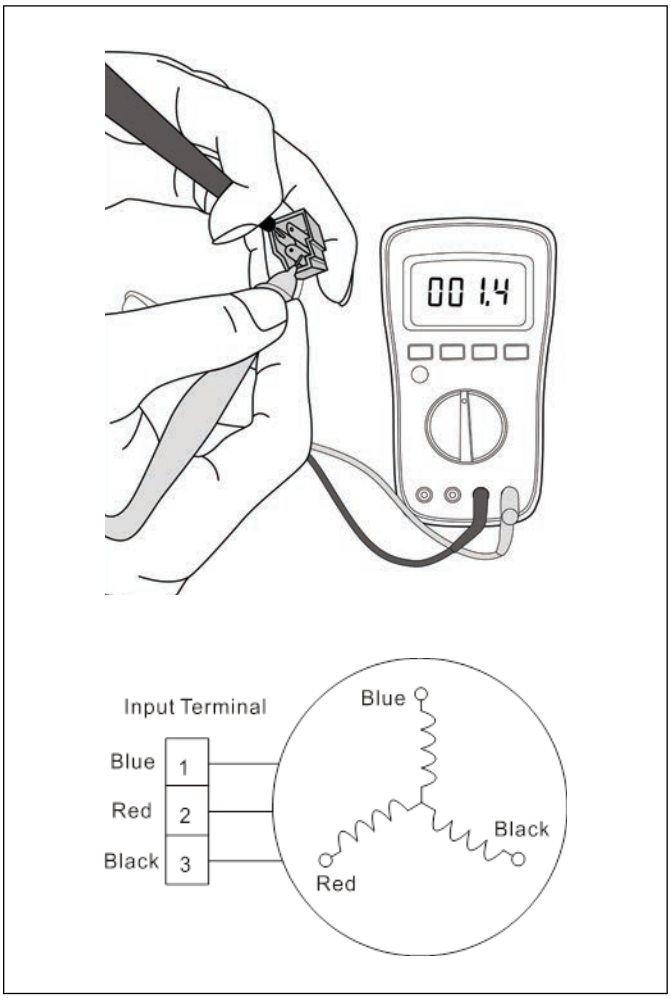


Figure 75

7.5.10 (PC 01) Over voltage or too low voltage protection

Error Code	PC 01
Malfunction decision conditions	An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.
Supposed causes	• Power supply problems • System leakage or block • Outdoor PCB faulty • Transformer

Table 42

Troubleshooting:

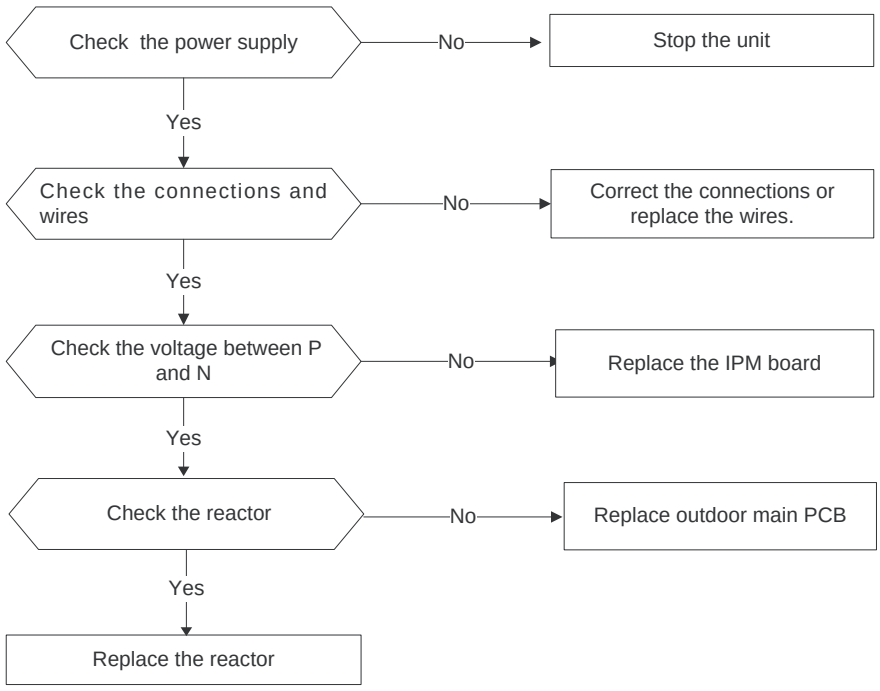


Figure 76

Measure the DC voltage between P and N port (Fig. 99). The normal value should be as shown below.

- When starting up the system, it is in 220V ~ 400V.
- When the system is in standby, 310V, 340V or 380V.

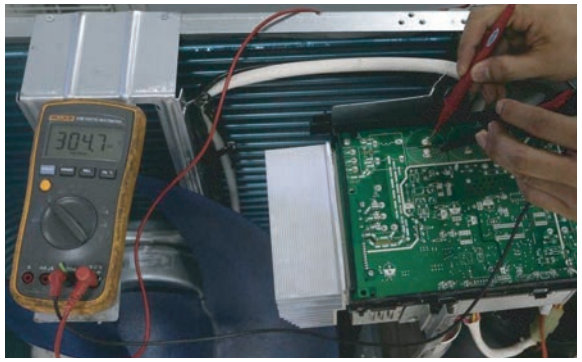


Figure 77

For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

7.5.11 (PC 02) Top temperature protection of compressor or High temperature protection of IPM module or High pressure protection

Error Code	PC 02
Malfunction decision conditions	For some models with overload protection, If the sampling voltage is not 5V, the LED will display the failure. If the temperature of IPM module is higher than a certain value, the LED displays the failure code. For some models with high pressure switch, outdoor pressure switch cut off the system because high pressure is higher than 4.4 MPa, the LED displays the failure code.
Supposed causes	• Installation mistake • Power supply problems • System leakage or block • Outdoor PCB faulty • Over load protector (OLP) faulty

Table 43

Troubleshooting:

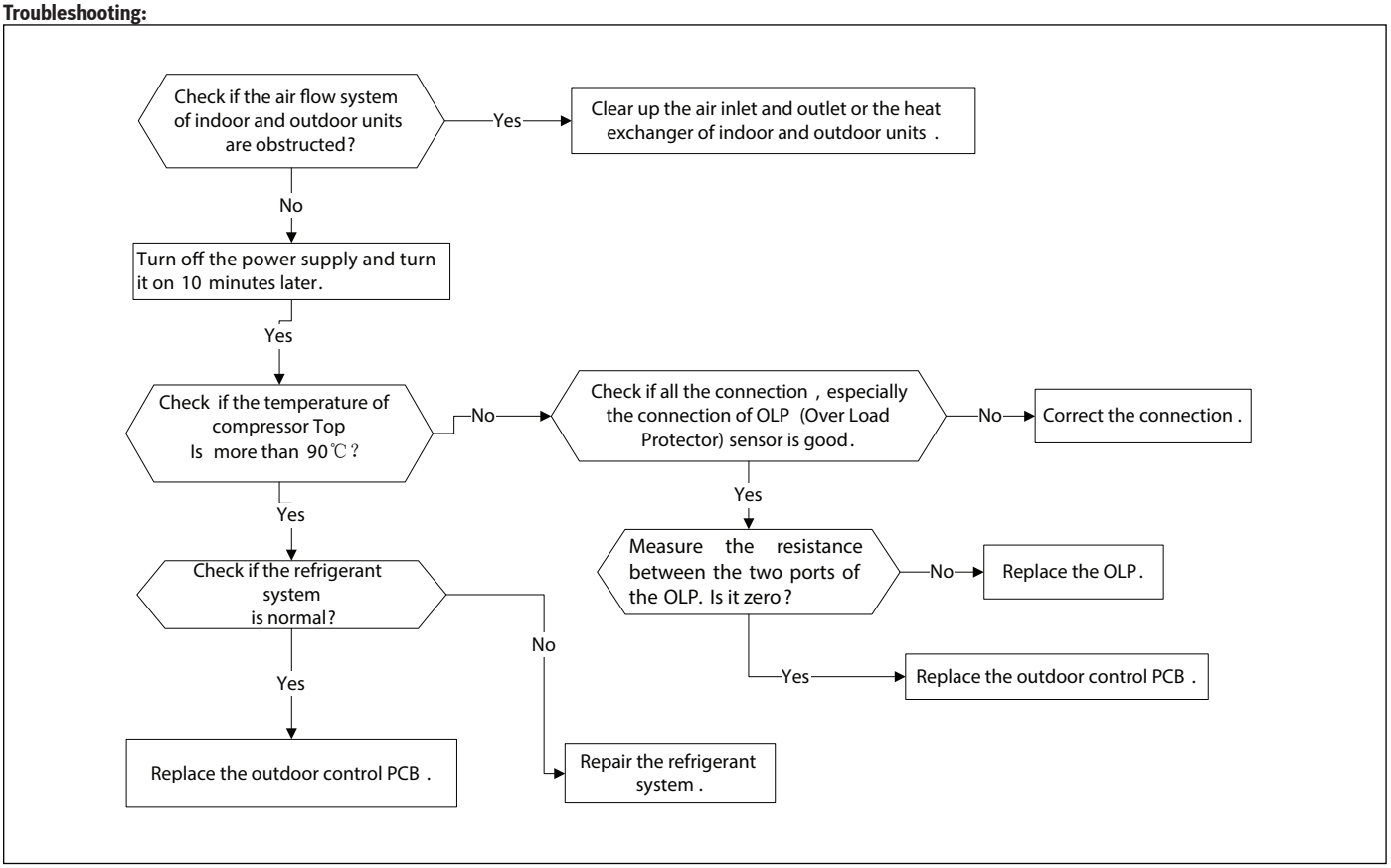


Figure 78

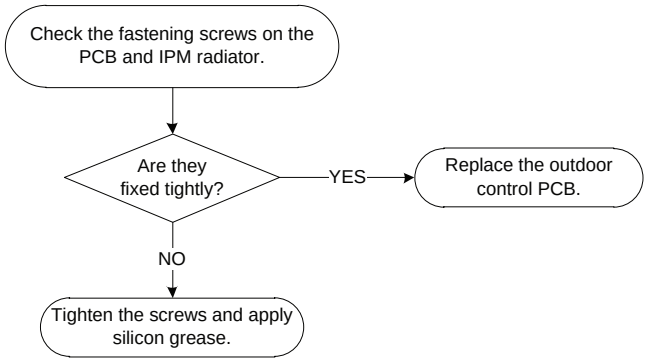


Figure 79

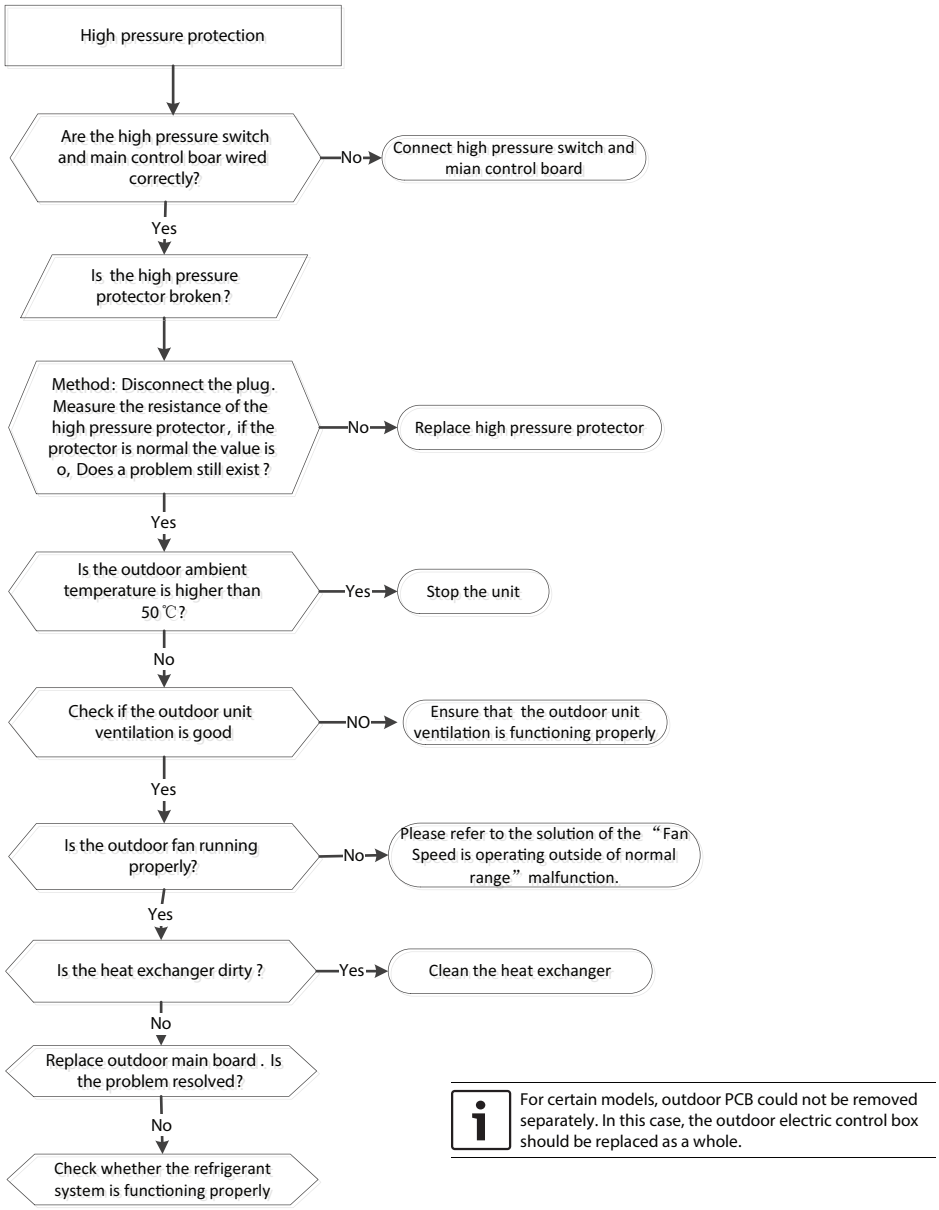


Figure 80

7.5.12 (PC 04) Inverter compressor drive error

Error Code	PC 04
Malfunction decision conditions	An abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.
Supposed causes	• Wiring mistake • IPM malfunction • Outdoor fan assembly faulty • Compressor malfunction • Outdoor PCB faulty

Table 44

Troubleshooting:

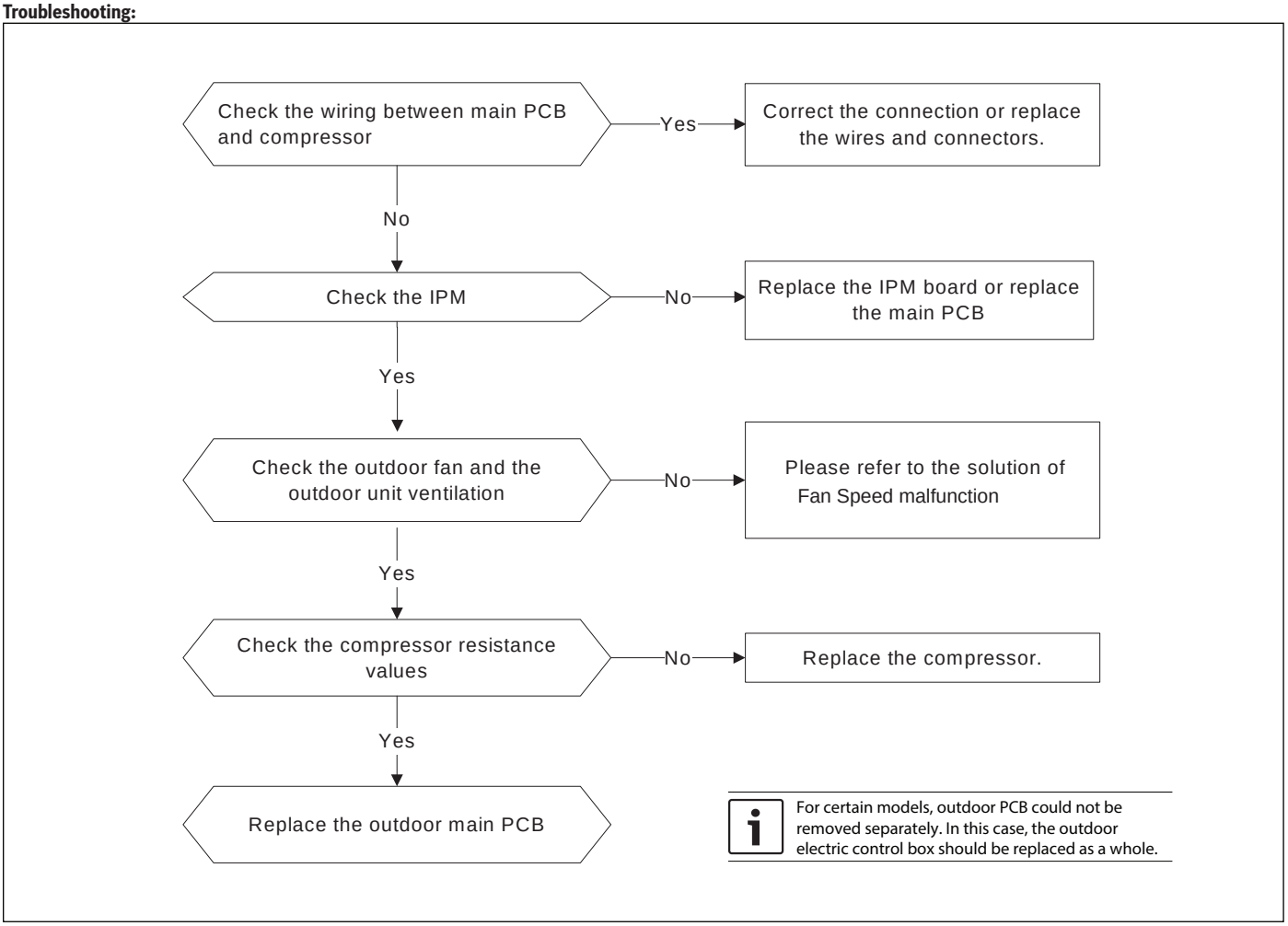


Figure 81

7.5.13 (PC 03) Low pressure protection

Error Code	PC 03
Malfunction decision conditions	Outdoor pressure switch cut off the system because low pressure is lower than 0.13 MPa, the LED displays the failure code.
Supposed causes	• Wiring mistake • Pressure protector faulty • Indoor fan motor faulty • Outdoor PCB faulty • Refrigerant leak

Table 45

Troubleshooting:

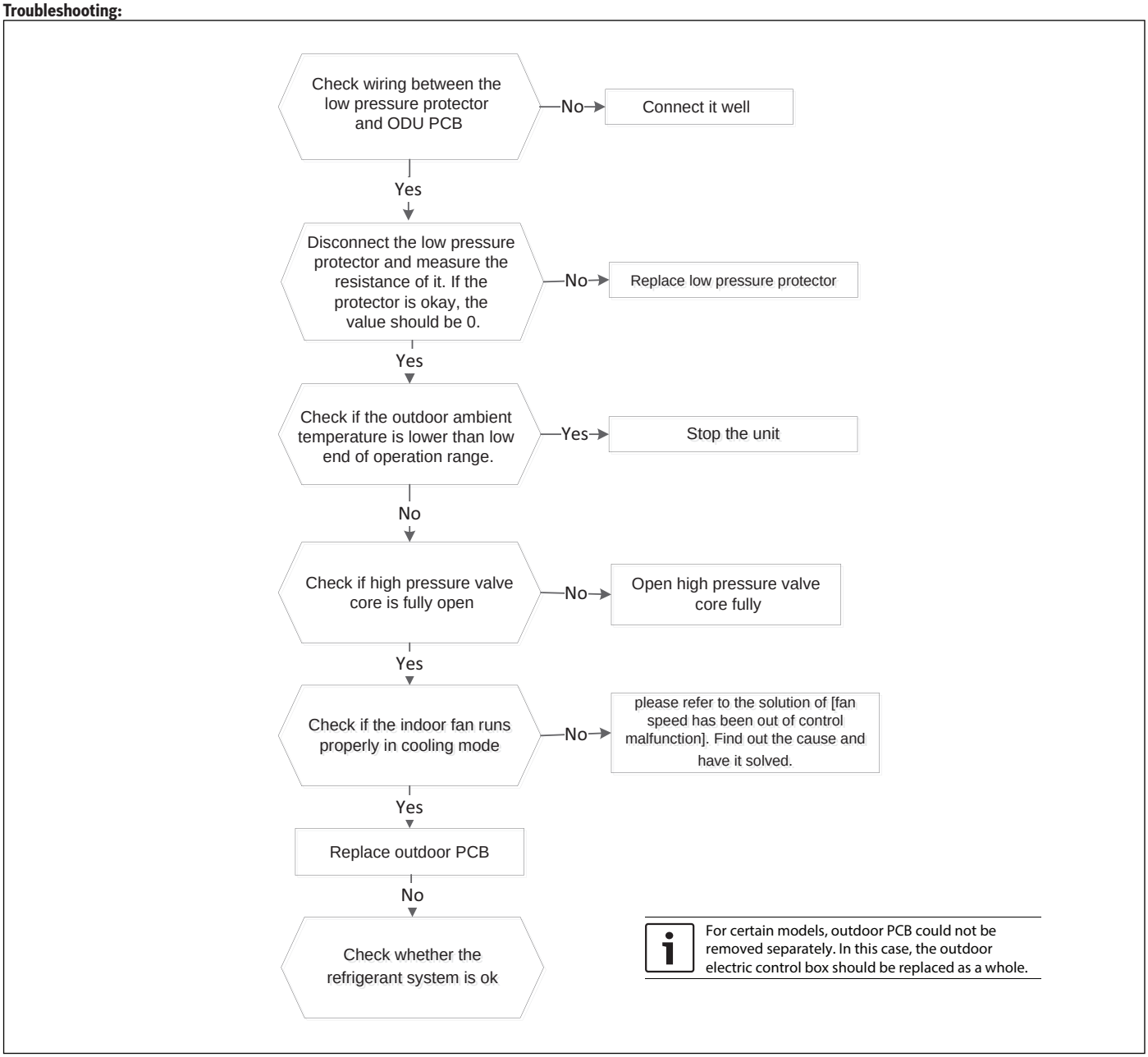


Figure 82

7.5.14 (PC 40) Communication error between outdoor unit main PCB and IPM control

Error Code	PC 40
Malfunction decision conditions	Communication error between outdoor PCB chip and compressor driven chip
Supposed causes	• Outdoor PCB faulty • Outdoor electric control box faulty

Table 46

Troubleshooting:

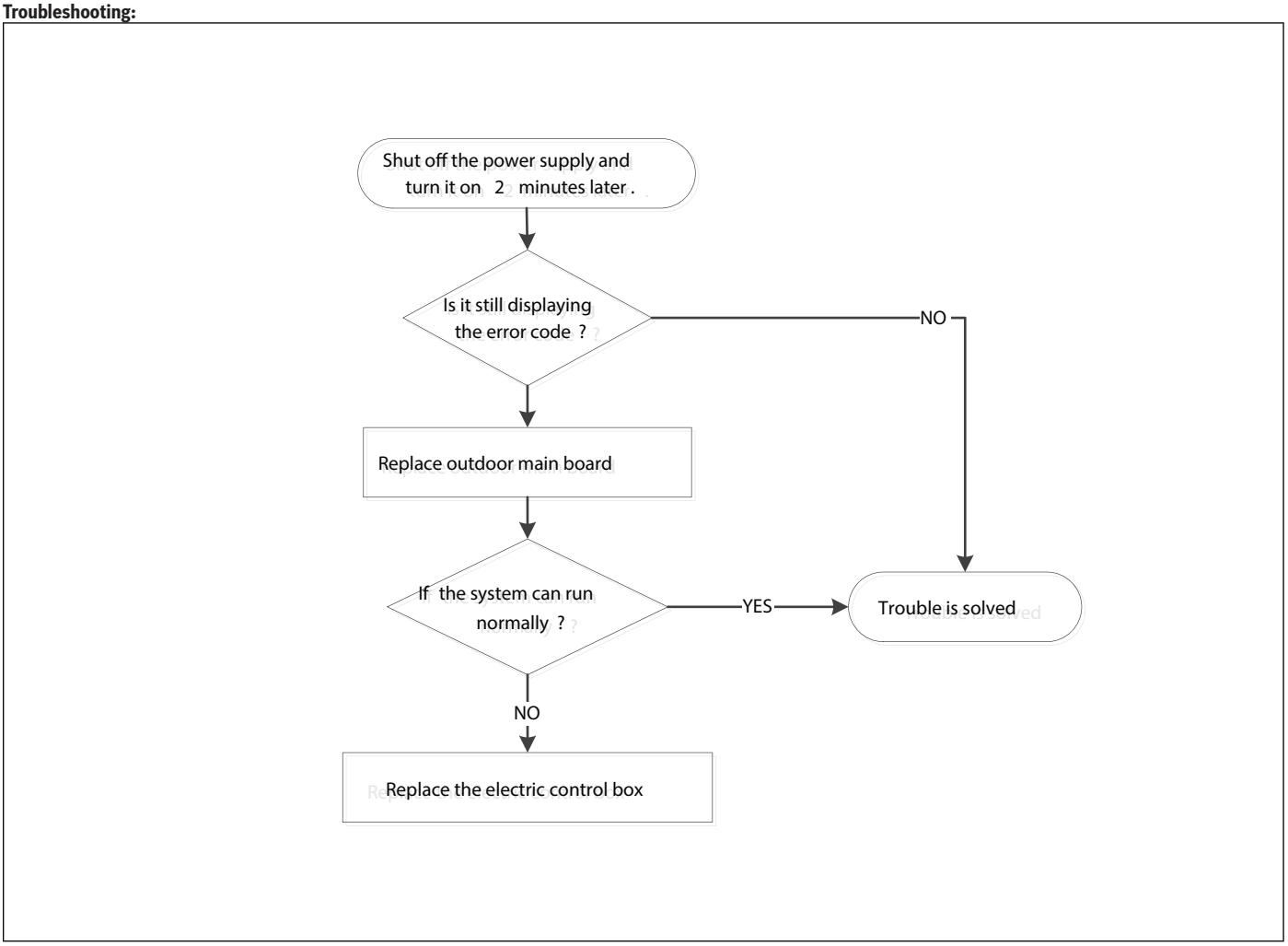


Figure 83

7.5.15 Main Parts Check

Temperature sensor check

WARNING

Electrical hazard!

Be sure to turn off all power supplies or disconnect all wires to avoid electric shock.

WARNING

Personal injury!

Operate after compressor and coil have returned to normal temperature in case of injury.

1. Disconnect the temperature sensor from PCB.
2. Measure the resistance value of the sensor using a multi-meter.
3. Check corresponding temperature sensor resistance value table.

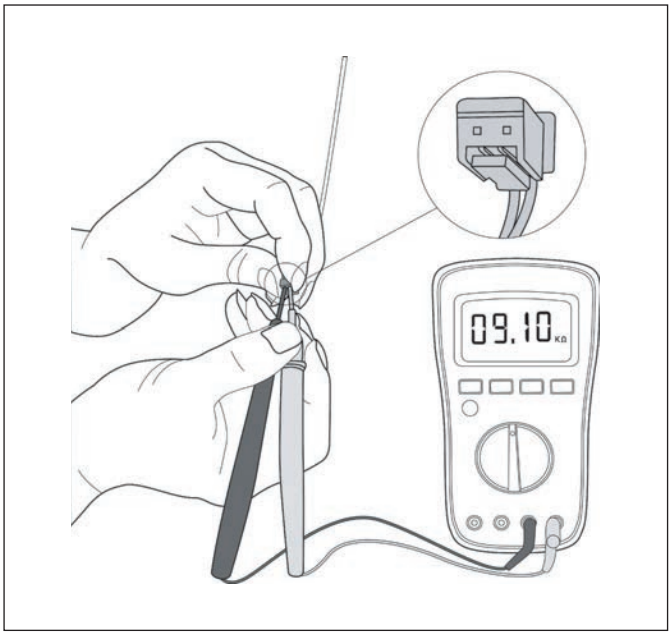


Figure 84

The picture and the value are only for reference, actual condition and specific value may vary.

Appendix 1 Resistance to Temperature value table for resistive sensors:
T1,T2,T3,T4 (°C/K Ohm)

℃	℉	K Ohm	℃	℉	K Ohm	℃	℉	K Ohm	℃	℉	K Ohm
-20	-4	115.266	20	68	12.6431	60	140	2.35774	100	212	0.62973
-19	-2	108.146	21	70	12.0561	61	142	2.27249	101	214	0.61148
-18	0	101.517	22	72	11.5	62	144	2.19073	102	216	0.59386
-17	1	96.3423	23	73	10.9731	63	145	2.11241	103	217	0.57683
-16	3	89.5865	24	75	10.4736	64	147	2.03732	104	219	0.56038
-15	5	84.219	25	77	10	65	149	1.96532	105	221	0.54448
-14	7	79.311	26	79	9.55074	66	151	1.89627	106	223	0.52912
-13	9	74.536	27	81	9.12445	67	153	1.83003	107	225	0.51426
-12	10	70.1698	28	82	8.71983	68	154	1.76647	108	226	0.49989
-11	12	66.0898	29	84	8.33566	69	156	1.70547	109	228	0.486
-10	14	62.2756	30	86	7.97078	70	158	1.64691	110	230	0.47256
-9	16	58.7079	31	88	7.62411	71	160	1.59068	111	232	0.45957
-8	18	56.3694	32	90	7.29464	72	162	1.53668	112	234	0.44699
-7	19	52.2438	33	91	6.98142	73	163	1.48481	113	235	0.43482
-6	21	49.3161	34	93	6.68355	74	165	1.43498	114	237	0.42304
-5	23	46.5725	35	95	6.40021	75	167	1.38703	115	239	0.41164
-4	25	44	36	97	6.13059	76	169	1.34105	116	241	0.4006
-3	27	41.5878	37	99	5.87359	77	171	1.29078	117	243	0.38991
-2	28	39.8239	38	100	5.62961	78	172	1.25423	118	244	0.37956
-1	30	37.1988	39	102	5.39689	79	174	1.2133	119	246	0.36954
0	32	35.2024	40	104	5.17519	80	176	1.17393	120	248	0.35982
1	34	33.3269	41	106	4.96392	81	178	1.13604	121	250	0.35042
2	36	31.5635	42	108	4.76253	82	180	1.09958	122	252	0.3413
3	37	29.9058	43	109	4.5705	83	181	1.06448	123	253	0.33246
4	39	28.3459	44	111	4.38736	84	183	1.03069	124	255	0.3239
5	41	26.8778	45	113	4.21263	85	185	0.99815	125	257	0.31559
6	43	25.4954	46	115	4.04589	86	187	0.96681	126	259	0.30754
7	45	24.1932	47	117	3.88673	87	189	0.93662	127	261	0.29974
8	46	22.5662	48	118	3.73476	88	190	0.90753	128	262	0.29216
9	48	21.8094	49	120	3.58962	89	192	0.8795	129	264	0.28482
10	50	20.7184	50	122	3.45097	90	194	0.85248	130	266	0.2777
11	52	19.6891	51	124	3.31847	91	196	0.82643	131	268	0.27078
12	54	18.7177	52	126	3.19183	92	198	0.80132	132	270	0.26408
13	55	17.8005	53	127	3.07075	93	199	0.77709	133	271	0.25757
14	57	16.9341	54	129	2.95896	94	201	0.75373	134	273	0.25125
15	59	16.1156	55	131	2.84421	95	203	0.73119	135	275	0.24512
16	61	15.3418	56	133	2.73823	96	205	0.70944	136	277	0.23916
17	63	14.6181	57	135	2.63682	97	207	0.68844	137	279	0.23338
18	64	13.918	58	136	2.53973	98	208	0.66818	138	280	0.22776
19	66	13.2631	59	138	2.44677	99	210	0.64862	139	282	0.22231

