



Repair Guideline for SANYO New Erp

DC Inverter Air Conditioner

(Published in May, 2013)

KRV-09TDAA, KRV-12TDAA, KRV-16TDAA,
KRV-18TDAA, KRV-22TDAA, KRV-24TDAA

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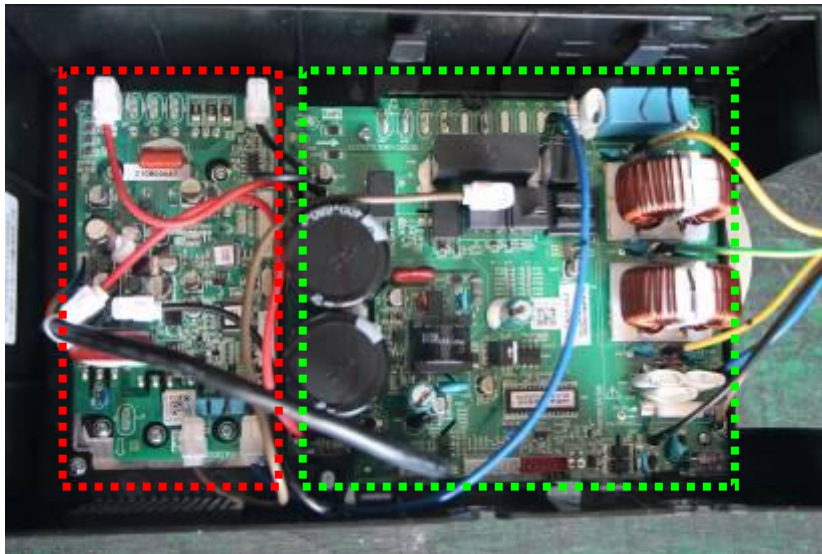
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I. Electronic Control of DC Inverter Air Conditioner

1. Main parts of the electronic control of DC inverter air conditioner

The electronic control of DC inverter air conditioner is composed of **indoor control system** and **outdoor control system**. All the units 9k/12k/18k/24k apply 180° sine wave technology, and **indoor control system** are controlled by **outdoor control system**.

For 9k and 12k, the outdoor PCB is divided into two parts, i.e. outdoor power source board and Intelligent Power Module (**IPM**). *Note: Power Factor Correction (**PFC**) is integrated in IPM.*

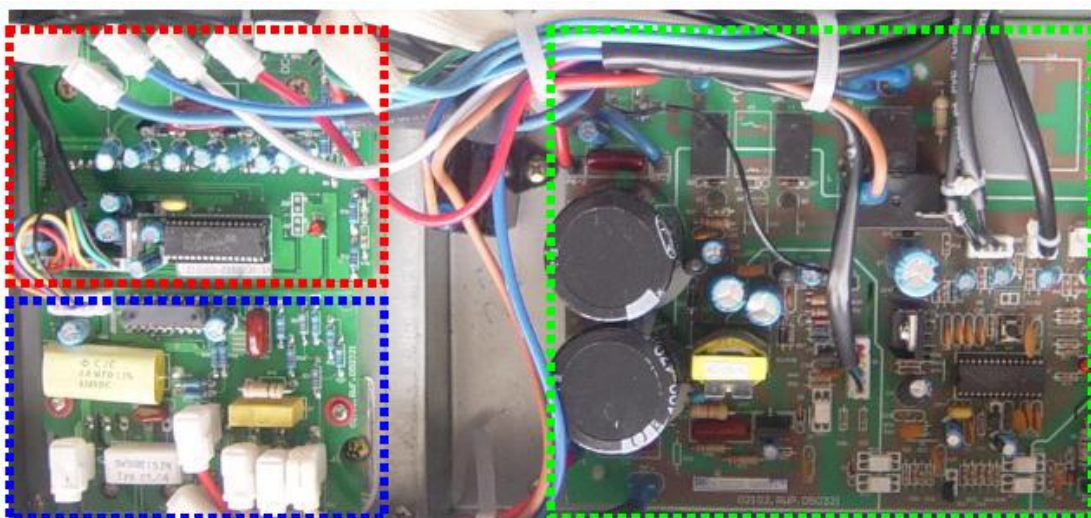


IPM board

Outdoor power source board

For 18k and 24k, the outdoor PCB is divided into three parts, i.e. outdoor power source board, Power Factor Correction (**PFC**) board and Intelligent Power Module (**IPM**).