Table 47

Appendix 2 Resistance to Temperature value table for resistive sensors: T5 (°C/K Ohm)

℃	℉	K Ohm	℃	℉	K Ohm	℃	℉	K Ohm	℃	℉	K Ohm
-20	-4	542.7	20	68	68.66	60	140	13.59	100	212	3.702
-19	-2	511.9	21	70	65.62	61	142	13.11	101	214	3.595
-18	0	483	22	72	62.73	62	144	12.65	102	216	3.492
-17	1	455.9	23	73	59.98	63	145	12.21	103	217	3.392
-16	3	430.5	24	75	57.37	64	147	11.79	104	219	3.296
-15	5	406.7	25	77	54.89	65	149	11.38	105	221	3.203
-14	7	384.3	26	79	52.53	66	151	10.99	106	223	3.113
-13	9	363.3	27	81	50.28	67	153	10.61	107	225	3.025
-12	10	343.6	28	82	48.14	68	154	10.25	108	226	2.941
-11	12	325.1	29	84	46.11	69	156	9.902	109	228	2.86
-10	14	307.7	30	86	44.17	70	158	9.569	110	230	2.781
-9	16	291.3	31	88	42.33	71	160	9.248	111	232	2.704
-8	18	275.9	32	90	40.57	72	162	8.94	112	234	2.63
-7	19	261.4	33	91	38.89	73	163	8.643	113	235	2.559
-6	21	247.8	34	93	37.3	74	165	8.358	114	237	2.489
-5	23	234.9	35	95	35.78	75	167	8.084	115	239	2.422
-4	25	222.8	36	97	34.32	76	169	7.82	116	241	2.357
-3	27	211.4	37	99	32.94	77	171	7.566	117	243	2.294
-2	28	200.7	38	100	31.62	78	172	7.321	118	244	2.233
-1	30	190.5	39	102	30.36	79	174	7.086	119	246	2.174
0	32	180.9	40	104	29.15	80	176	6.859	120	248	2.117
1	34	171.9	41	106	28	81	178	6.641	121	250	2.061
2	36	163.3	42	108	26.9	82	180	6.43	122	252	2.007
3	37	155.2	43	109	25.86	83	181	6.228	123	253	1.955
4	39	147.6	44	111	24.85	84	183	6.033	124	255	1.905
5	41	140.4	45	113	23.89	85	185	5.844	125	257	1.856
6	43	133.5	46	115	22.89	86	187	5.663	126	259	1.808
7	45	127.1	47	117	22.1	87	189	5.488	127	261	1.762
8	46	121	48	118	21.26	88	190	5.32	128	262	1.717
9	48	115.2	49	120	20.46	89	192	5.157	129	264	1.674
10	50	109.8	50	122	19.69	90	194	5	130	266	1.632
11	52	104.6	51	124	18.96	91	196	4.849			
12	54	99.69	52	126	18.26	92	198	4.703			
13	55	95.05	53	127	17.58	93	199	4.562			
14	57	90.66	54	129	16.94	94	201	4.426			
15	59	86.49	55	131	16.32	95	203	4.294			
16	61	82.54	56	133	15.73	96	205	4.167			
17	63	78.79	57	135	15.16	97	207	4.045			
18	64	75.24	58	136	14.62	98	208	3.927			
19	66	71.86	59	138	14.09	99	210	3.812			

Table 48

Compressor check

Measure the resistance value of each winding by using the tester.

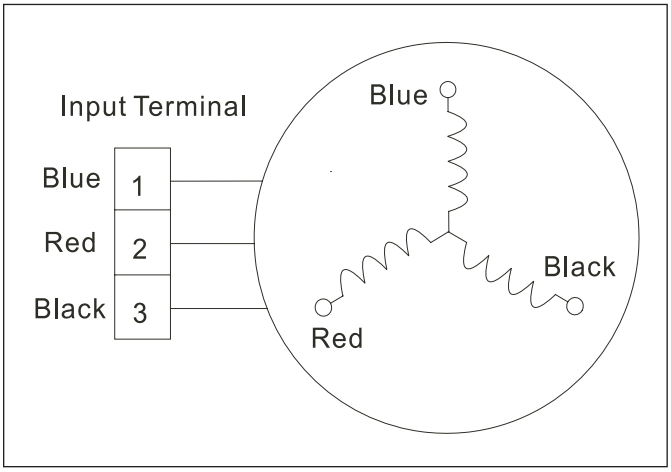


Figure 85

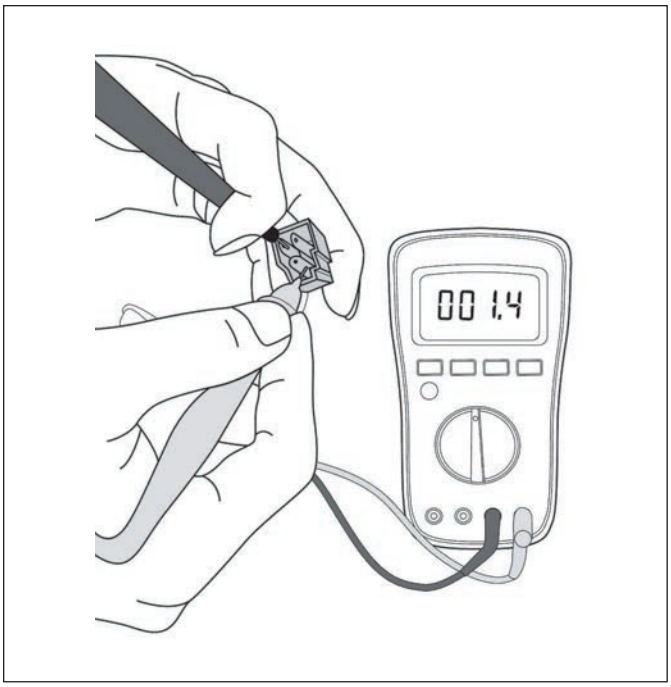


Figure 86

IPM continuity check

WARNING

Electrical hazard!

Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before trouble shooting.

Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

Digital tester		Normal resistance value	Digital tester		Normal resistance value
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ (Several MΩ)	U	N	∞ (Several MΩ)
	U		V		
	V		W		
	W		(+)Red		

Table 49

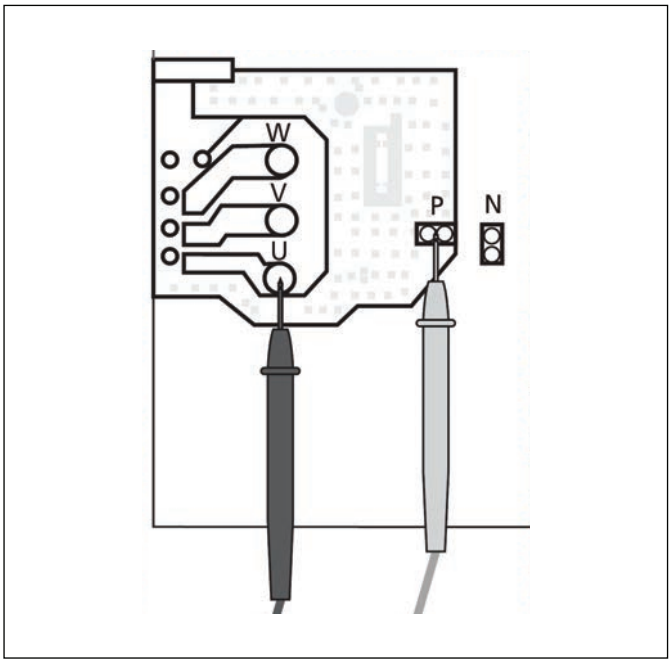


Figure 87

EXV Check

WARNING

Electrical shock hazard!

- Electricity remains in capacitors even when the power supply is off.
- Ensure the capacitors are fully discharged before troubleshooting.

1. Disconnect the connector from outdoor PCB.
2. Measure the resistance value of each winding using a multi-meter.

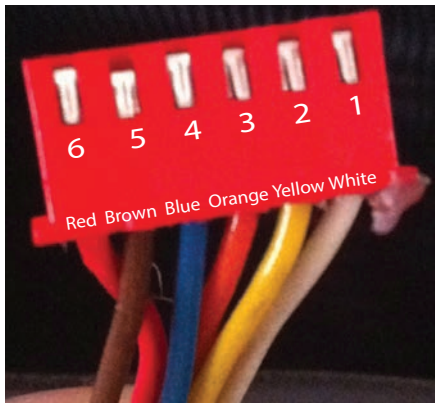


Figure 88

3. Check the resistance value of each winding in the following table.

Color of lead winding	Normal Value
Red - Blue	About 50Ω
Red - Yellow	
Brown - Orange	
Brown - White	

Table 50

8 Disassembly Guide

This part is for reference, the images may have slight differences with your machine.

8.1 Indoor Unit - Low Static Ducted Unit

8.1.1 Electrical Parts

1. Remove 5 screws of the cover of electronic control box and then remove the cover.

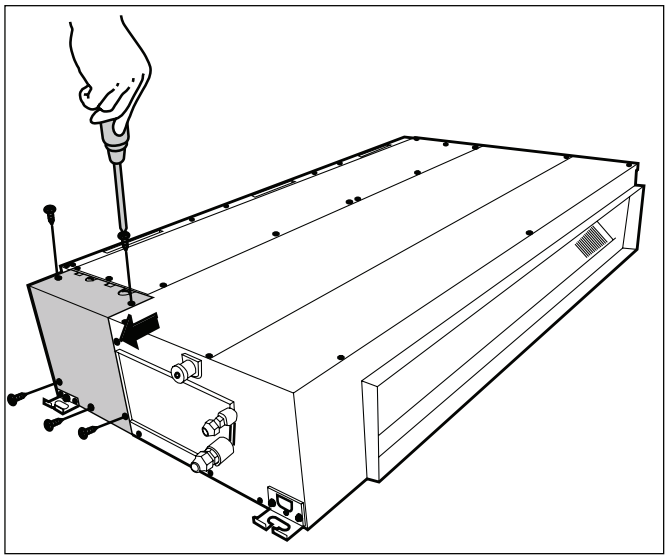


Figure 89

2. Remove 2 screws of the electronic control box. Then release 2 hooks of the main control board.

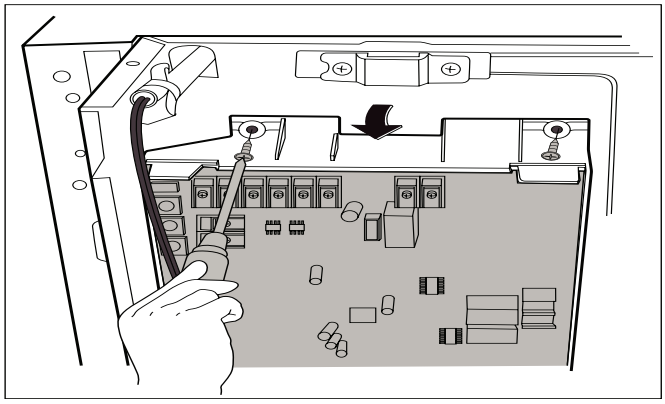


Figure 90

3. Disconnect the connectors and then remove the front main control board.

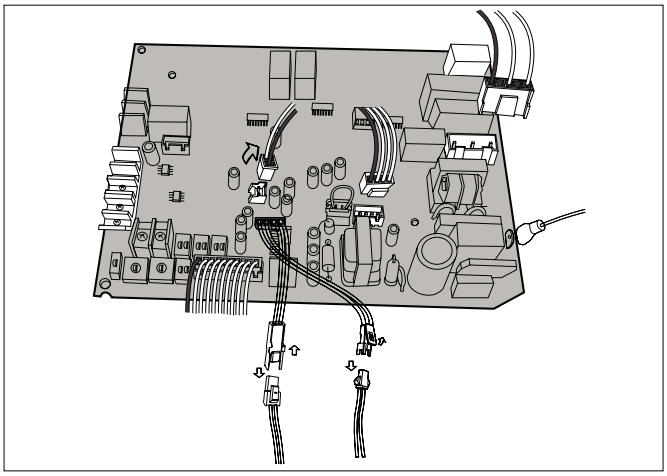


Figure 91

4. Turn over the electronic control box. Disconnect the connectors and remove 2 screws of rear main control board.

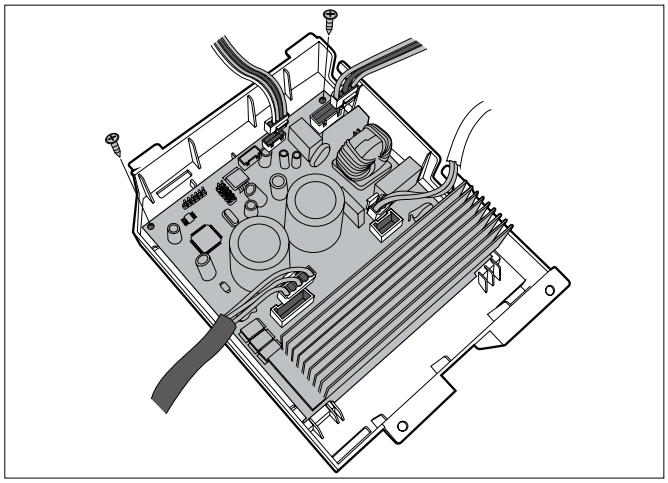


Figure 92

5. Remove 2 screws of reactor and remove the reactor.

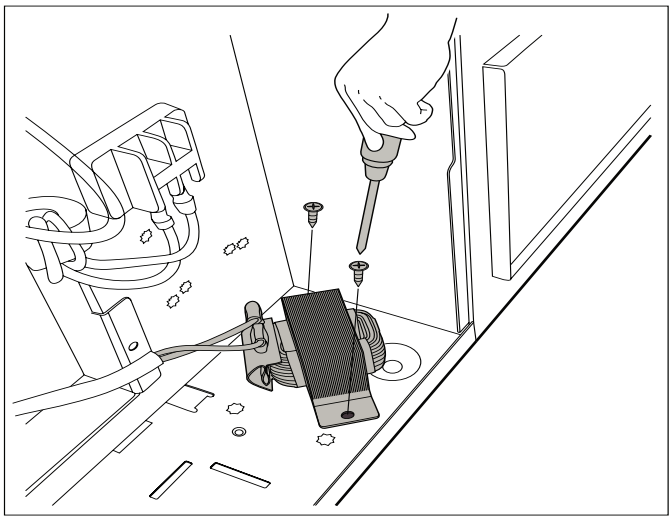


Figure 93

Fan motor and fan

6. Remove 10 screws of the top cover and then remove the top cover.

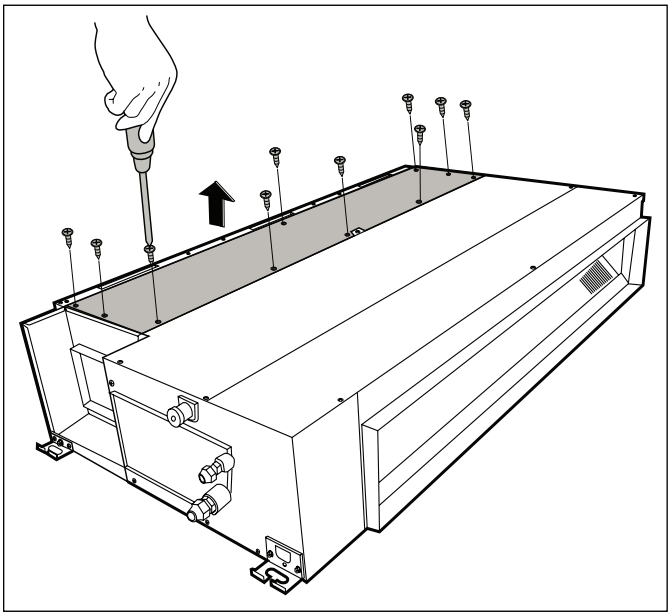


Figure 94

7. Release 3 hooks of volute Shell.

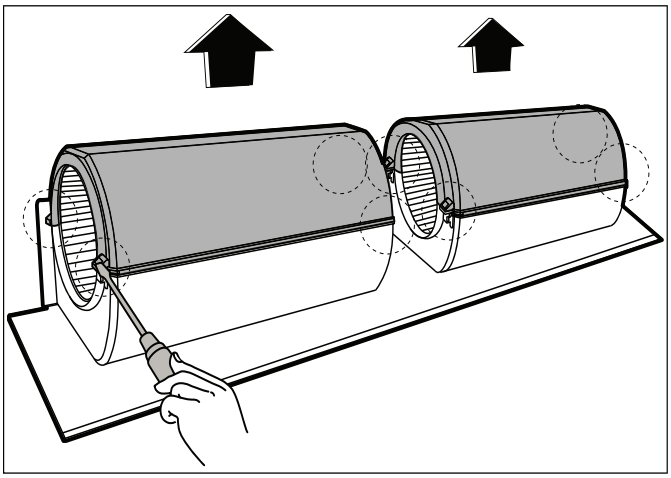


Figure 95

8. Remove the fitting screws of fan.

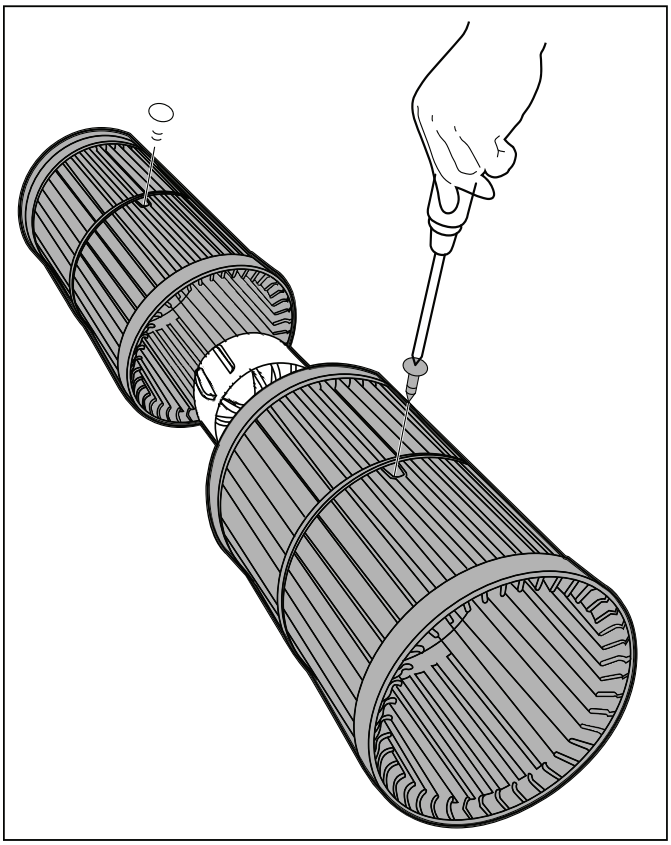


Figure 96

Evaporator

1. Remove 9 Screws of the water collecterand remove the water collecter.

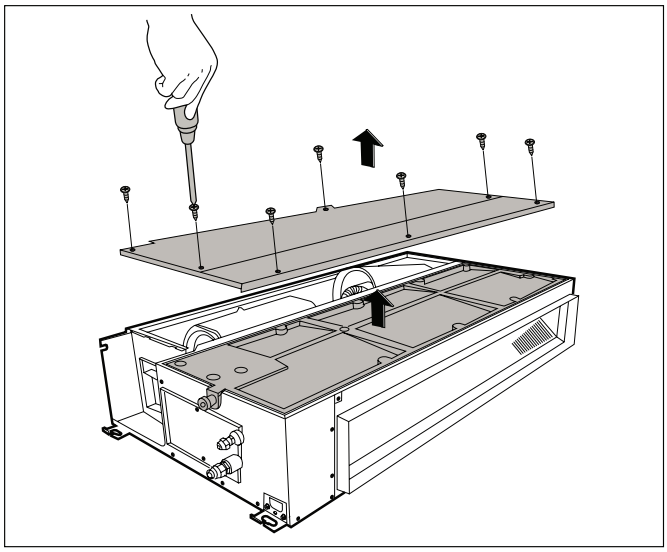


Figure 97

2. Remove the screws of the pipe clamp board and the left side board (3 for the pipe clamp and 9 for left side board).
3. Remove 2 screws and remove the refrigerant sensor.

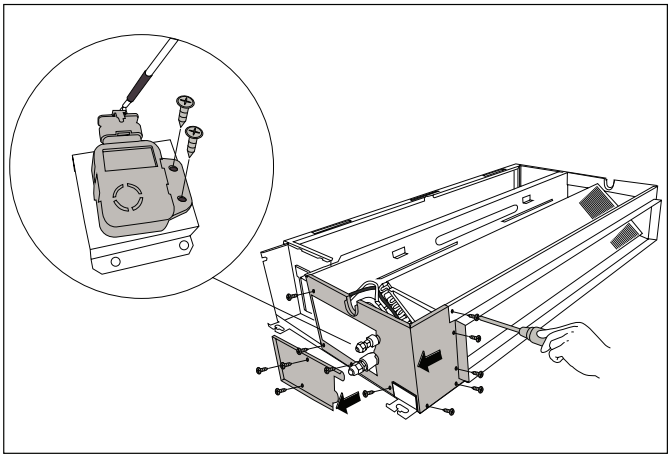


Figure 98

4. Remove 2 screws of the evaporator support and then pull up the temperature sensor.

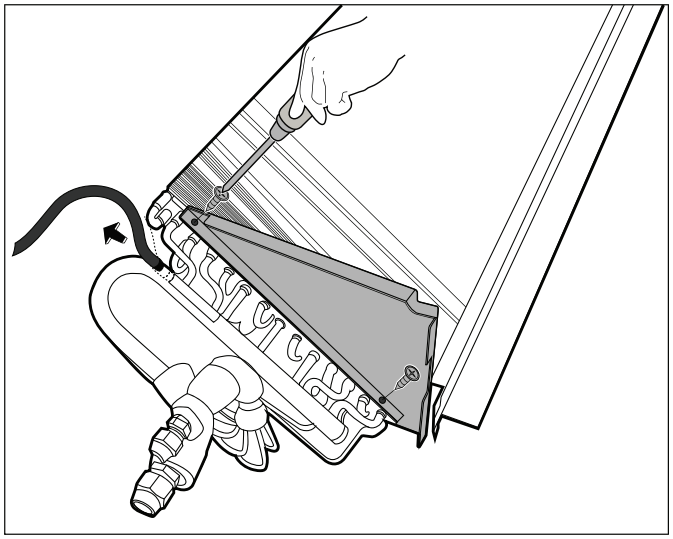


Figure 99

5. Remove the screw of the evaporator and then remove it.

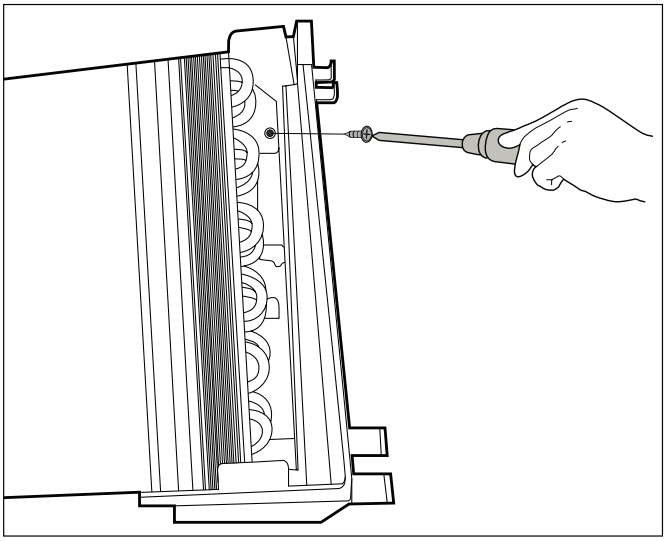


Figure 100

8.2 Indoor Unit - High Static Ducted Unit

8.2.1 Electrical Parts

1. Remove 4 screws of the cover of electronic control box and then remove the cover.

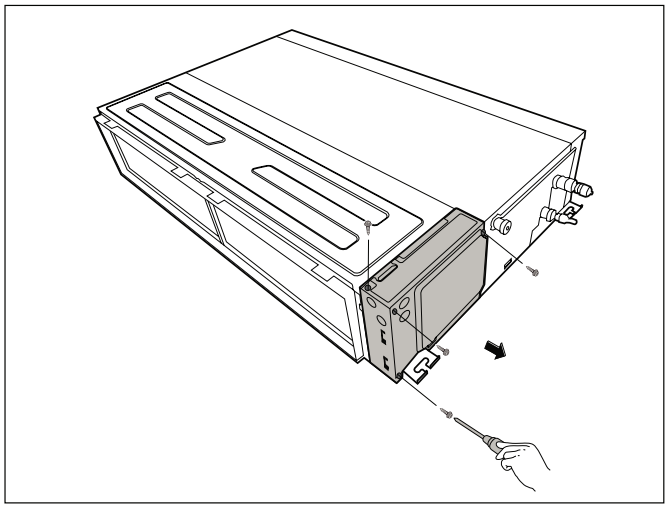


Figure 101

2. Remove 2 screws of the electronic control box.
3. Disconnect the connector of fan motor and unplug pipe temperature sensor socket.

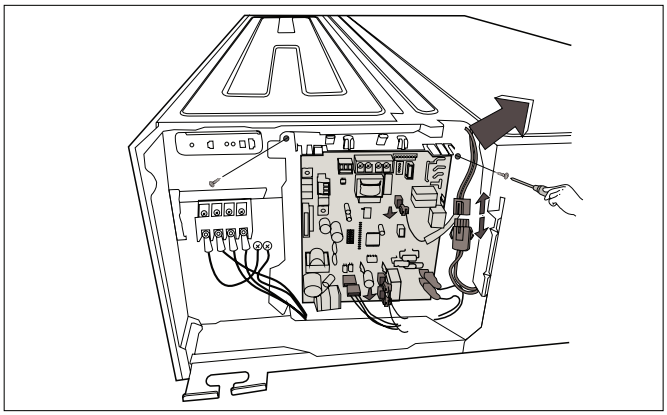


Figure 102

4. Release 2 hooks and then remove the main control board.

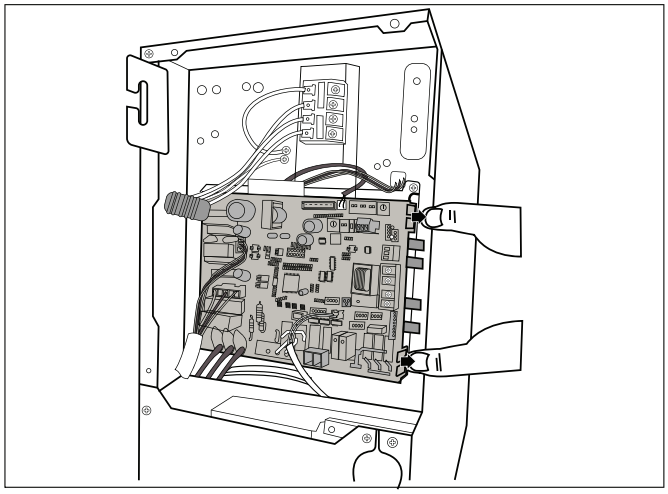


Figure 103

5. Turn over the electronic control box. Disconnect the connectors and remove 1 screw of fan driver control board.
6. Remove 1 screw and then remove the reactor.

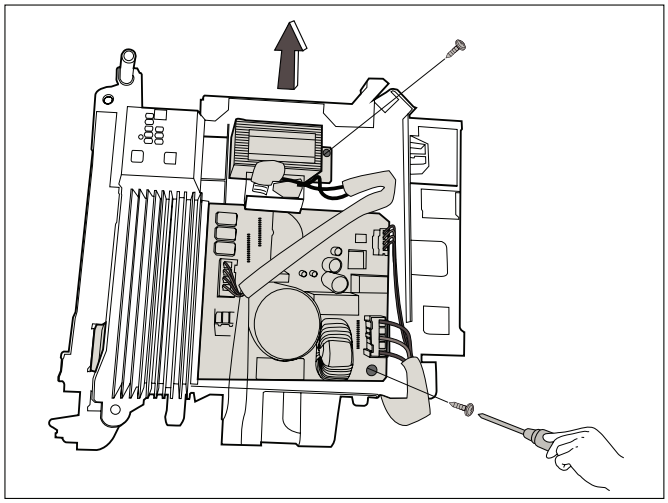


Figure 104

8.2.2 Fan Motor and Fan

1. Remove 10 screws of the rear cover subassembly and then remove the rear cover subassembly.

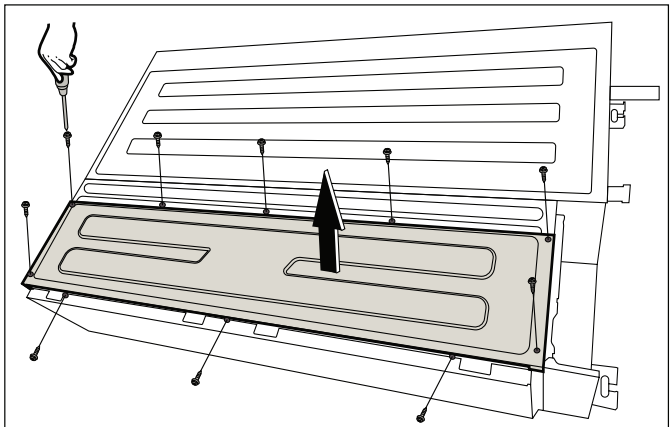


Figure 105

2. Remove 2 screws of top cover subassembly, then bend the top cover.

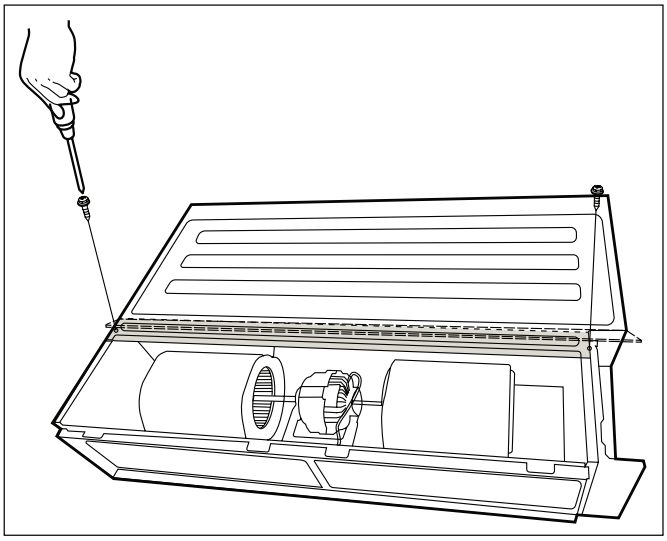


Figure 106

3. Remove 8 screws of centrifuge fan assembly.
4. Remove two fixing screws of fan motor fixing board.
5. Remove the fan motor and centrifugal fan assembly.
6. Turn the wind wheel so that the screw notch is against the hole in the volute. (The left and right wind wheel method is the same)
7. Remove the fan motor.