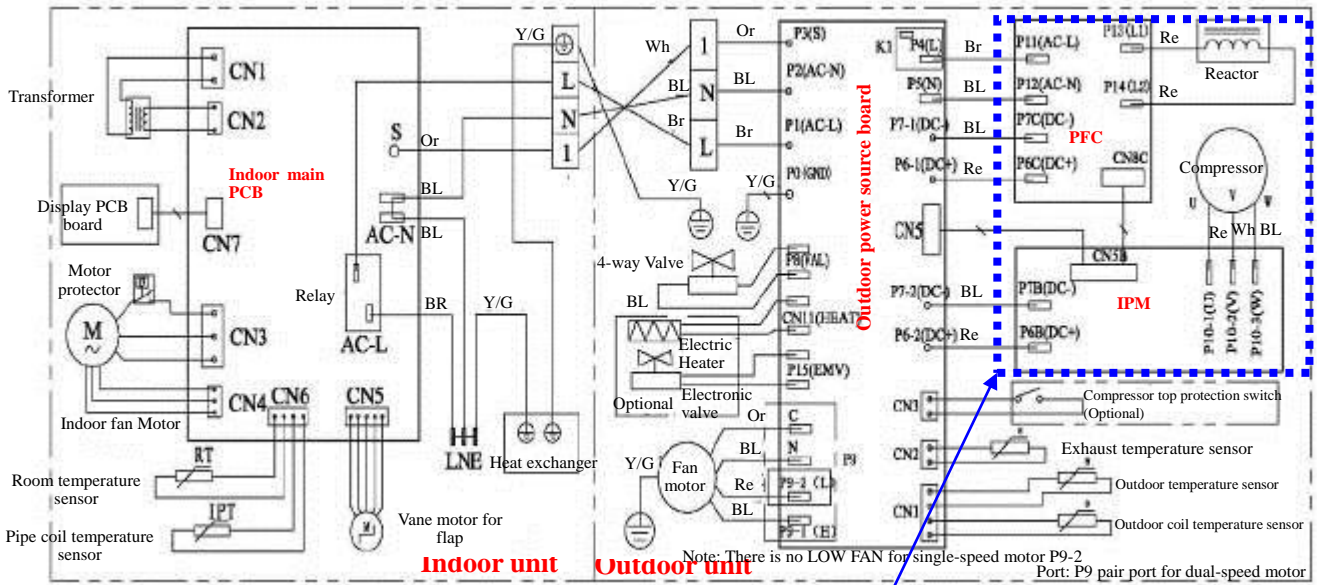
IPM board



PFC board

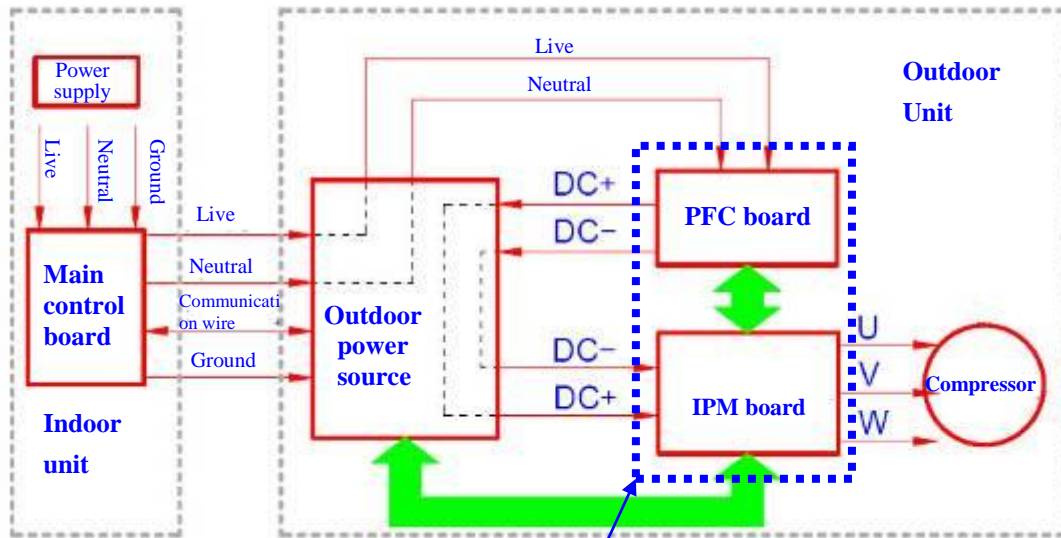
Outdoor power source board

2. Wiring of DC Inverter Unit



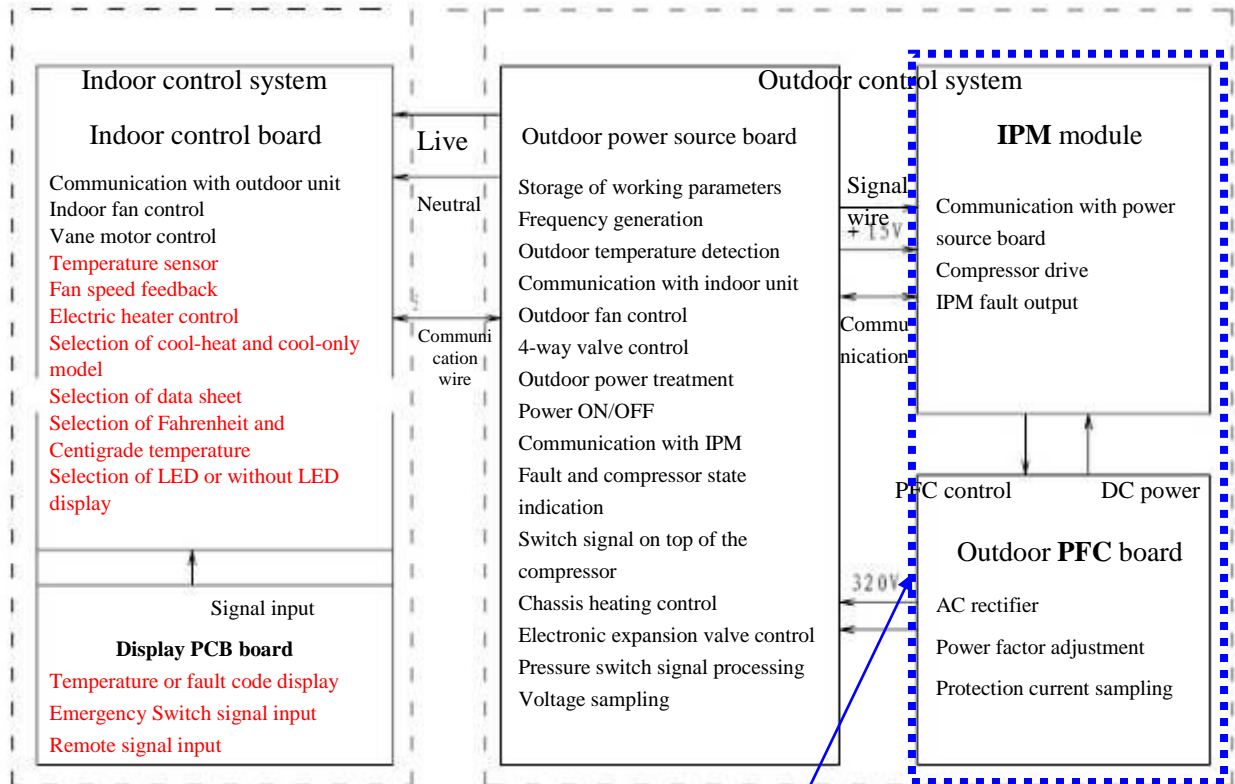
(For 9k/12k, PFC is integrated in IPM.)

3. Current Flow



(For 9k/12k, PFC is integrated in IPM.)

4. Software Control Function Flow Chart



(For 9k/12k, PFC is integrated in IPM.)

5. Fault Codes (including quick solutions) and Protection codes

Fault Codes

(If the error code indicated on display PCB is not in the below list, the display PCB may be broken.)

Digital LED display	Indoor Function Indicator (flash)	Fault Type	Quick solutions (Please try the tips one by one, not all at the same time.)
E0/E5	RUN & TIMER: Blink/ RUN-5/8 sec.	Indoor/outdoor communication fault <i>(The most frequent fault means possible problems in the indoor/outdoor communication from indoor PCB, through connecting wires and to/among outdoor PCBs.)</i>	1 Check the wire connection from indoor to outdoor, and among outdoor PCBs. 2 Check if the LED indication light on outdoor power source board is on. If the light is not on, replace outdoor intelligent board when outdoor voltage is 220V, and replace indoor main PCB when outdoor voltage is not 220V. If the light is on, and E0 is showed on display PCB before compressor running, replace the indoor main PCB, and then the outdoor PCB boards, and then indoor/outdoor connecting wires. If the light is on, and E0 is showed on display PCB after compressor running several minutes, replace the indoor/outdoor connecting wires, then indoor/outdoor PCBs.
EC	RUN & TIMER: Blink	Outdoor PCB's communication fault	1 Check the wire connections among all outdoor PCB boards. 2 Replace intelligent power module board. 3 Replace power source board.
E1	RUN-1/8 sec.	Indoor room temperature sensor (IRT)	1 Check the wire connection of indoor temperature sensor assembly. 2 Replace indoor temperature sensor assembly. 3 Replace indoor main PCB.
E2	RUN-2/8 sec.	Indoor pipe (coil) temperature sensor (IPT)	1 Check the wire connection of indoor temperature sensor assembly. 2 Replace indoor temperature sensor assembly. 3 Replace indoor main PCB.
E3	RUN-3/8 sec.	Outdoor pipe (coil) temperature sensor (OPT)	1 Check the wire connections of outdoor temperature sensor assembly 2 Replace outdoor temperature sensor assembly. 3 Replace outdoor power source board.
E4	RUN-4/8 sec.	System abnormal	1 Check if high pressure valve and low pressure valve open 2 Check if refrigerant is in short, and then recharge. 3 Check if temperature sensor on outdoor condenser loose or broken. 4 Replace the indoor main PCB.
E6	RUN-6/8 sec.	Indoor fan motor fault	1 Check if indoor cross fan runs normally. 2 Check if wires of indoor fan motor connect indoor main PCB well. 3 Replace indoor main PCB. 4 Replace indoor fan motor.
E7	RUN-7/8 sec.	Outdoor temperature sensor	1 Check the wire connections of outdoor temperature sensor assembly 2 Replace outdoor temperature sensor assembly. 3 Replace outdoor power source board.
E8	RUN-8/8 sec.	Exhaust temperature sensor	1 Check the wire connections of outdoor temperature sensor assembly 2 Replace outdoor temperature sensor assembly. 3 Replace outdoor power source board.

E9	RUN-9/8 sec.	Intelligent power module of drive and module fault	1 Replace intelligent power module board.
EF	RUN-10/8 sec.	Outdoor fan motor fault (DC Motor)	1. Replace the outdoor power source board 2. Replace the outdoor DC fan motor
EA	RUN-11/8 sec.	Current sensor fault	1 Find the leakage point and recharge the refrigerant. 2 Replace power source board.
EE	RUN-12/8 sec.	EEPROM fault	1 Check if the EEPROM on indoor main PCB or outdoor power source board installed well. 2 Replace indoor main PCB. 3 Replace outdoor power source board.
EP	RUN-13/8 sec.	Temperature switch fault (on top of the compressor)	1 Check if wires of compressor connect outdoor power source board well. 2 Replace outdoor power source board.
EU	RUN-14/8 sec.	Voltage sensor fault	1 Check the wire connections between power source board and intelligent power module. 2 Replace power source board.
EH	RUN-15/8 sec.	Outdoor intake temperature sensor	1 Check the wire connections of outdoor temperature sensor assembly 2 Replace outdoor temperature sensor assembly. 3 Replace outdoor power source board.

You are suggested to change the whole outdoor PCB box for 9K/12K in the final user's house. :



Protection Codes

(Protection codes mean protection from the machine automatically. The machine usually can recover by itself; otherwise it will change to fault codes. Protection codes have little possibility to occur, so we do not list the quick solutions as below.)

Digital LED display	Indoor function Indicator (flash)	Protection Type
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P1	RUN: Blink; TIMER: 1 blink /8 sec	Overvoltage / undervoltage protection
P2	RUN: Blink; TIMER: 2 blink /8 sec	Overcurrent protection
P4	RUN: Blink; TIMER: 4 blink /8 sec	Exhaust overtemperature protection
P5	RUN: Bright; TIMER: 5 blink /8 sec	Subcooling protection under cooling mode
P6	RUN: Bright; TIMER: 6 blink /8 sec	Overheating protection under cooling mode
P7	RUN: Bright; TIMER: 7 blink /8 sec	Overheating protection under heating mode
P8	RUN: Bright; TIMER: 8 blink /8 sec	Outdoor overtemperature/ undertemperature protection
P9	RUN: Blink; TIMER: 9 blink /8 sec	Intelligent Power Module protection (software control)
P0	RUN: Blink; TIMER: 10 blink /8 sec	Intelligent Power Module protection (hardware control)

Display on outdoor power source board: The indicator alerts the fault in a cycle as such that it is bright for 0.5 seconds, dark for 0.5 seconds, blinks “n” times and then dark for 3 seconds.

It is not easy to count the blink times, so it can only be the assistant to Fault and Protections codes and only useful for professional technicians.

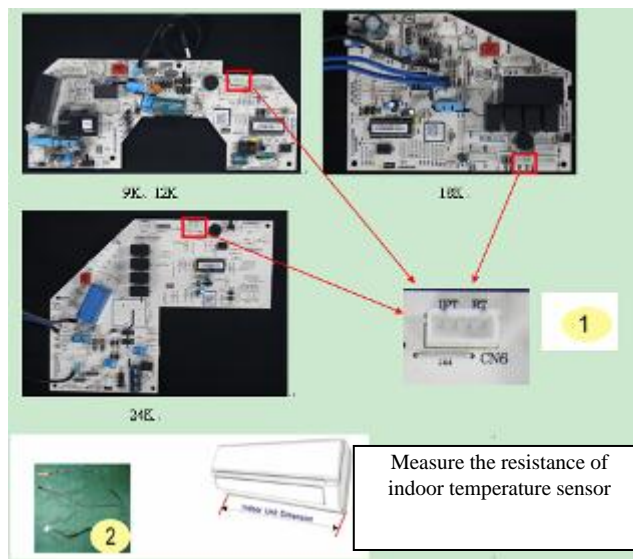
Blink times(n)	Fault Message	Blink times(n)	Fault Message
1	IPM protection	18	Short-circuit / open-circuit fault of intake temperature sensor
2	Overvoltage / undervoltage	19	Outdoor EEPROM fault
3	Overcurrent	20	Outdoor fan motor protection
4	Exhaust overtemperature protection	21	Indoor fan motor protection
5	Outdoor coil overtemperature protection	-	-
6	Drive fault and protection	23	System in shortage of Freon
7	Communication fault with indoor unit	24	Model configuration wrong
8	Compressor overheat fault (compressor top switch)	25	Indoor sensor fault
9	Short-circuit / open-circuit fault of outdoor temperature sensor	26	Indoor coil sensor fault
10	Short circuit / open-circuit fault of outdoor heat exchanger temperature sensor	27	Indoor EEPROM fault
11	Short-circuit / open-circuit fault of exhaust temperature sensor	28	Indoor fan motor fault
12	Voltage sensor fault	30	drive fault (V4、VP2)
13	Current sensor fault	31	Outdoor environmental overtemperature / undertemperature protection
14	IPM fault	32	Indoor coil deforst prevention
15	communication fault between power source board and intelligent power module	33	Indoor coil overheating protection
16	No feedback from DC fan motor(outdoor unit)		
17	Defrost state		

II. Troubleshooting

1. According to the fault code

(1) Display E1 or E2:

Symptom		Display E1 or E2	
Cause		Indoor temperature sensor assembly	
S/N	Inspections	How to Solve	Remarks
1	Check the connection of indoor room temperature sensor assembly to CN6 (RT、IPT) on indoor main PCB	Insert again if loose.	
2	Measure the resistance on the two ends of indoor temperature sensor: (25°C/ 5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet (Appendix 1).	Replace the temperature sensor if the resistance is not in standard level	
3	If the above testing is normal	Replace the indoor main PCB	