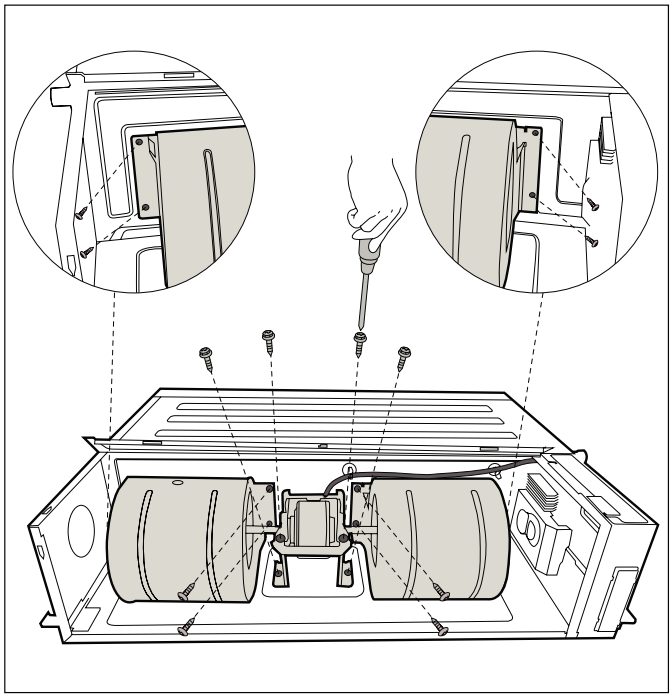


Figure 107

8.2.3 Evaporator and Water Collector

1. Remove eight screws. (5 screws for the pipe clamp and 3 screws for top cover subassembly)-

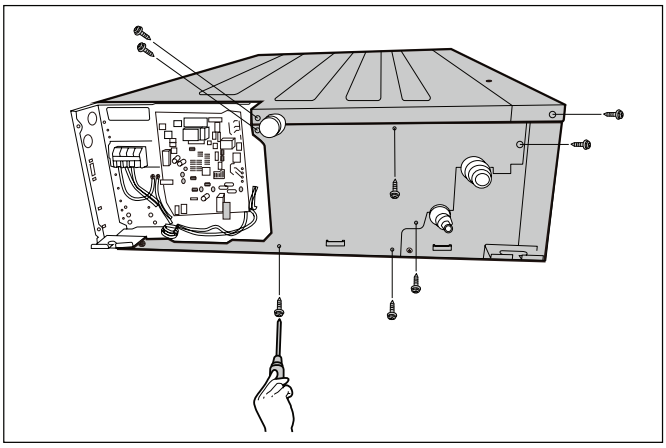


Figure 108

2. Remove 2 screws and remove the refrigerant sensor.

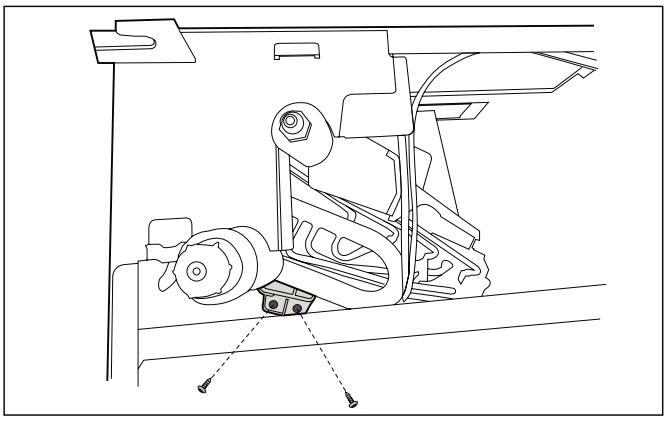


Figure 109

3. Remove 10 screws of top cover subassembly and then remove the top cover subassembly.

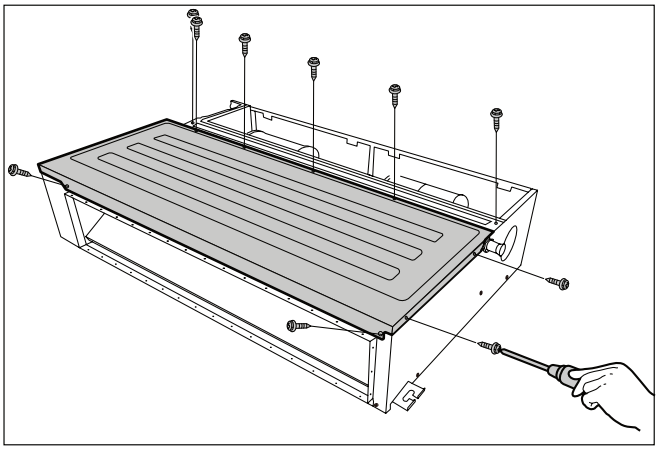


Figure 110

4. Remove the water collector.

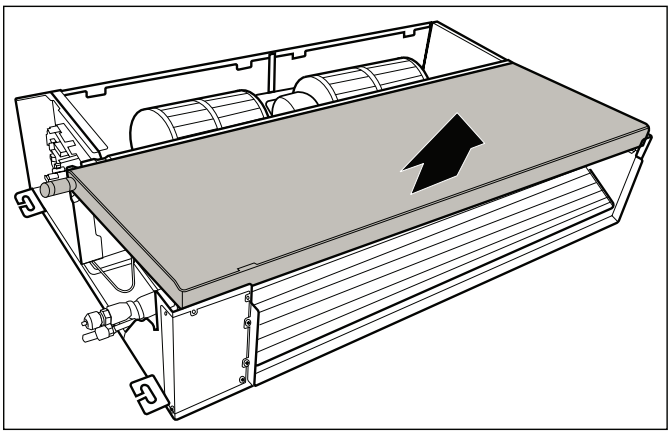


Figure 111

5. Remove 4 screws of the evaporator support.

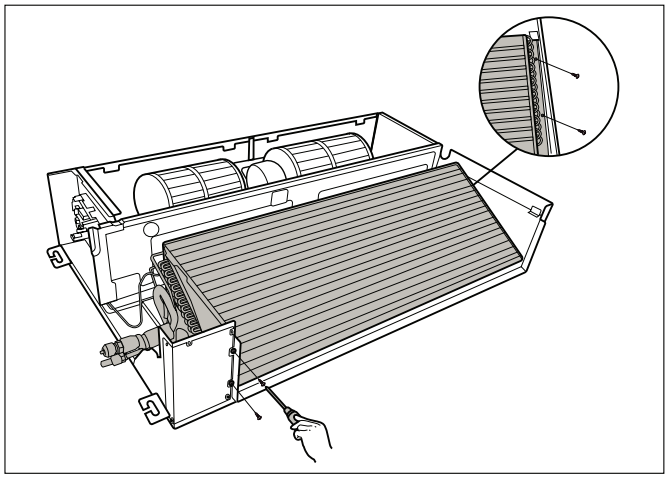


Figure 112

6. Pull up the temperature sensor.
7. Remove the evaporator.

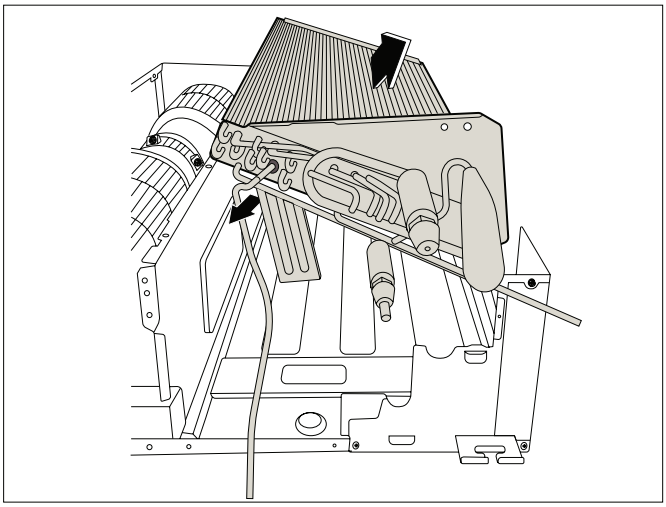


Figure 113

8.3 Outdoor Unit

8.3.1 Panel Plates

Panel Plate 24K (Reg/Max P), 30K, 36K (Reg)

1. Turn off the air conditioner and the power breaker.
2. Remove the screws of the big handle and then remove the big handle.

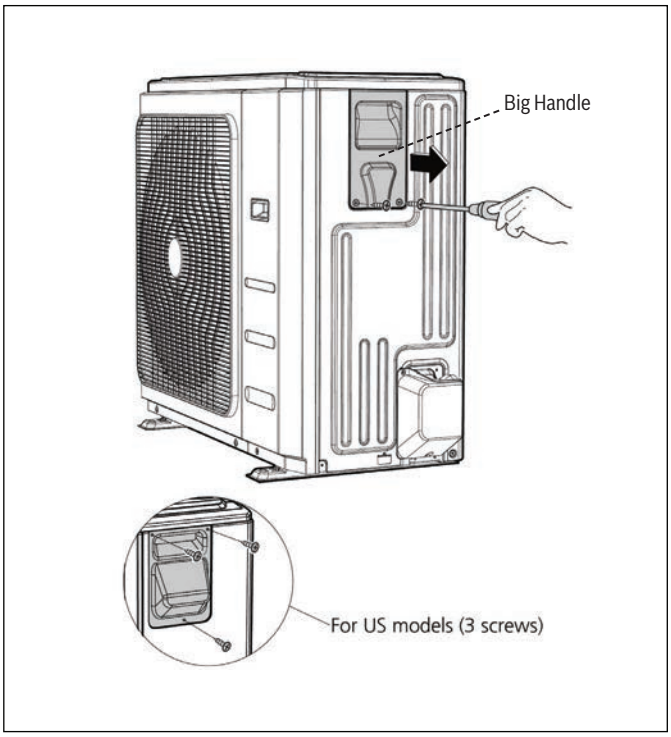


Figure 114

3. Remove the screws of the top cover and then remove the top cover (4 screws). Two of the screws are located underneath the big handle.

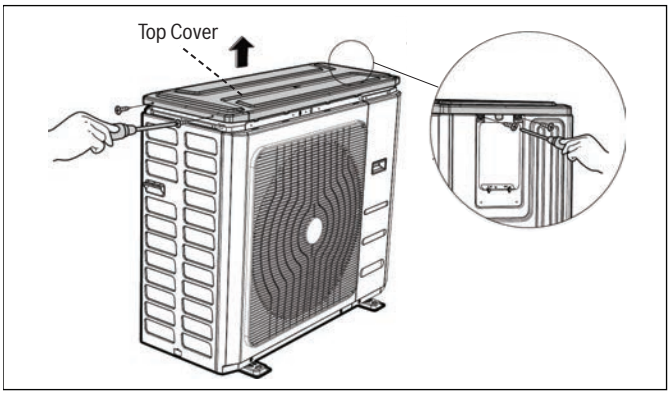


Figure 115

4. Remove the screws of the front right panel and then remove the front right panel (2 screws).

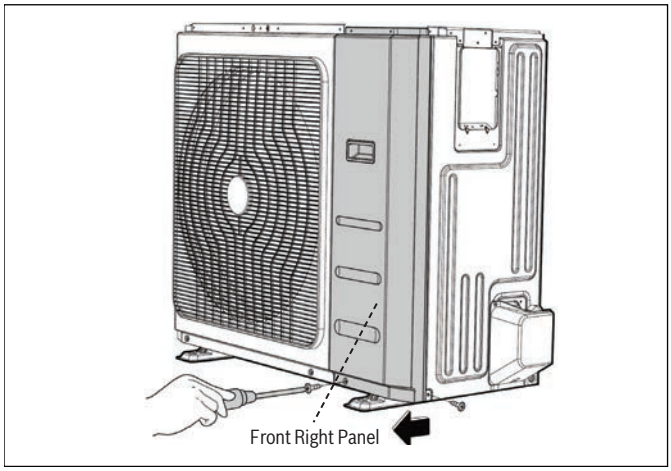


Figure 116

5. Remove the screws of the front panel and then remove the front panel (9 screws).

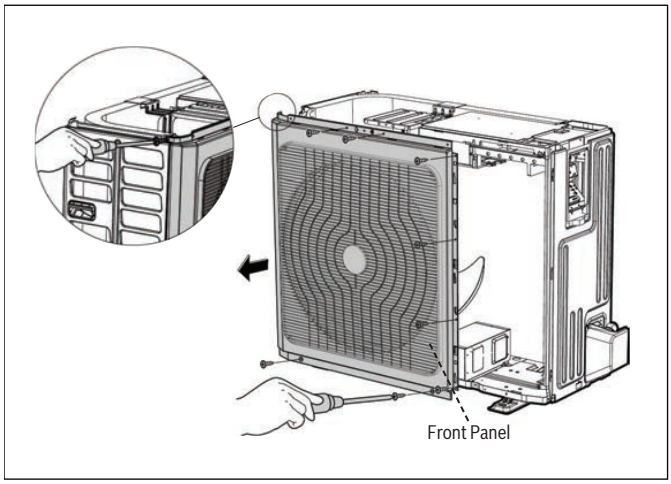


Figure 117

6. Remove the screws of water collecting cover and then remove the water collecting cover.

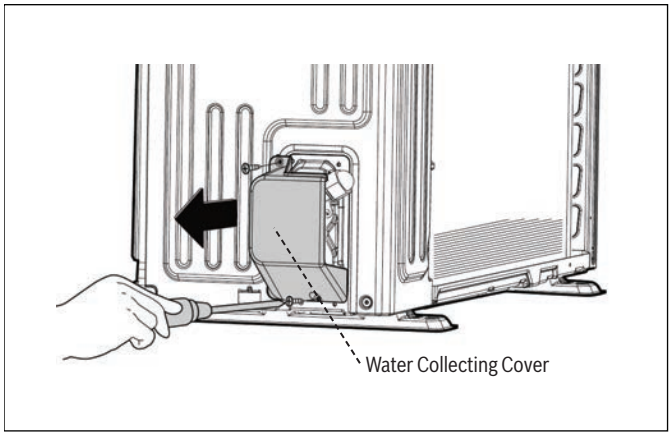


Figure 118

7. Remove the screws of the rear net and then remove the rear net (3 screws).

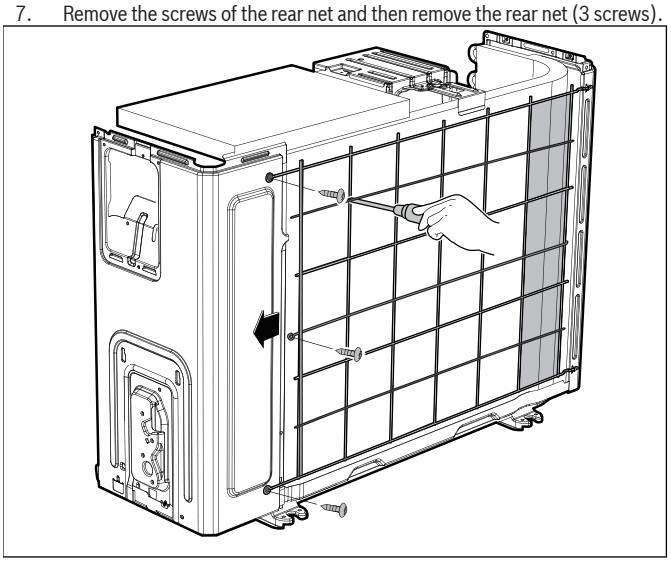


Figure 119

8. Remove the screws of the right panel and then remove the right panel.

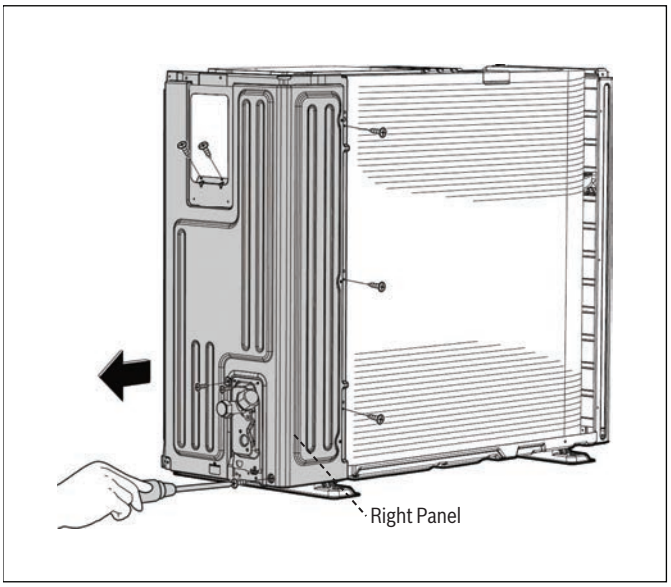


Figure 120

Panel Plate12K115V, 9K, 12K, Reg/Max P

1. Turn off the air conditioner and the power breaker.
2. Remove the screw of the big handle and then remove the big handle (1 screws).

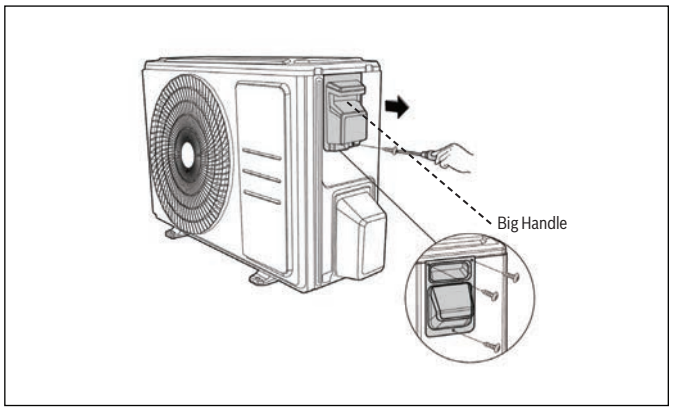


Figure 121

3. Remove the screws of the top cover and then remove the top cover (4 screws). One of the screws is located underneath the big handle.

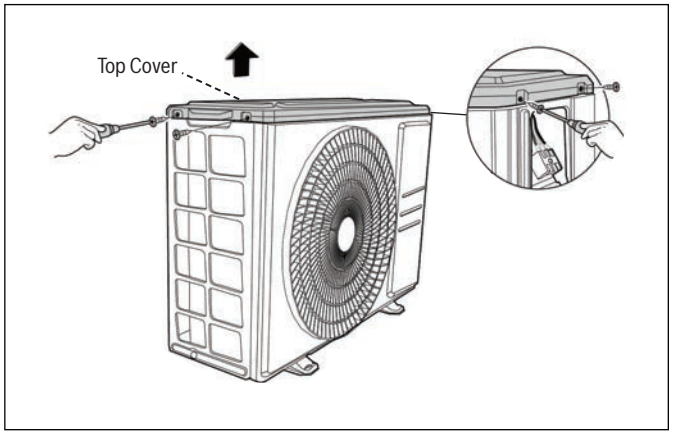


Figure 122

4. Remove the screws of water collecting cover and then remove the water collecting cover (2 screws).

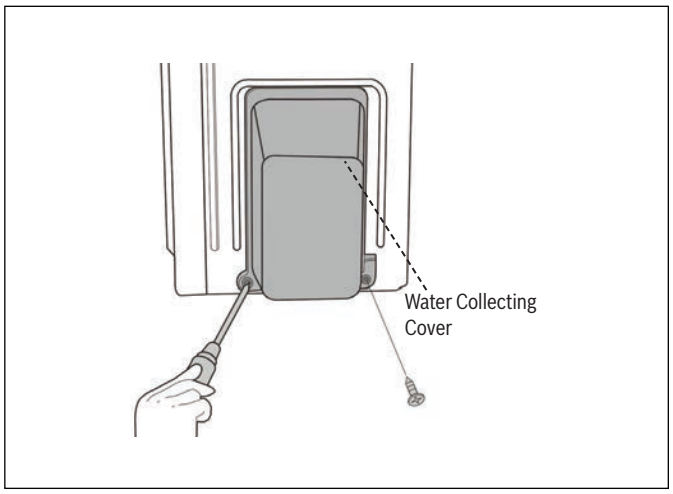


Figure 123

5. Remove the screws of the front panel and then remove the front panel (9 screws).

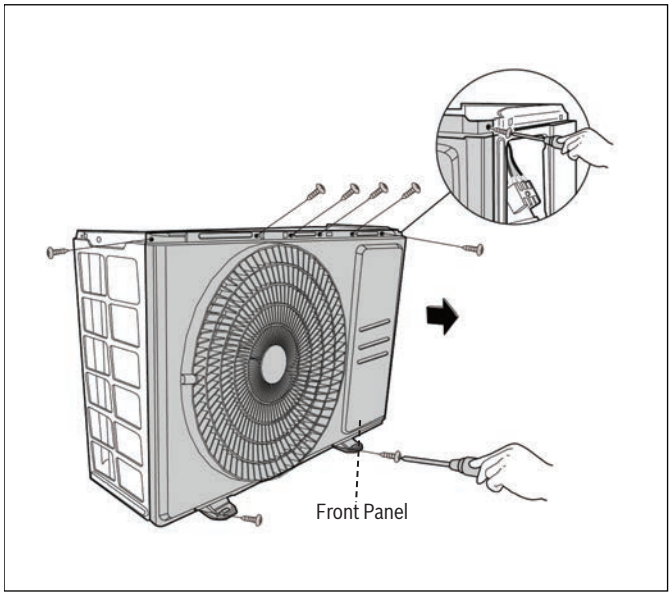


Figure 124

6. Remove the screws of the right panel and then remove the right panel (5 screws).

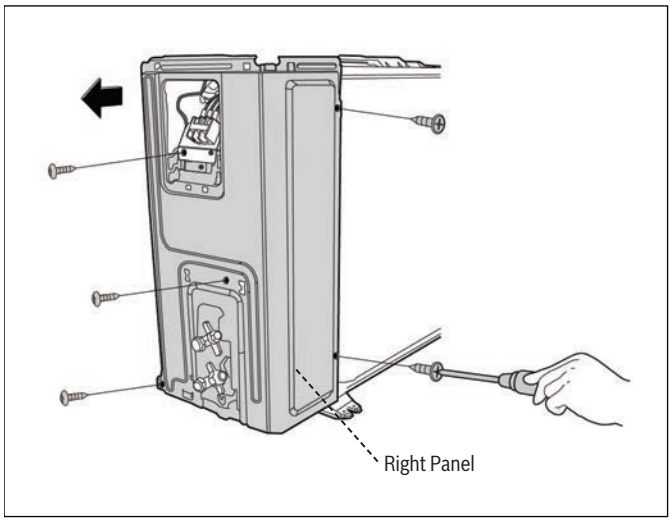


Figure 125

Panel Plate 18K Reg/Max P

1. Turn off the air conditioner and the circuit breaker.
2. Remove the screw of the big handle and then remove the big handle (1 screw).

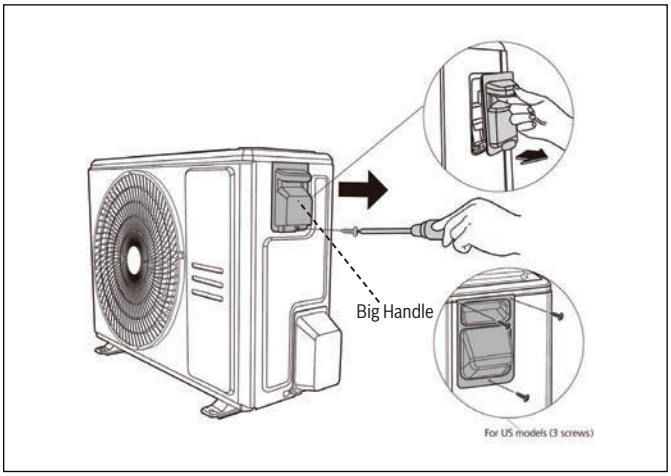


Figure 126

3. Remove the screws of the top cover and then remove the top cover (3 screws). One of the screws is located underneath the big handle.

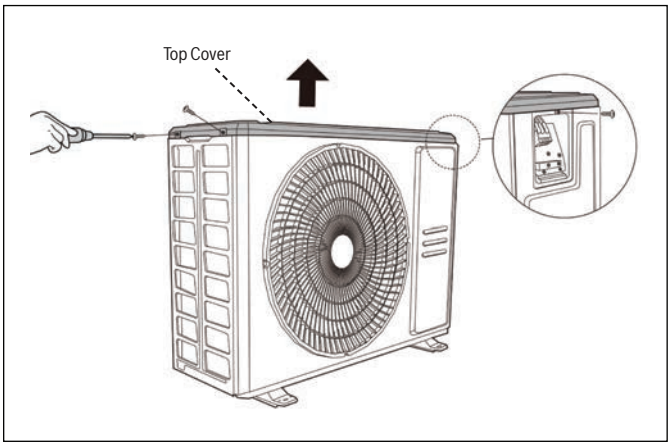


Figure 127

4. Remove the screws of water collecting cover and then remove the water collecting cover (2 screws).

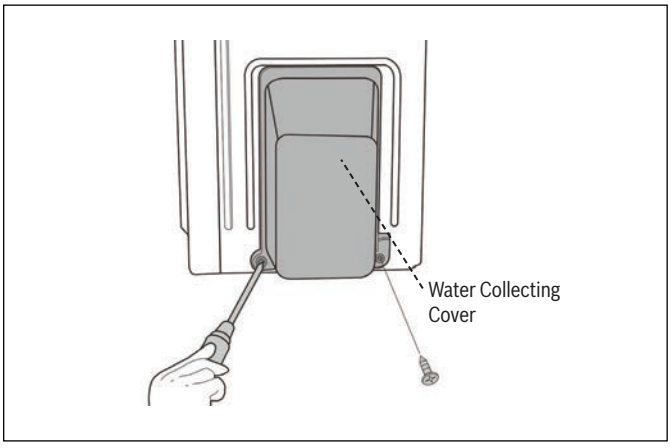


Figure 128

5. Remove the screws of the front panel and then remove the front panel (7 screws).

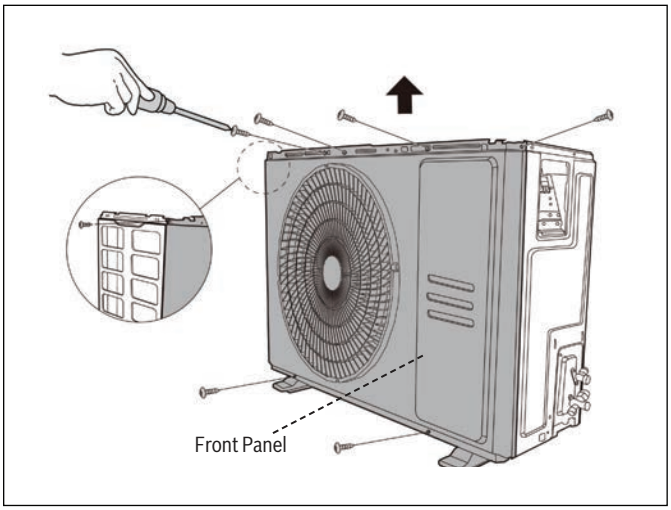


Figure 129

6. Remove the screws of the right panel and then remove the right panel (6 screws).

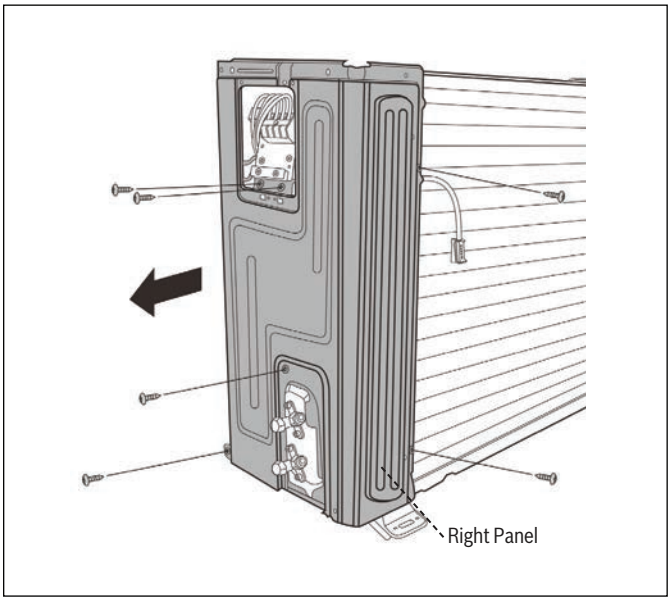


Figure 130

8.3.2 Electrical Parts

PCB Board 18K (Reg/Max P)

1. Remove the screws and unfix the hooks, then open the electronic control box cover (5 screws and 2 hooks).

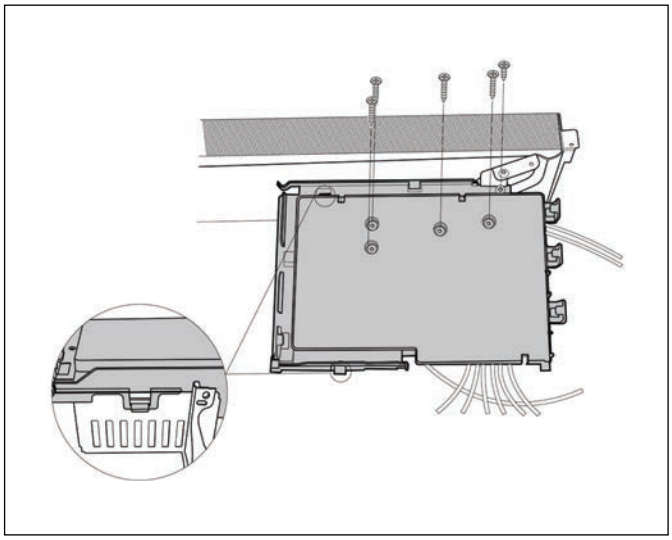


Figure 131

2. Disconnect the connector for fan motor from the electronic control board.
3. Remove the connector for the compressor.
4. Pull out the two blue wires connected with the four way valve.
5. Pull out connectors of the condenser coil temp. sensor (T3), outdoor ambient temp. sensor (T4) and discharge temp. sensor (TP).
6. Disconnect the electronic expansion valve wire.
7. Remove the connector for the DR and reactor.
8. Then remove the electronic control board.