Check the connection of indoor room temperature sensor assembly to CN6 (RT、IPT) on indoor main PCB

(2) Display E6

Symptom		Display E6	
Cause		Indoor fan motor fault	
S/N	Inspections	How to Solve	Remarks
1	Check the indoor cross fan blade	If the fan does not run, adjust the fan position until it can run smoothly.	
2	Check the connection of indoor fan motor to CN3, CN4 on indoor main PCB	Insert again if loose.	
3	The above inspections are normal	Replace the indoor main PCB	

(3) Display E3, E7, E8

Symptom		Display E3, E7, E8	
Cause		Outdoor temperature sensor assembly fault	
S/N	Inspections	How to Solve	Remarks
1	Check the connection of outdoor temperature sensor to CN1, CN2 on outdoor power source board	Insert again if loose.	
2	Measure the resistance on the two ends of outdoor temperature sensor: Resistance of CN1 terminal sensor – (25°C / 5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet. Resistance of CN2 terminal sensor – (25°C / 20KΩ). For other resistance, please refer to the Temperature – Resistance Sheet.	Replace the temperature sensor assembly if the resistance is not in standard level.	
3	If the above testing is normal	Replace outdoor power source board	

(4) Display E4

Symptom		Display E4	
Cause		System abnormal: Let the compressor run for 5 minutes. If the indoor coil temperature cannot be 2°C lower than that before the compressor is started (2°C higher for heating mode), it can be judged as the system is abnormal.	
S/N	Inspections	How to Solve	Remarks
1	Check the high-pressure and low-pressure valves.	If not open, open again to ensure the system circulation is smooth.	
2	Check refrigerant volume. If no obvious temperature change after running 5 minutes in cooling mode, the system is in shortage of refrigerant.	Check the leakage point and recharge the refrigerant.	
3	Check the indoor evaporator pipe coil temperature sensor (25°C/5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet.	Replace the temperature sensor if the resistance is not in standard level.	
4	If the above inspections are normal	Replace the indoor main PCB.	

(5) Display EC

Symptom		Display EC	
Cause		Outdoor communication fault between power source board and intelligent power module	
S/N	Inspections	How to Solve	Remarks
1	Check the contact of communication wire (CN5) between power source board and intelligent power module	Insert again if loose.	
2	If the above inspections are normal	Replace intelligent power module. If still not solved, replace outdoor power source board.	

(6) Display EP

Symptom		Display EP	
Cause		Compressor temperature switch fault (on top of the compressor)	
S/N	Inspections	How to Solve	Remarks
1	Check the connection of the compressor top temperature switch wires to CN3 on outdoor power source board	Insert again if loose.	
	No switch on compressor top	Jumper short-circuiting (This function not provided for 9k/12k unit)	
2	If the compressor temperature is very high, with bad smell.	Check the U, V and W wires of the compressor.	Connect again if incorrect.
		Check the system pressure.	The pressure is low. Add refrigerant to ensure the system pressure is normal.
		Check if anything blocks the outdoor ventilation and radiating	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.
3	If compressor temperature is not high.	Replace the outdoor power source board.	

(7) Display EA

Symptom		Display EA	
Cause		Current sensor fault	
S/N	Inspections	How to Solve	Remarks
1	Check if refrigerant leakage	Find the leakage point and recharge the refrigerant	
2	If still not solved,	Replace the outdoor power source board	

(8) Display EU

Symptom		Display EU	
Cause		Voltage sensor fault	
S/N	Inspections	How to Solve	Remarks
1	Voltage sensor fault	Replace the outdoor power source board	

(9) Display E9 (Firstly display P0 or P9, then change to E9)

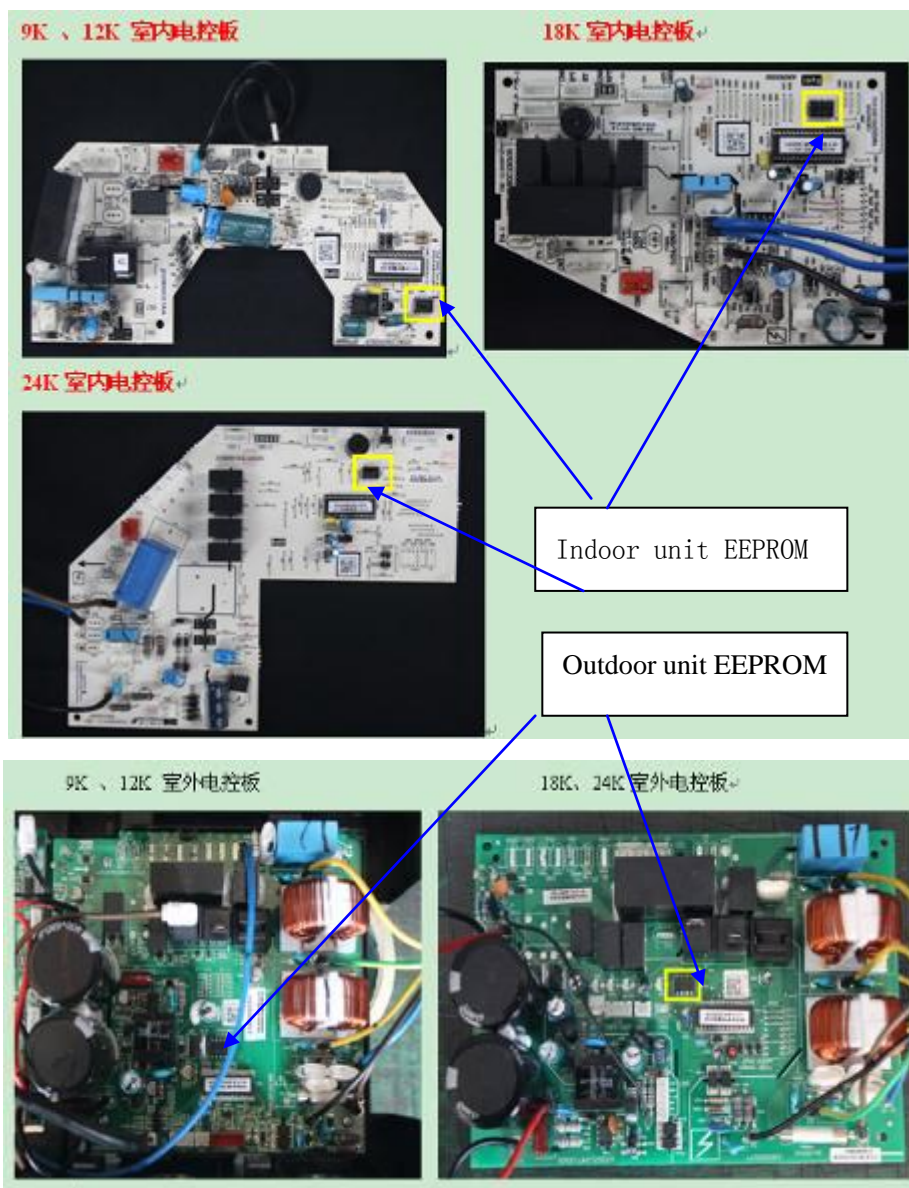
Symptom		Cause		Display E9 (Firstly display P0 or P9, then change to E9)		
S/N	Inspections		Intelligent power module fault		Remarks	
1	Power off and then, power on, check the protection code on display. Firstly display P0	If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness		If no insert wrong, replace the intelligent power module		
		“P0” appears when the air conditioner is working	Check if the outdoor module is tightly installed onto the radiating fins and if the silicone is applied evenly	Fix the screws again if loose.		
			Check the system pressure.	Recharge refrigerant if the pressure is low. Discharge some refrigerant if the pressure is too high.		
			Check the outdoor ventilation and if there is any obstruction that affects the normal radiating of the air conditioner.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.		
		The above inspections are normal, but the fault remains unsolved		Replace the intelligent power module		
2	Power off and then, power on, check the protection code on display. Firstly display P9	If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness		If no insert wrong, replace the intelligent power module		
		P9 appears after the air conditioner is started and has run for a period of time	Cooling / heating is normal during run	Replace the intelligent power module		
			If the cooling / heating is abnormal, check the compressor wiring for correctness.	Insert again if loose.		Be sure to apply silicone when replacing intelligent power module.
		When the compressor is restarted immediately after stop, this might also cause P9 protection because the cooling system is not stable.		Try to start the air conditioner again after a longer period of stop		

(10) Display E0、 E5

Symptom		Display E0、 E5			
Cause		Indoor / outdoor communication fault			
S/N	Inspections	How to Solve	Remarks		
1	Energize and observe for approx. 10 minutes. If E0 is always displayed or changed to E5 after a period of time:	1. Check if the indoor and outdoor connections are correct. The terminal L and N shall correspond to each other on indoor and outdoor units. Measure the voltage on outdoor terminal L and N (before display of E0 fault). If the voltage is “0”:	Replace the indoor main PCB		
		2. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage change occurs between 0~24V (change pulse voltage)	Replace the indoor main PCB.		
		3. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage change occurs between 0~12V(change pulse voltage), but there is no 24V:	Replace the outdoor power source board		
		4. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage has no change:	Firstly replace the indoor main PCB. If the fault remains unsolved, replace the outdoor power source board.		
		5. Indicator on outdoor power source board	1) Check if PFC board damaged	If damaged, replace PFC board.	
			2) If no damage, test the DC voltage between DC+ and DC-. If the voltage is approx. 300V:	Replace the power source board.	
			3) If no damage, test the DC voltage between DC+ and DC-. If the voltage is zero:	Replace the PFC board	
6. If the problem cannot be solved by using the methods above:	Firstly replace the intelligent power module. If the problem remains unsolved, replace the indoor main PCB, power source board, and PFC board				

(11) Display EE

Symptom		Display EE	
Cause		EEPROM fault	
S/N	Inspections	How to Solve	Remarks
1	Power off and then power on, if the fault remains, it is needed to check if the indoor and outdoor EEPROM installation is loose.	Fix again	
2	If the installation is good:	Replace the indoor main PCB	
3	If the fault remains unsolved after replacement of the indoor control board:	Replace outdoor power source board	



(12) Display EF

Symptom		Display EF	
Cause		Outdoor fan motor fault (DC motor)	
S/N	Inspections	How to Solve	Remarks
1	Check if the outdoor power source board is broken	Replace outdoor power source board	
2	If not solved by above method	Replace outdoor DC fan motor	

(13) Display EH

Symptom		Display EH	
Cause		Outdoor intake temperature sensor fault	
S/N	Inspections	How to Solve	Remarks
1	Check the wire connections of outdoor temperature sensor assembly	Fix again	
2	Check the outdoor intake temperature sensor (25°C/5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet.	Replace outdoor temperature sensor assembly.	
3	If the fault remains unsolved	Replace outdoor power source board	

(14) Display P0

Symptom		Display P0	
Cause		Intelligent Power Module protection	
Inspections		How to Solve	Remarks
Power off and then power on, check the protection code on display. Firstly display P0	If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness.		If no insert wrong, replace the intelligent power module
	“P0” appears when the air conditioner is working	Check if the outdoor intelligent power module is tightly installed onto the radiating fins and if the silicone is applied evenly.	Fix the radiator again if loose.
		Check the system pressure.	Recharge refrigerant if the pressure is low. Discharge some refrigerant if the pressure is too high.
		Check the outdoor ventilation and if there is any obstruction that affects the normal radiating of the air conditioner.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.
		The above inspections are normal, but the fault remains unsolved	Replace the intelligent power module

(15) Display P1

Symptom		Display P1	
Cause		Overvoltage / undervoltage protection	
S/N	Inspections	How to Solve	Remarks
1	Test the supply voltage if it is between 160V ~260V (AC) .	It is normal protection if exceeding this range.	
2	Test if the voltage between L and N terminal of outdoor unit is within 160V~260V (AC) .	It is normal protection if exceeding this range.	
3	If the voltage is normal:	Replace the outdoor power source board	



(16) Display P2

Symptom		Display P2	
Cause		Overcurrent protection	
S/N	Inspections	How to Solve	Remarks
1	Check if the outdoor fan motor is stopped due to overheat protection, or damaged, and if the fan capacitor is damaged.	Replace the damaged capacitor and the damaged outdoor fan motor.	
2	Intelligent power module damaged	Replace the intelligent power module.	

(17) Display P4

Symptom		Display P4	
Cause		Exhaust overtemperature protection	
S/N	Inspections	How to Solve	Remarks
1	Check if the air inlet and outlet of outdoor unit is blocked by any obstruction.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.	
2	Check the system for shortage of refrigerant.	Add refrigerant	
3	Check if the exhaust temperature sensor is not in standard level (25°C/20KΩ). For other resistances, please refer to the Exhaust Temperature Sensor – Resistance Sheet)	Replace outdoor temperature sensor assembly	
4	Outdoor power source board damaged	Replace the outdoor power source board	



(18) Display P5

Symptom		Display P5	
Cause		Subcooling protection under cooling mode	
S/N	Inspections	How to Solve	Remarks
1	Check if the air inlet and outlet of indoor unit is blocked by any obstruction.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.	
2	Check the system for shortage of refrigerant.	Add refrigerant	
3	Check if the exhaust temperature sensor is not in standard level. (Measure the resistance of the resistors on two ends of indoor temperature sensor: (25°C / 5KΩ). For other resistances, please refer to the Temperature – Resistance Sheet (Appendix 1).	Replace indoor temperature sensor assembly	
4	Indoor main PCB board damaged	Replace the indoor main PCB	



(19) Display P6

Symptom		Display P6	
Cause		Overheating protection under cooling mode	
S/N	Inspections	How to Solve	Remarks
1	Check if the air inlet and outlet of outdoor unit is blocked by any obstructions.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.	
2	Check the system for shortage of refrigerant.	Add refrigerant	
3	Check if the outdoor evaporator coil temperature sensor is drifted, short circuited or open circuited (25°C/5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet.	Replace the outdoor temperature sensor assembly	
4	Outdoor power source board damaged	Replace the outdoor power source board	



(20) Display P7

Symptom		Display P7	
Cause		Overheating protection under heating mode	
S/N	Inspections	How to Solve	Remarks
1	Check if the air inlet and outlet of outdoor unit is blocked by any obstruction.	Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth.	
2	Check the system for shortage of refrigerant.	Add refrigerant	
3	Check if the exhaust temperature sensor is not in standard level. (Measure the resistance of the resistors on two ends of indoor temperature sensor: (25°C / 5KΩ). For other resistances, please refer to the Temperature – Resistance Sheet (Appendix 1).	Replace the indoor temperature sensor assembly	
4	Indoor main PCB damaged	Replace the indoor main PCB board	




(21) Display P8

Symptom		Display P8	
Cause		Outdoor overtemperature / undertemperature protection	
S/N	Inspections	How to Solve	Remarks
1	If the compressor run under cooling mode when the outdoor temperature is lower than -1°C, or run under heating mode when the outdoor temperature is higher than 33°C, the compressor alarms P8 protection.	Normal protection function	
2	If the temperature is not within the protective range above, please refer to the Temperature – Resistance Sheet (See Appendix). Measure the resistors on the two ends of outdoor intake temperature sensor (CN1) (25°C/5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet.	Replace outdoor temperature sensor assembly	
3	If the fault remains unsolved	Replace outdoor power source board	



(22) Display P9

Symptom		Cause		Intelligent power module fault	
S/N	Inspections		How to Solve	Remarks	
1	Power off and power on, check the protection code on display. Firstly display P9	If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness.		If no insert wrong, replace the intelligent power module.	
		P9 appears after the air conditioner is started and has run for a period of time	Cooling/heating is normal during run	Replace the intelligent power module. (Be sure to apply silicone when replacing the intelligent power module.) .	
			If the cooling / heating are abnormal, check the compressor wiring for correctness.	Insert again if loose	
		When the compressor is restarted immediately after stop, this might also cause P9 protection because the cooling system is not stable.		Try starting the air conditioner again after a longer period of stop	

2. Other faults

1) The indoor unit works normally but the outdoor unit does not work.

Cause Analysis:

- a) Check if fault code is displayed: If yes, treat according to fault code. If no, check according to the following steps.
- b) If the outdoor fan runs normally (The outdoor fan is started 5 seconds before the compressor is started, and it is stopped 15 seconds after the compressor is stopped), the client might make wrong judgment on that the outdoor unit does not work because the compressor working frequency is low or the system is in shortage of refrigerant. Check the system cooling / heating effect and confirm if the system is in shortage of refrigerant.
- c) Check if the resistance of each temperature sensor is in standard level. (See appendix for the temperature sensor parameters): If not, replace the temperature sensor.
- d) Check if the indoor / outdoor and circuit board wiring. Check if the connection is good. Please tighten the wires.

2) The outdoor unit is stopped when the air conditioner has run for a period of time

Cause Analysis:

- a) If any fault is displayed after stop: If yes, treat according to fault code. If not, check according to Step (b).
- b) Check if the supply voltage is normal, including the voltage change when the air condition is started. If the voltage is unstable or changes too heavily, please check the power source. If no problem, check according to Step (c).
- c) Check if the temperature sensors are normal (See appendix for the temperature sensor parameters). Check if the resistance is in standard level. If not, replace the temperature sensor. If normal, check according to Step (d).
- d) Check if the indoor / outdoor circuit connection and power connection are in good contact. If no, tighten the connection wires. If yes, check according to Step (e).
- e) Check if the refrigerant is too much or too less. If yes, add refrigerant.

3) The air conditioner is tripped when it is started.

Cause Analysis:

- a) Check if the user's power source plug is correctly connected (for example, the ground wire might be wrongly connected as the neutral wire)
- b) Check if the indoor / outdoor circuit and the wiring terminal are correctly connected, and if there is short circuiting.
- c) Check if the outdoor circuit board, wiring terminal and power connection wires are damaged, and if there is short circuiting to the metal parts.
- d) Check if the rectifier bridge of outdoor controller is short circuited (The short circuiting of rectifier bridge will probably cause tripping error).

4) The complete unit does not work

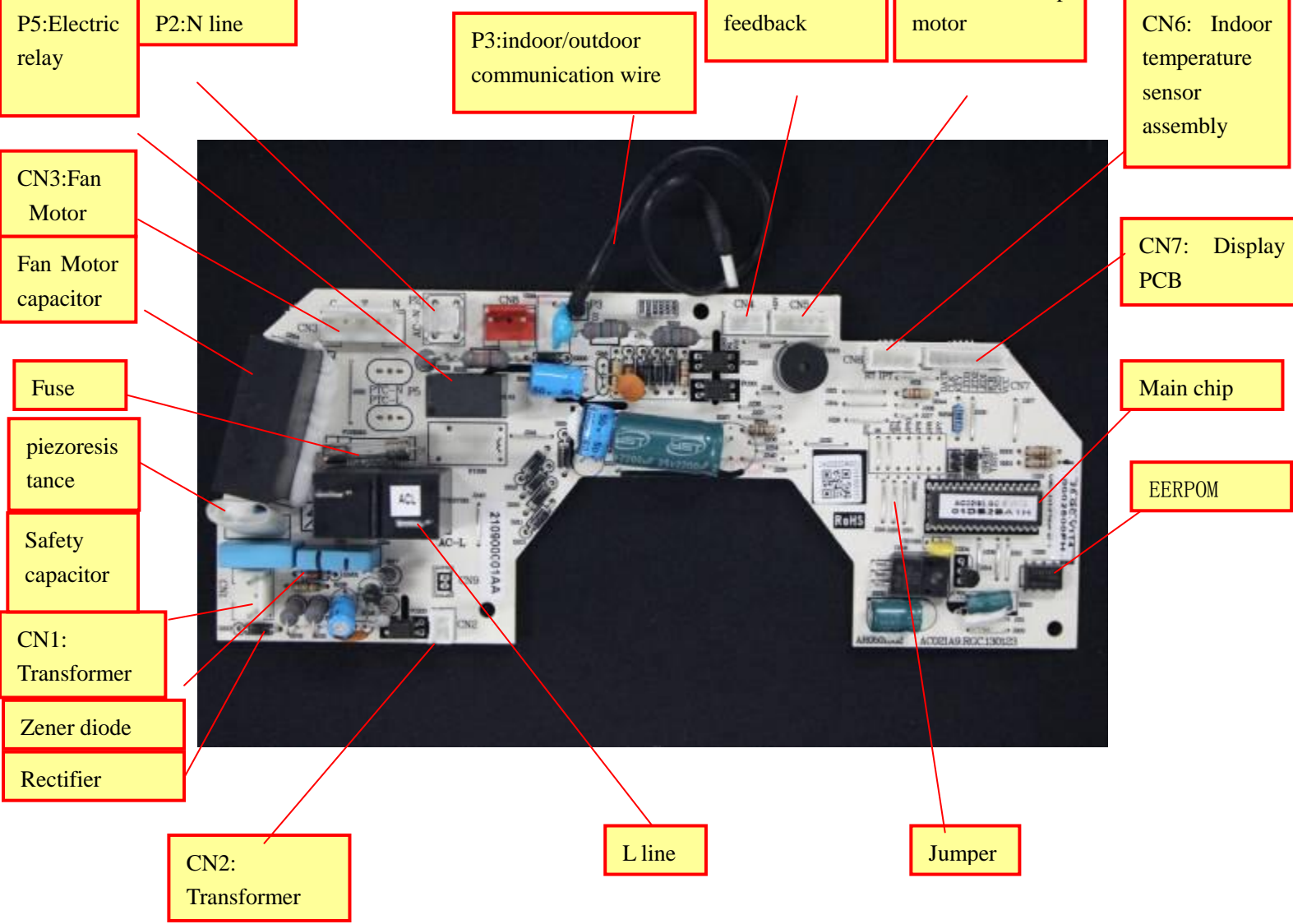
Cause Analysis:

- a) If fault code is displayed: If yes, treat according to fault code. If no, check according to Step (2).