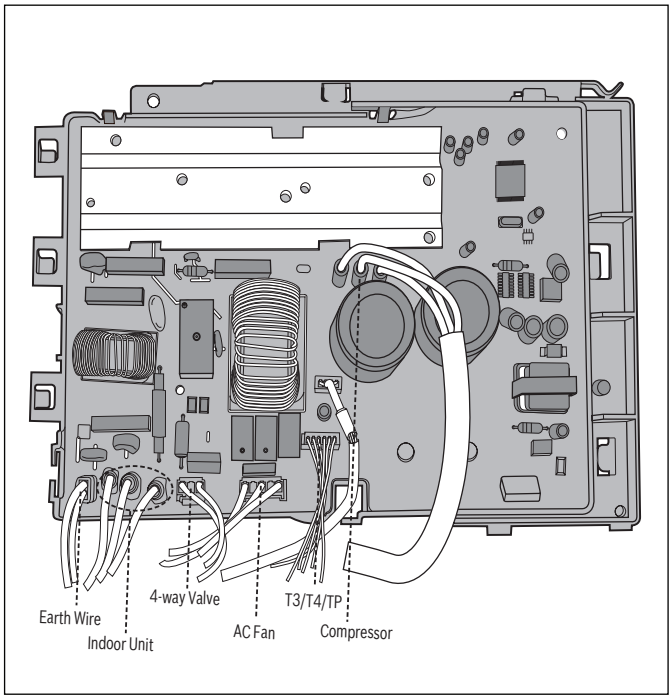


Figure 132

PCB Board 12K 115V (Reg), 9K, 12K (Reg/Max P)

1. Disconnect the connector for compressor and release the ground wire (1 screw).

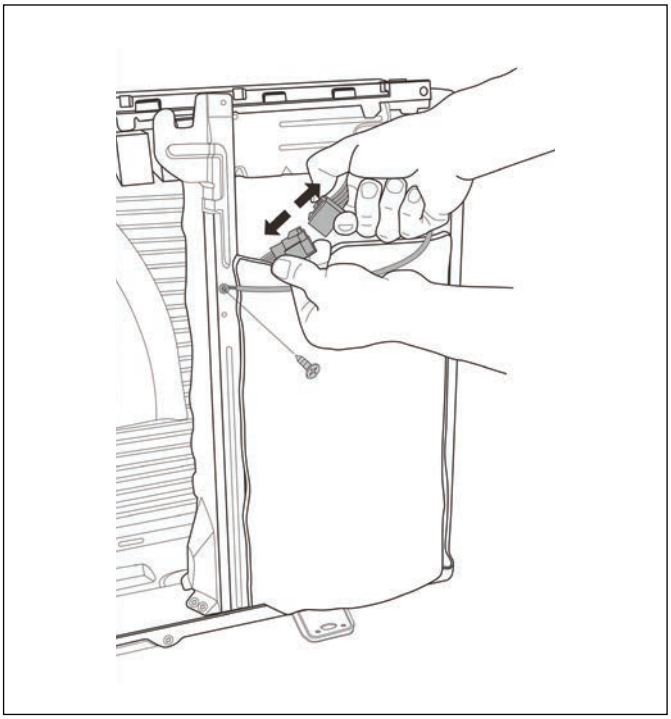


Figure 133

2. Pull out the wires from electrical supporting plate and turn over the electronic control assembly.

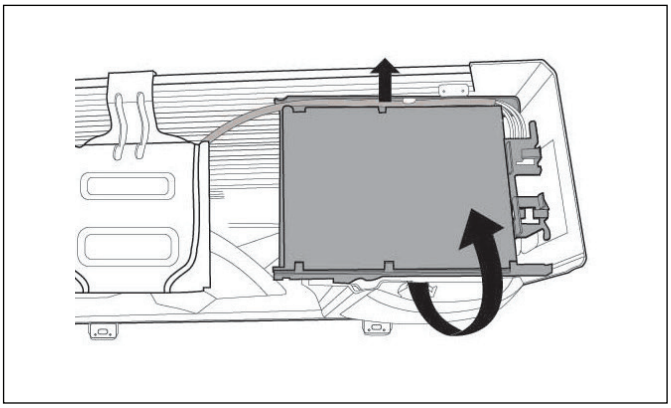


Figure 134

3. Remove the electronic installing box subassembly (4 hooks).

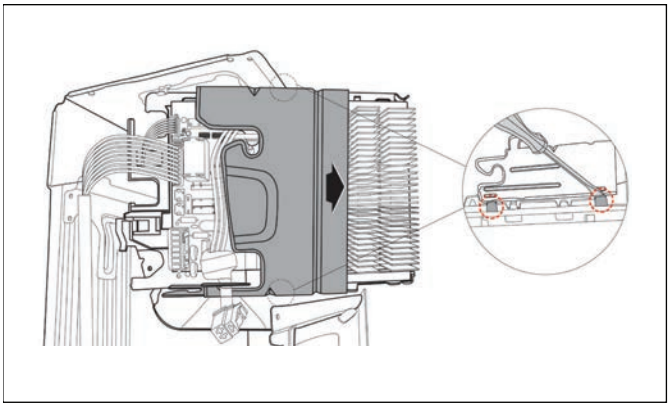


Figure 135

4. Remove the fixing board (2 hooks).

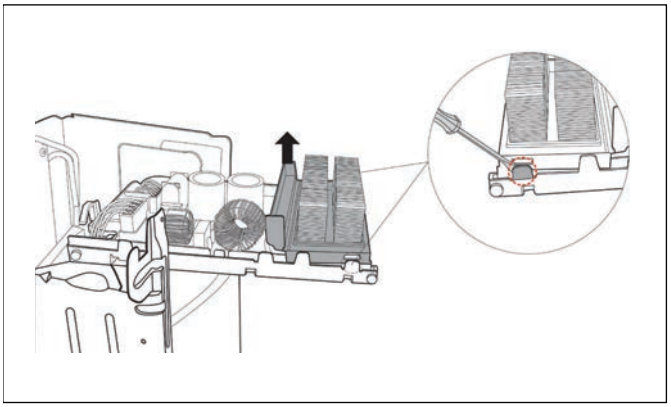


Figure 136

5. Disconnect the connectors from the electronic control board.

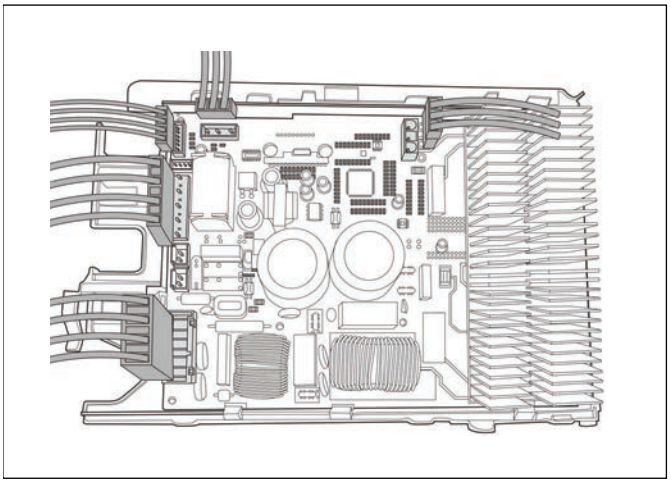


Figure 137

6. Then remove the electronic control board (4 hooks).

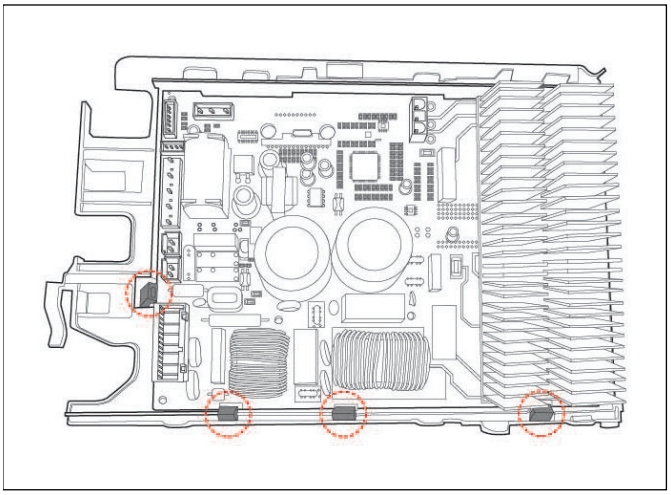


Figure 138

PCB Board 24K (Reg/Max P), 30K and 36K (Reg)

WARNING

Antistatic gloves must be worn when you disassemble the electronic box.

1. Remove the cover of electrical control box.

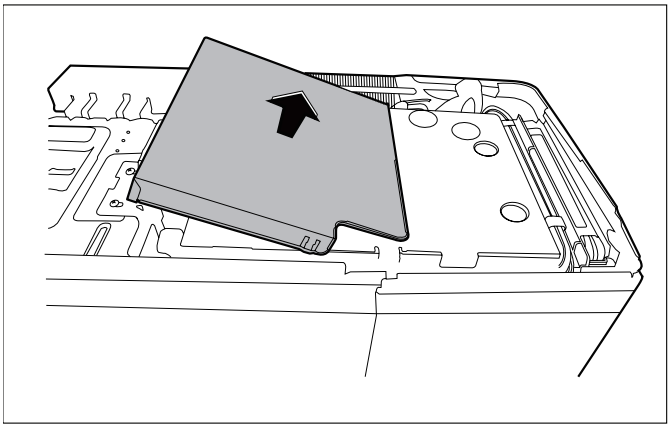


Figure 139

2. Disconnect the fan motor connector.

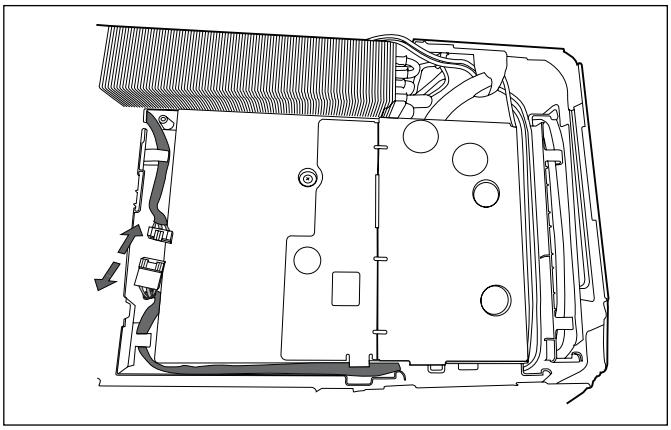


Figure 140

3. Remove eight fixing screws.
4. Turn over the electronic control box subassembly.

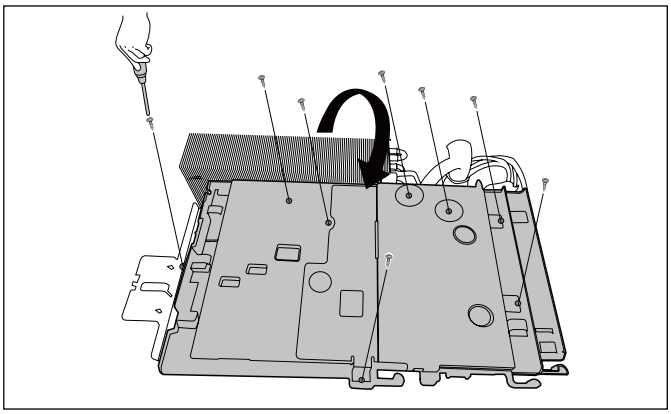


Figure 141

5. Remove 3 screws and then remove the bracket.
6. Disconnect the connectors from the electronic control board.
7. Remove 3 screws and then remove the electronic control board.

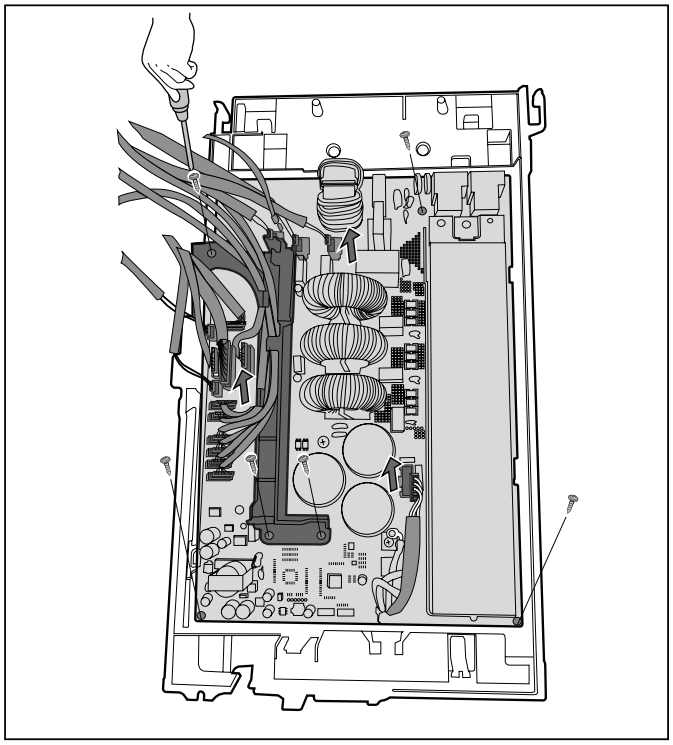


Figure 142

8. Pull out the connector, remove one screw and then remove the keyboard subassembly on terminal board.

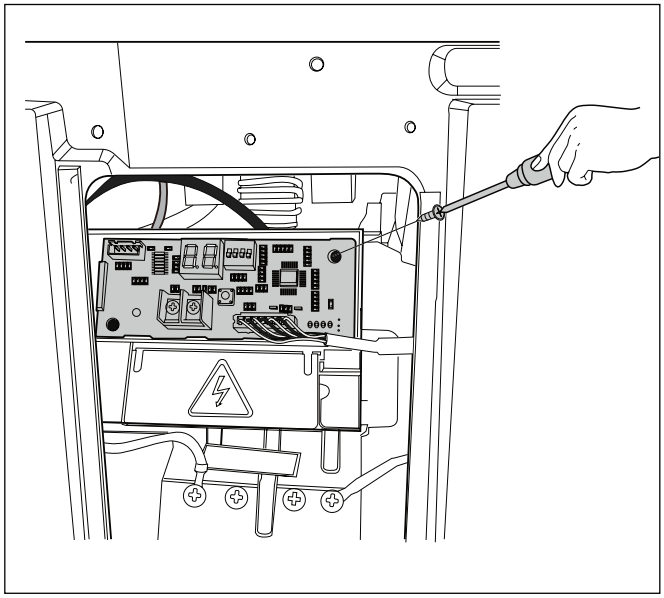
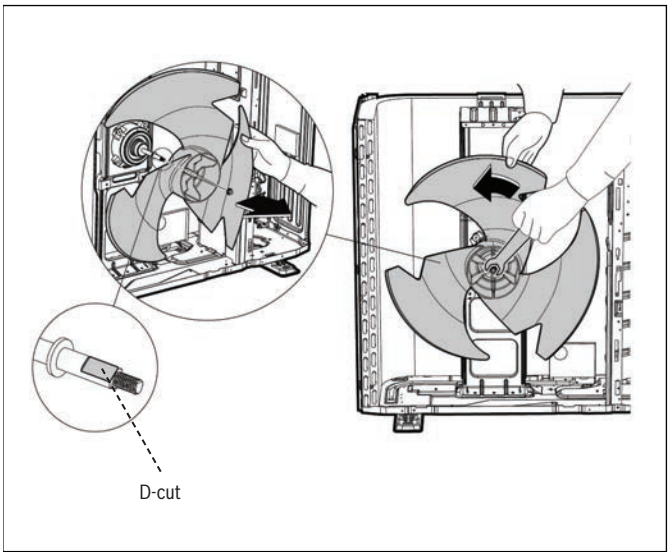


Figure 143

8.3.3 Fan Assembly

Remove the panel plate before disassembling fan.