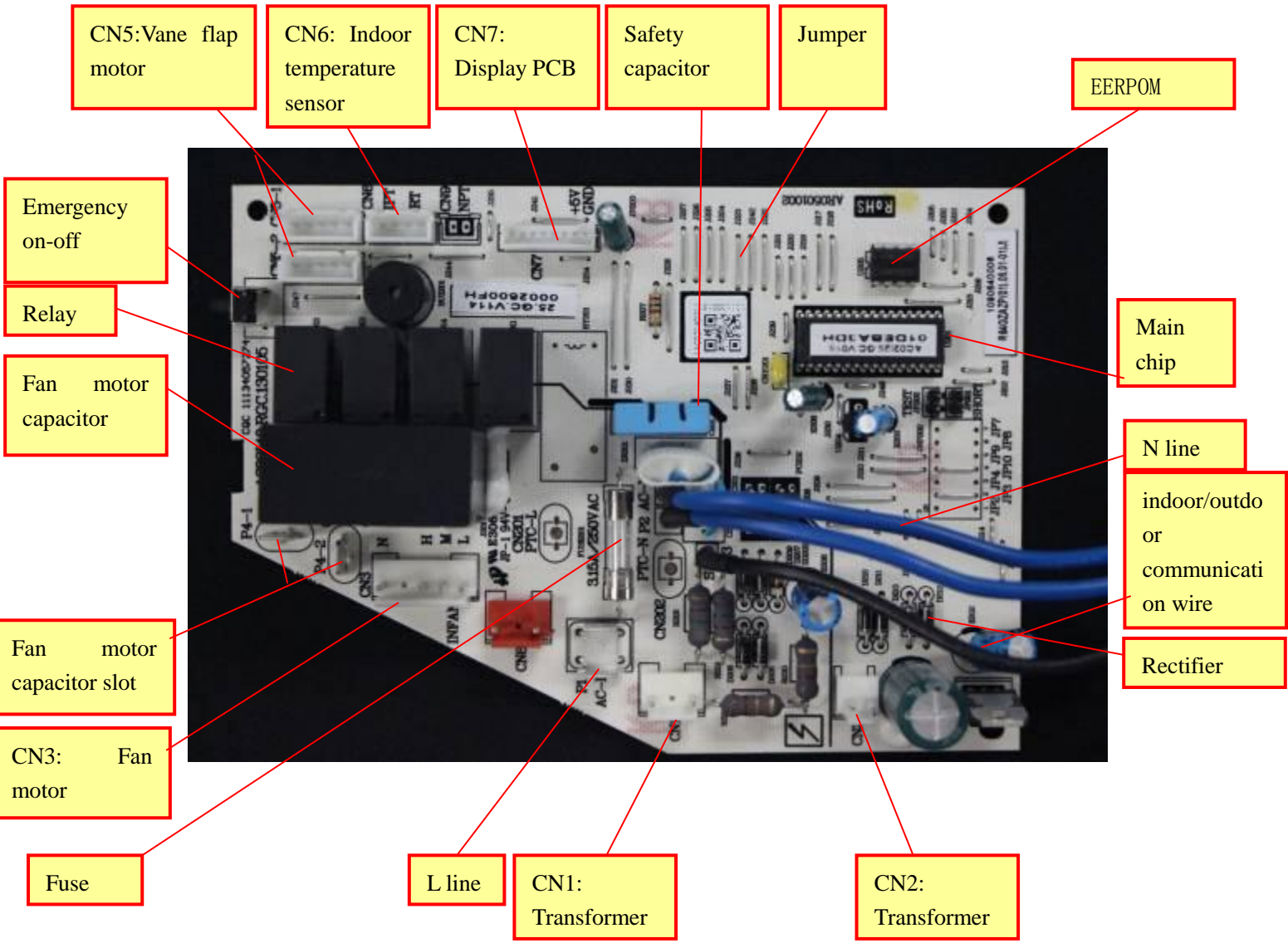
- b) Check if the power plug has electricity. If no, check the power source. If yes, check if the fuse is good. If no, replace the fuse. If yes, check according to Step (3).
- c) Check if the resistance of the sensors on indoor and outdoor units is in standard level. If not, replace the sensor. If yes, check according to Step (4).
- d) Check if the indoor and outdoor communication is failed. The step is same as that for check when the indoor unit works normally but the outdoor unit does not work.

Appendix 1

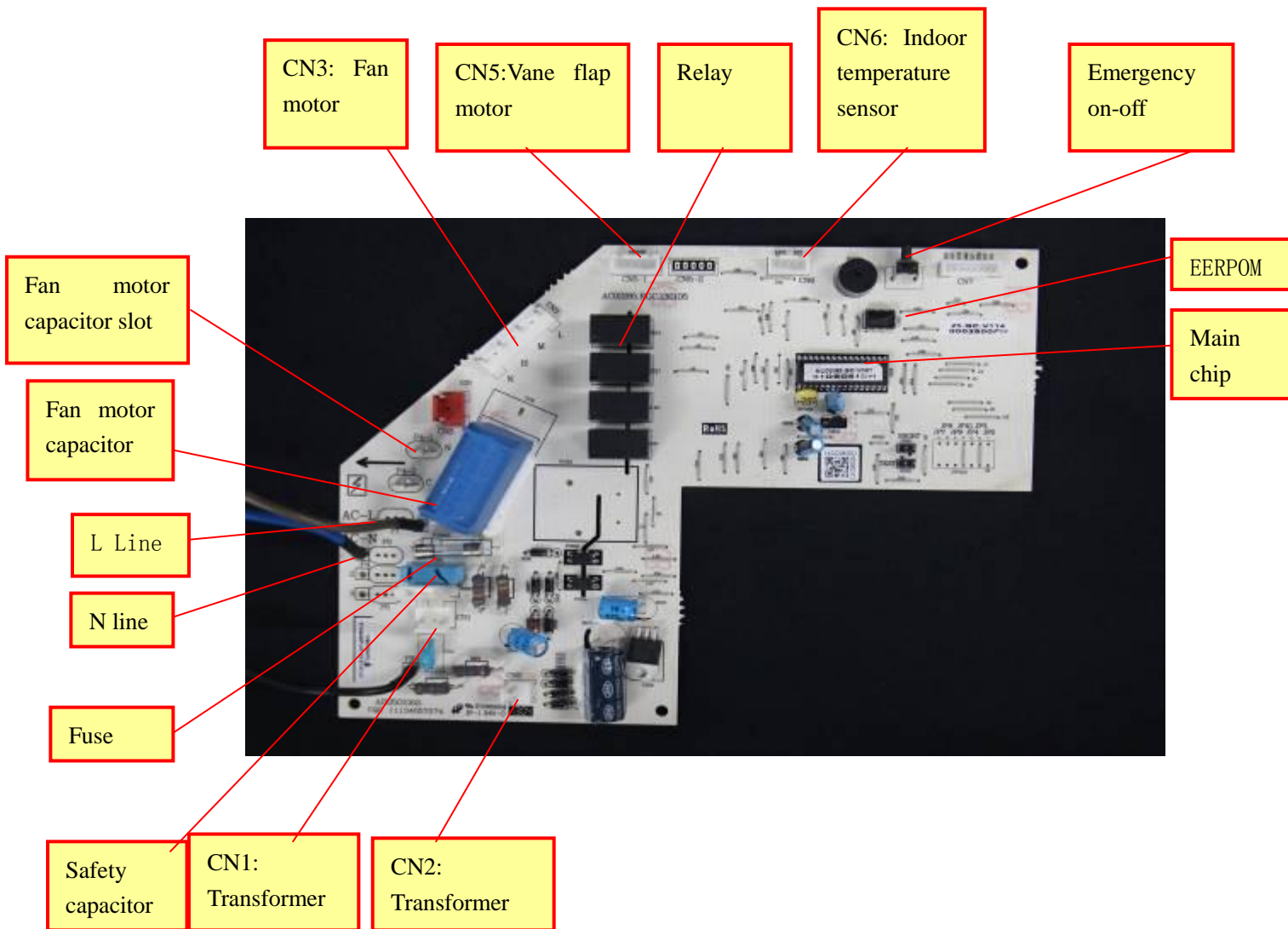
1. 9k/12k Indoor main PCB:



18k indoor unit PCB:



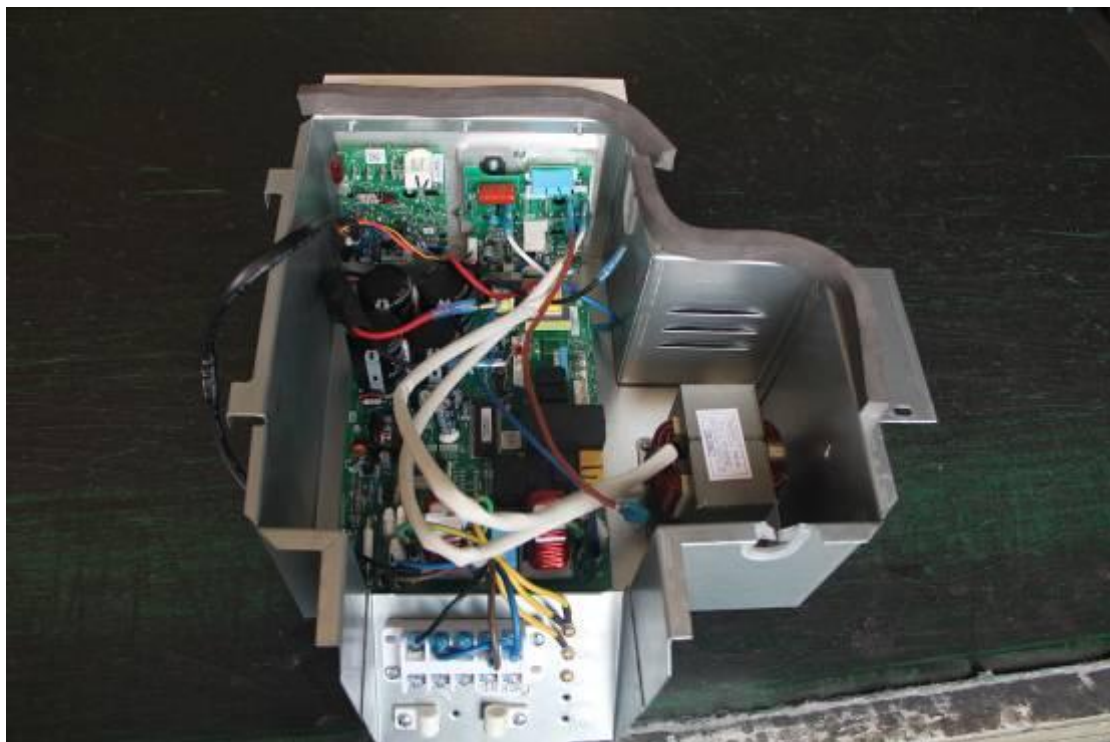
24k indoor main PCB:



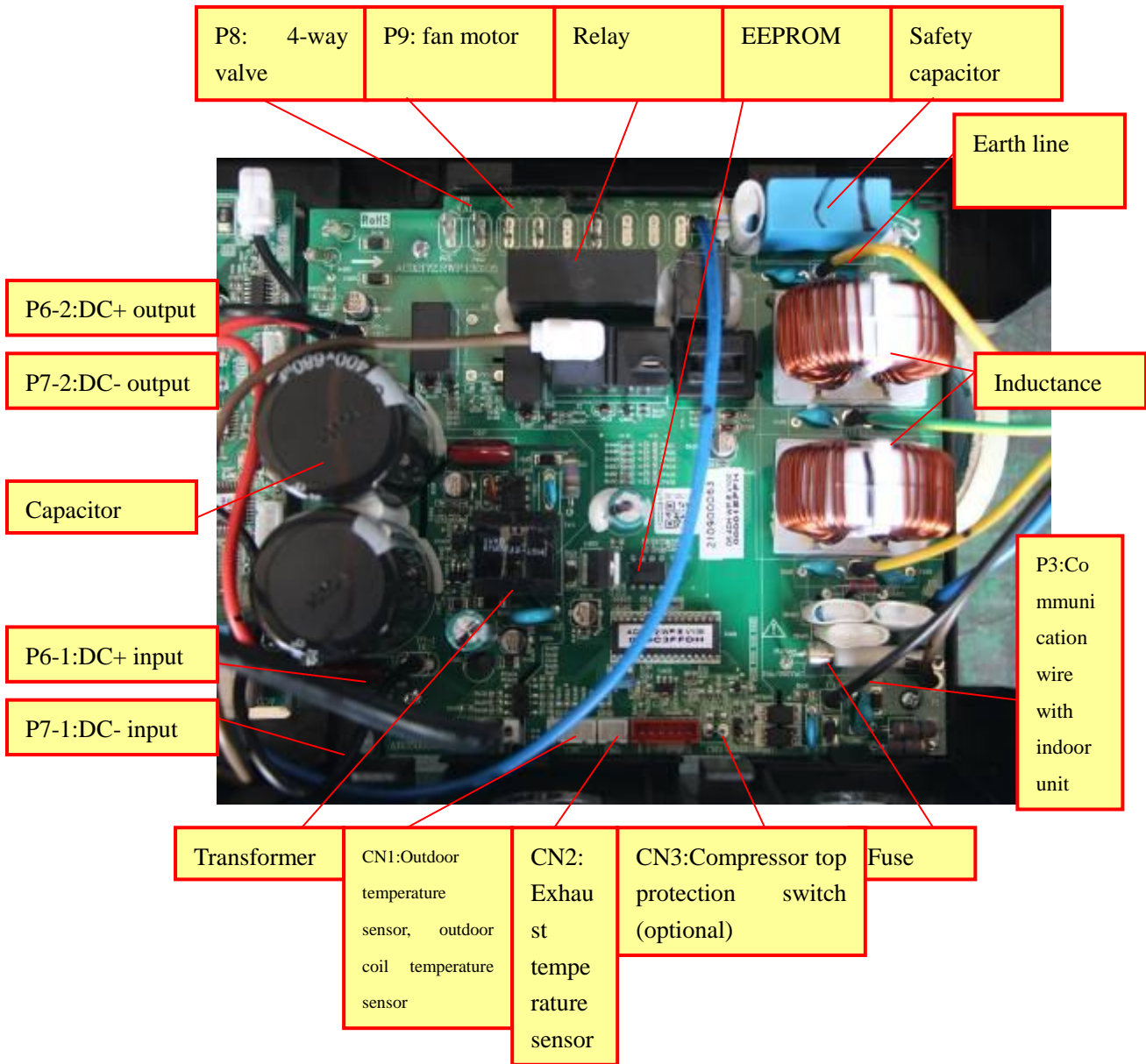
2. 9k/12k outdoor power source board and intelligent power source board



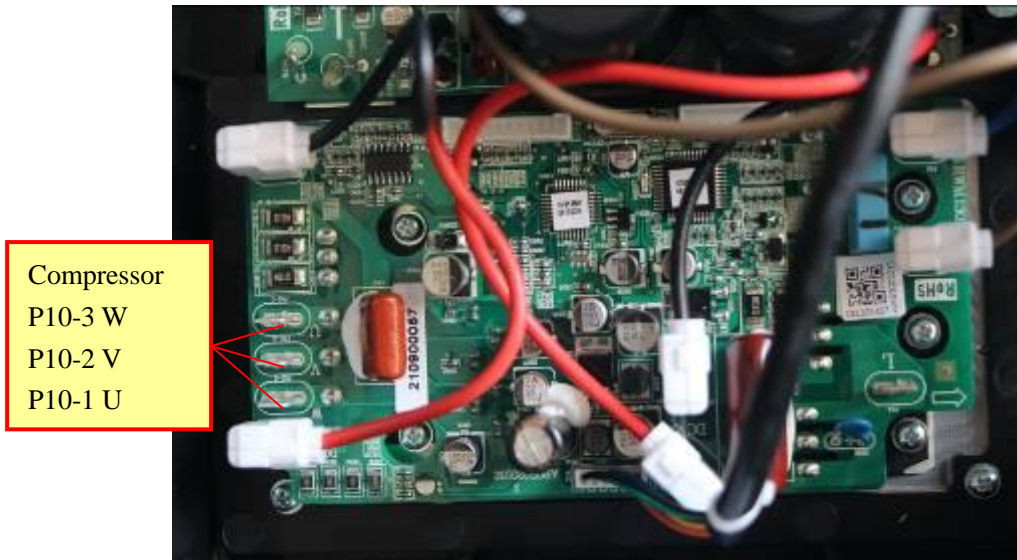
18k/24k outdoor power source board, intelligent power source board and PFC board