1. Remove the nut securing the fan with a spanner.
2. Remove the fan.



4**Fan Motor**

Remove the panel plate, the connection of fan motor on PCB and fan assembly before disassembling fan motor.

1. Remove the fixing screws of the fan motor (4 screws).
2. Remove the fan motor.

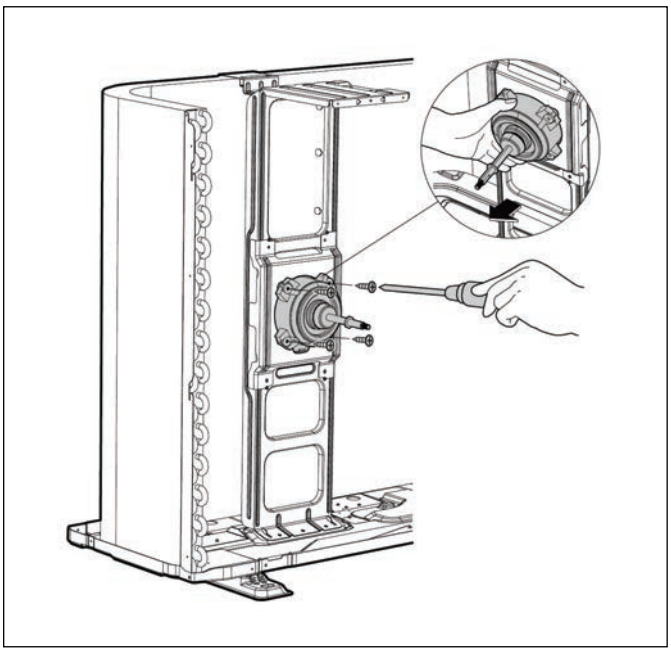


Figure 144

8.3.5 Sound Blanket

Remove the panel plate before disassembling sound blanket.

1. Remove the sound blanket (side and top).

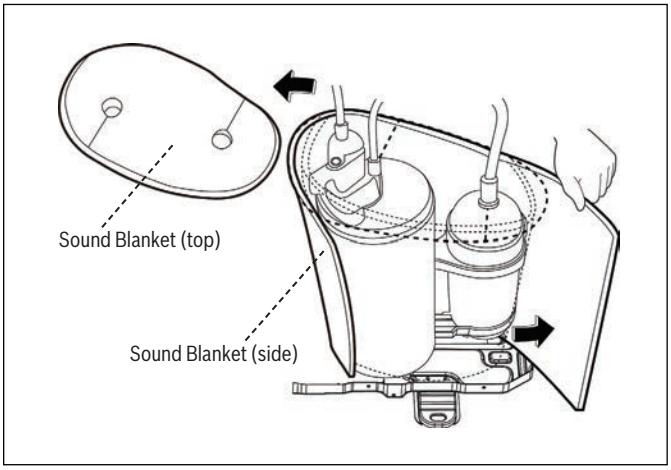


Figure 145

8.3.6 Four-Way Valve

WARNING

Contains refrigerant!

Evacuate the system and confirm that there is no refrigerant left in the system before removing the four-way valve and the compressor. You should evacuate the system with the vacuum pump; flush the system with nitrogen; then repeat the two steps before heating up the brazed parts. The operations above should be implemented by HVAC professionals.

Remove the panel plate, connection of four-way valve on PCB before disassembling sound blanket.

1. Heat up the brazed parts and then detach the the four-way valve and the pipe.
2. Remove the four-way valve assembly with pliers.

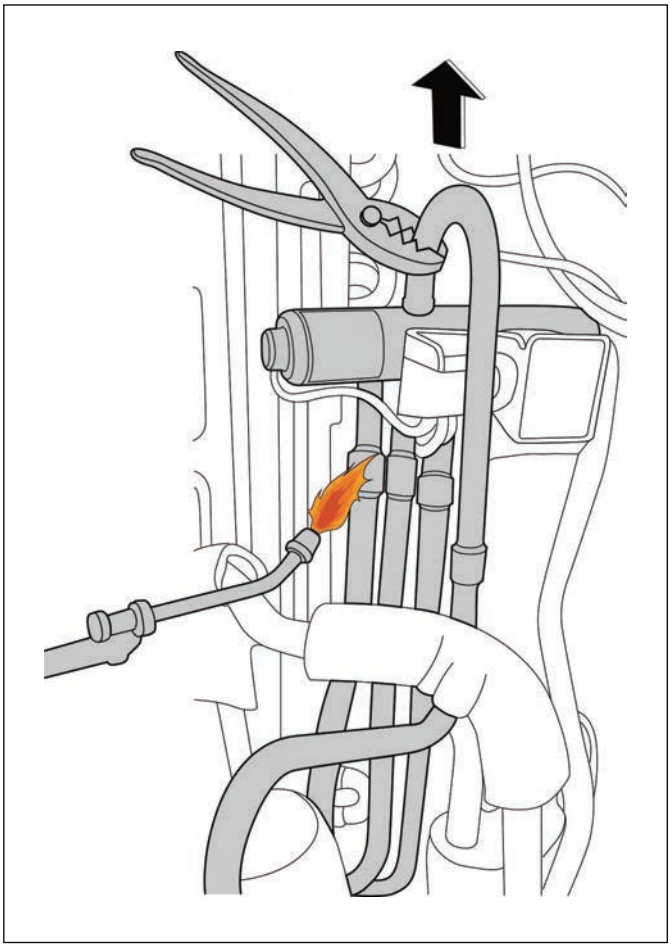


Figure 146

8.3.7 Compressor

WARNING

Contains refrigerant!

Evacuate the system and confirm that there is no refrigerant left in the system before removing the four-way valve and the compressor. For R32 & R290, you should evacuate the system with the vacuum pump; flush the system with nitrogen; then repeat the two steps before heating up the brazed parts. The operations above should be implemented by HVAC professionals.

Remove the panel plate, connection of compressor on PCB before disassembling sound blanket.

1. Remove the flange nut of terminal cover and remove the terminal cover.

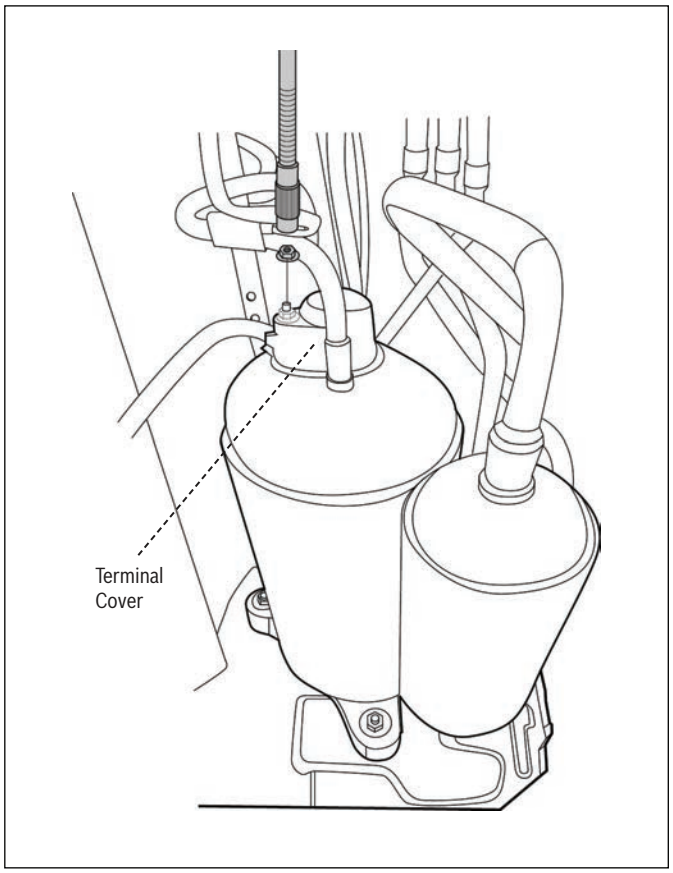


Figure 147

2. Disconnect the connectors.

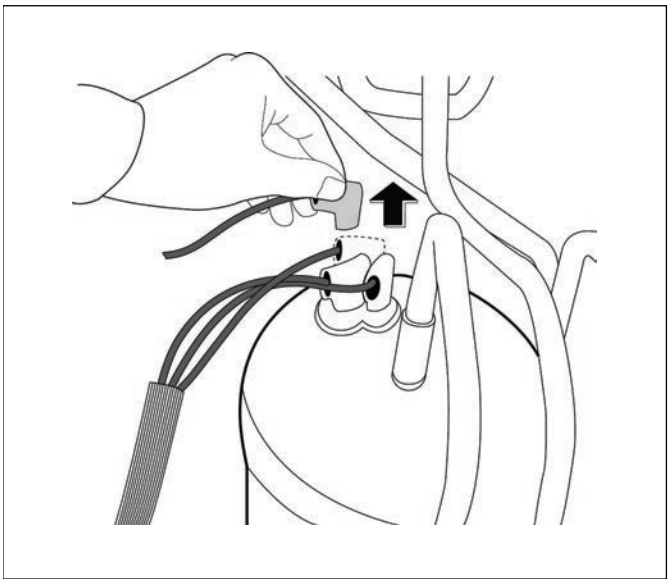


Figure 148

3. Remove the hex nuts and washers securing the compressor, located on the bottom plate.

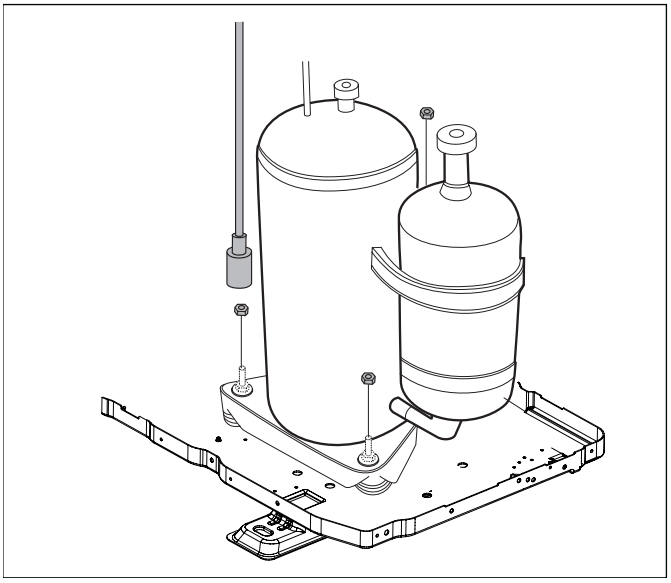


Figure 149

4. Heat up the brazed parts and then remove the discharge pipe and the suction pipe.
5. Lift the compressor from the base pan assembly with pliers.

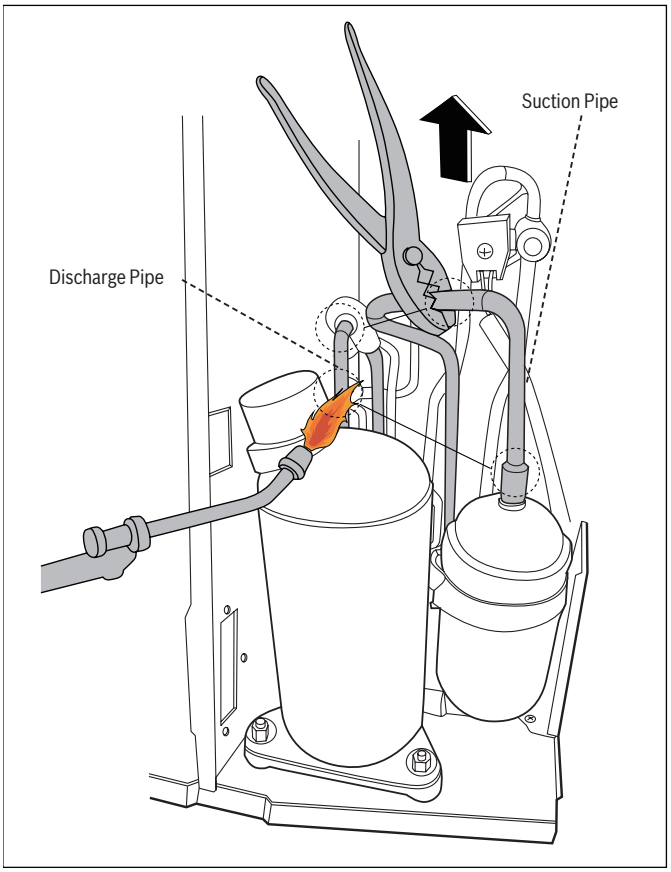


Figure 150

Online Help Resources

Alternatively, please visit our Service & Support webpage to find FAQs, videos, service bulletins, and more; bosch-homecomfort.us/service or use your cellphone to scan the code below.

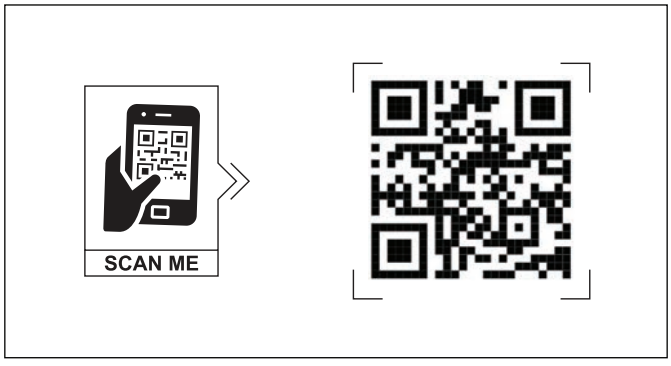


Figure 151

NOTES:

NOTES:

NOTES:

United States and Canada
Bosch Thermotechnology Corp.
65 Grove St.
Watertown, MA 02472

Tel: 800-283-3787
www.bosch-homecomfort.us

BTC 769202305 A / 04.2025