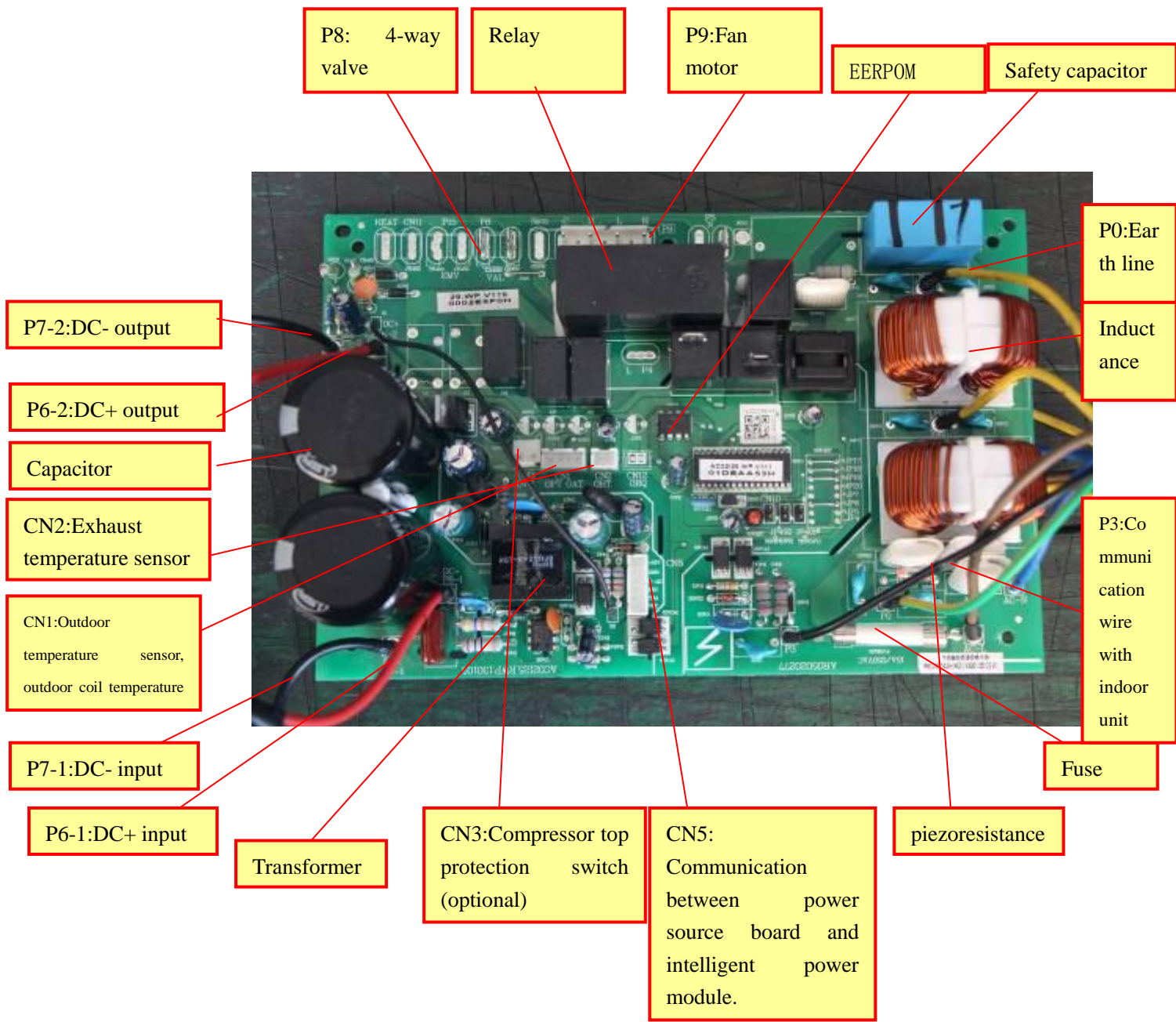
9k/12k outdoor power source board



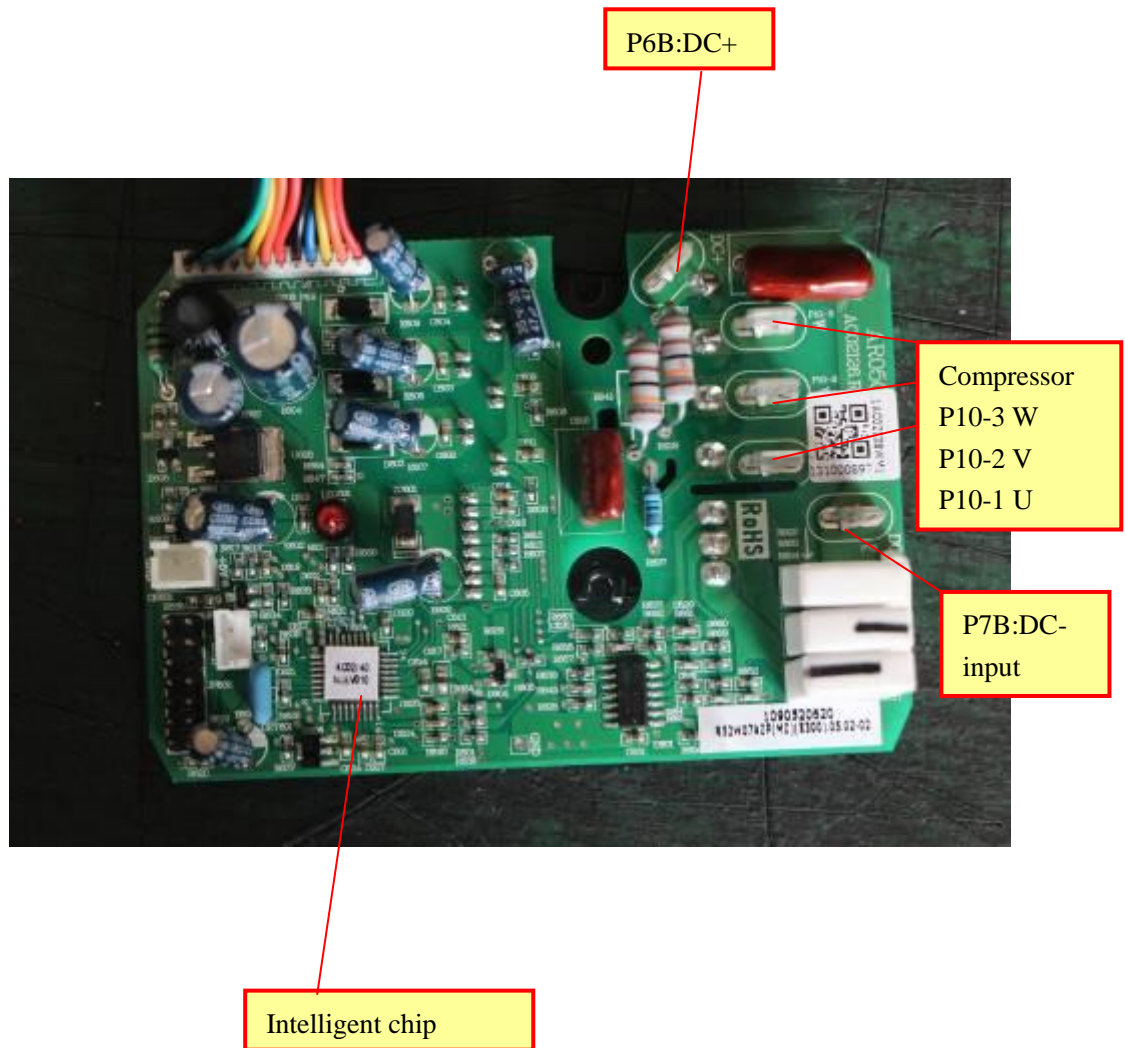
9k/12k intelligent power module board (PFC board integrated.)



18k/24k outdoor power source board



4. 18k/24k Intelligent power module:



Appendix 2

R25°C = 5K Ω \pm 2%				B25°C/50°C = 3470 \pm 2%				
TEMP.	R(Kohm)	Sensor Voltage on two ends	TEMP	R(Kohm)	Sensor Voltage on two ends	TEMP	R(Kohm)	Sensor Voltage on two ends
-25	48.488	<i>4.524</i>	17	6.863	<i>2.868</i>	59	1.512	<i>1.143</i>
-24	45.985	<i>4.501</i>	18	6.591	<i>2.819</i>	60	1.464	<i>1.115</i>
-23	43.627	<i>4.477</i>	19	6.332	<i>2.769</i>	61	1.418	<i>1.088</i>
-22	41.403	<i>4.452</i>	20	6.084	<i>2.720</i>	62	1.374	<i>1.061</i>
-21	39.305	<i>4.426</i>	21	5.847	<i>2.671</i>	63	1.331	<i>1.035</i>
-20	37.326	<i>4.399</i>	22	5.621	<i>2.621</i>	64	1.290	<i>1.009</i>
-19	35.458	<i>4.371</i>	23	5.404	<i>2.572</i>	65	1.250	<i>0.984</i>
-18	33.695	<i>4.343</i>	24	5.198	<i>2.524</i>	66	1.212	<i>0.960</i>
-17	32.030	<i>4.313</i>	25	5.000	<i>2.475</i>	67	1.175	<i>0.936</i>
-16	30.458	<i>4.283</i>	26	4.811	<i>2.427</i>	68	1.139	<i>0.913</i>
-15	28.972	<i>4.252</i>	27	4.630	<i>2.379</i>	69	1.105	<i>0.890</i>
-14	27.567	<i>4.219</i>	28	4.457	<i>2.332</i>	70	1.072	<i>0.868</i>
-13	26.239	<i>4.186</i>	29	4.292	<i>2.285</i>	71	1.040	<i>0.847</i>
-12	24.984	<i>4.152</i>	30	4.133	<i>2.238</i>	72	1.009	<i>0.825</i>
-11	23.795	<i>4.117</i>	31	3.981	<i>2.192</i>	73	0.979	<i>0.805</i>
-10	22.671	<i>4.082</i>	32	3.836	<i>2.146</i>	74	0.950	<i>0.785</i>
-9	21.606	<i>4.045</i>	33	3.697	<i>2.101</i>	75	0.922	<i>0.765</i>
-8	20.598	<i>4.008</i>	34	3.563	<i>2.057</i>	76	0.895	<i>0.746</i>
-7	19.644	<i>3.969</i>	35	3.435	<i>2.012</i>	77	0.869	<i>0.728</i>
-6	18.732	<i>3.930</i>	36	3.313	<i>1.969</i>	78	0.843	<i>0.710</i>
-5	17.881	<i>3.890</i>	37	3.195	<i>1.926</i>	79	0.819	<i>0.692</i>
-4	17.068	<i>3.850</i>	38	3.082	<i>1.883</i>	80	0.795	<i>0.675</i>
-3	16.297	<i>3.808</i>	39	2.974	<i>1.842</i>	81	0.773	<i>0.658</i>
-2	15.565	<i>3.766</i>	40	2.870	<i>1.800</i>	82	0.751	<i>0.641</i>
-1	14.871	<i>3.723</i>	41	2.770	<i>1.760</i>	83	0.729	<i>0.625</i>
0	14.212	<i>3.680</i>	42	2.674	<i>1.720</i>	84	0.709	<i>0.610</i>
1	13.586	<i>3.635</i>	43	2.583	<i>1.681</i>	85	0.689	<i>0.595</i>
2	12.991	<i>3.590</i>	44	2.494	<i>1.642</i>	86	0.669	<i>0.580</i>
3	12.426	<i>3.545</i>	45	2.410	<i>1.604</i>	87	0.651	<i>0.566</i>
4	11.889	<i>3.499</i>	46	2.328	<i>1.567</i>	88	0.633	<i>0.552</i>
5	11.378	<i>3.452</i>	47	2.250	<i>1.530</i>	89	0.615	<i>0.538</i>
6	10.893	<i>3.406</i>	48	2.174	<i>1.495</i>	90	0.598	<i>0.525</i>
7	10.431	<i>3.358</i>	49	2.102	<i>1.459</i>	91	0.582	<i>0.512</i>
8	9.991	<i>3.310</i>	50	2.032	<i>1.425</i>	92	0.566	<i>0.499</i>
9	9.573	<i>3.262</i>	51	1.965	<i>1.391</i>	93	0.550	<i>0.487</i>
10	9.174	<i>3.214</i>	52	1.901	<i>1.357</i>	94	0.535	<i>0.475</i>
11	8.795	<i>3.165</i>	53	1.839	<i>1.325</i>	95	0.521	<i>0.463</i>
12	8.433	<i>3.116</i>	54	1.779	<i>1.293</i>	96	0.507	<i>0.452</i>
13	8.089	<i>3.067</i>	55	1.721	<i>1.262</i>	97	0.493	<i>0.441</i>
14	7.760	<i>3.017</i>	56	1.666	<i>1.231</i>	98	0.480	<i>0.430</i>
15	7.447	<i>2.968</i>	57	1.613	<i>1.201</i>	99	0.467	<i>0.419</i>
16	7.148	<i>2.918</i>	58	1.561	<i>1.172</i>	100	0.455	<i>0.409</i>

Exhaust temperature sensor: R85°C=2. 113KΩ ± 3%

B25°C/85°C=4000 ± 2%

TEMP	Rmin	R(t)	Rmax	TEMP	Rmin	R(t)	Rmax	TEMP	Rmin	R(t)	Rmax
-30	283.3	322.9	367.7	24	19.36	20.89	22.52	78	2.563	2.654	2.745
-29	267.4	304.4	346.3	25	18.55	20	21.54	79	2.481	2.567	2.654
-28	252.5	287.1	307.4	26	17.77	19.14	20.6	80	2.402	2.484	2.567
-27	238.5	270.9	307.4	27	17.03	18.32	19.7	81	2.327	2.404	2.483
-26	225.4	255.7	289.8	28	16.32	17.55	18.85	82	2.254	2.327	2.401
-25	213.1	241.4	273.3	29	15.65	16.81	18.04	83	2.183	2.253	2.323
-24	201.5	228	257.9	30	15	16.1	17.27	84	2.115	2.182	2.248
-23	190.6	215.5	243.4	31	14.39	15.43	16.54	85	2.05	2.113	2.176
-22	180.3	203.6	229.8	32	13.81	14.79	15.34	86	1.985	2.047	2.109
-21	170.7	192.5	217	33	13.25	14.18	15.17	87	1.922	1.983	2.045
-20	161.6	182.1	205	34	12.72	13.6	14.54	88	1.861	1.922	1.983
-19	153.1	172.3	193.7	35	12.21	13.05	13.93	89	1.802	1.862	1.923
-18	145	163.1	183.2	36	11.72	12.52	13.36	90	1.746	1.805	1.865
-17	137.5	154.4	173.2	37	11.26	12.01	12.81	91	1.692	1.75	1.809
-16	130.3	146.2	163.9	38	10.82	11.53	12.29	92	1.639	1.697	1.755
-15	123.6	138.5	155.1	39	10.29	11.07	11.78	93	1.589	1.646	1.703
-14	117.3	131.3	146.8	40	9.986	10.63	11.31	94	1.54	1.596	1.653
-13	111.3	124.4	139	41	9.6	10.21	10.85	95	1.493	1.549	1.604
-12	105.6	118	131.7	42	9.231	9.813	10.42	96	1.448	1.502	1.558
-11	100.3	111.9	124.7	43	8.878	9.43	10	97	1.404	1.458	1.512
-10	95.24	106.2	118.2	44	8.54	9.064	9.612	98	1.362	1.415	1.469
-9	90.49	100.8	112.1	45	8.217	8.714	9.233	99	1.321	1.373	1.426
-8	85.99	95.68	106.2	46	7.908	8.38	8.872	100	1.284	1.335	1.387
-7	81.75	90.86	100.8	47	7.612	8.06	8.526	101	1.245	1.296	1.348
-6	77.74	86.31	95.74	48	7.328	7.754	8.196	102	1.209	1.258	1.309
-5	73.94	82.01	90.88	49	7.057	7.461	7.88	103	1.173	1.222	1.272
-4	70.35	77.95	86.29	50	6.797	7.18	7.578	104	1.139	1.187	1.236
-3	66.96	74.11	81.96	51	6.548	6.912	7.289	105	1.105	1.153	1.202
-2	63.74	70.48	77.87	52	6.309	6.655	7.013	106	1.073	1.12	1.168
-1	60.69	67.05	74	53	6.08	6.409	6.748	107	1.042	1.089	1.136
0	57.81	63.8	70.34	54	5.861	6.173	6.495	108	1.013	1.058	1.104
1	55.08	60.72	66.88	55	5.651	5.947	6.253	109	0.9833	1.028	1.074
2	52.49	57.81	63.61	56	5.449	5.73	6.02	110	0.9553	0.9997	1.045
3	50.03	55.05	60.52	57	5.255	5.522	5.798	111	0.9283	0.9719	1.016
4	47.71	52.44	57.59	58	5.07	5.323	5.585	112	0.9021	0.9451	0.9892
5	45.5	49.97	54.82	59	4.891	5.132	5.381	113	0.8765	0.9191	0.9626
6	43.41	47.62	52.2	60	4.72	4.949	5.101	114	0.8524	0.894	0.9367
7	41.42	45.4	49.71	61	4.556	4.774	4.997	115	0.8087	0.8595	0.9117
8	39.53	43.2	42.33	62	4.398	4.605	4.817	116	0.8059	0.8461	0.8875
9	37.74	41.29	45.12	63	4.247	4.448	4.644	117	0.7837	0.8233	0.8641
10	36.04	39.39	43.01	64	4.101	4.288	4.479	118	0.7623	0.8012	0.8413
11	34.42	37.59	41	65	3.961	4.139	4.32	119	0.7415	0.7798	0.8193
12	32.89	35.87	39.1	66	3.827	3.995	4.167	120			
13	31.43	34.25	37.29	67	3.698	3.858	4.021	121	0.702	0.7386	0.7773
14	30.04	32.71	35.58	68				122	0.6631	0.7195	0.7572
15	29.72	31.24	33.95	69				123	0.6649	0.7007	0.7378
16				70	3.339	3.476	3.616	124	0.6472	0.6824	0.7189
17				71	3.229	3.359	3.491	125	0.6301	0.6647	0.7006
18	25.13	27.26	29.55	72	3.122	3.246	3.372	126	0.6135	0.6476	0.6829
19	24.05	26.07	28.23	73	3.02	3.138	3.257	127	0.5974	0.6309	0.6657

20	23.02	24.93	26.97	74	2.921	3.033	3.146	128	0.5818	0.6148	0.649
21	22.04	23.84	25.77	75	2.827	2.933	3.04	129	0.5667	0.5991	0.6328
22	21.1	22.81	24.63	76	2.735	2.836	2.938	130	0.5521	0.5839	0.6171
23	20.21	21.83	23.55	77	2.647	2.743	2.84				

Appendix 3

Silk-printed label on outdoor power source board

Control board connection	Connector label	Description label	Relay label	Remarks
AC power incoming wire L	P1	AC-L		
AC power incoming wire N	P2	AC-N		It is required to reserve 4 inserts at least
To indoor communication wire	P3	S		
Ground wire	P0	GND		
Outgoing wire L after filter	P4	L	K1	Relay control
Outgoing wire N after filter	P5	N		For multiple wires, use P5-1 and P5-2 to identify.
DC+ input	P6-1	DC+		
DC- input	P7-1	DC-		
DC+ output	P6-2	DC+		
DC- output	P7-2	DC-		
4-way valve output	P8	VAL	K4	
Outdoor fan HI output	P9-1	H	K2	
Outdoor fan LOW output	P9-2	L	K3	
Outdoor fan capacitor	P9-3	C		
Compressor output phase-U	P10-1	U		
Compressor output phase-V	P10-2	V		
Compressor output phase-W	P10-3	W		
Module DC+ input	P6B	DC+		Intelligent power module
Module DC- input	P7B	DC-		Intelligent power module
PFC board rectified input + (Direct-insert bridge AC input)	P11	DC+		Power factor correction
PFC board rectified input - (Direct-insert bridge AC input)	P12	DC-		Power factor correction
PFC inductance interface	P13、P14	L		Power factor correction
PFC DC+ output	P6C	DC+		Power factor correction
PFC DC- output	P7C	DC-		Power factor correction
Outdoor fan DC motor socket	CN9			
Outdoor temperature sensor	CN1			
Exhaust pipe temperature sensor	CN2			
Suction pipe temperature sensor	CN10			
Compressor top thermostat	CN3			
Switching power output of power source board	CN4			CN4B on Intelligent power module, and CN4C on Power factor correction
Communication signal of power source board and module board	CN5			CN5B on Intelligent power module
Electronic expansion valve control	CN6			CN6B on Intelligent

signal				power module
Electronic expansion valve socket	CN7			
Communication between power source board and PFC board	CN9			CN9C on Power factor correction
Communication between module board and PFC board	CN8B(Module board)			CN8B on Power factor correction
Base Auxiliary heating	CN11			

Cautions on Replacement of PCB Boards

1, Directive for Replacement of Inverter Module

When replacing inverter module, the technician must take care on the operating process for replacement of inverter module. Special care shall be taken to ensure the coating quality of thermal grease. The detailed directive is as follows:

1. Before replacing the inverter module, make sure to eliminate the old thermal grease and foreign particles with soft clean cloth before you can apply the new thermal grease. Always use the thermal grease provided by the customer service department or the same silicone grease as used in the factory. Never use any other product of poor quality. Operate in strict accordance with the guideline.
2. Ensure that the thermal grease (silicone grease) is applied thin, flat and even. Use plastic scraper to apply the grease. Firstly, place a tiny quantity of thermal grease at the center of the place where the grease is to be coated. Then, use the plastic scraper to apply the grease at the center slightly and evenly onto the entire surface to be treated. In consideration of the deviation in the levelness of radiating fin, the thickness of thermal grease must be 0.1mm (for small area) to 0.3mm (for large area), depending on the size of radiating area.
Note: The function of thermal grease is to fill up the gap and let the surface tightly adhered. It is not true "the more the better".
3. Before placing the greased module flatly onto the radiating fin to tighten the screws, firstly hold down with the hands; then press and move back and forth slightly until it is in full contact before tightening the screws. When tightening the screws, take special care on the strength of radiator materials when using the electric screwdriver, torque screwdriver or torque wrench. Ensure that the screws are correctly tightened to position. The tightening force varies with the module.
4. Cautions on installation of screws on inverter module: If the tightening force is applied extremely unbalance`d during installation of the module onto the radiator, the silicon chip inside the module may be deformed due to the stress. And this might cause damage or degrade to the module. Therefore, be sure to operate according to the required tightening sequence.

The recommended tightening sequence for the inverter module fixed by two screws is as shown below:

A\ Pre-tightening ①→②

B\ Final tightening ①→②

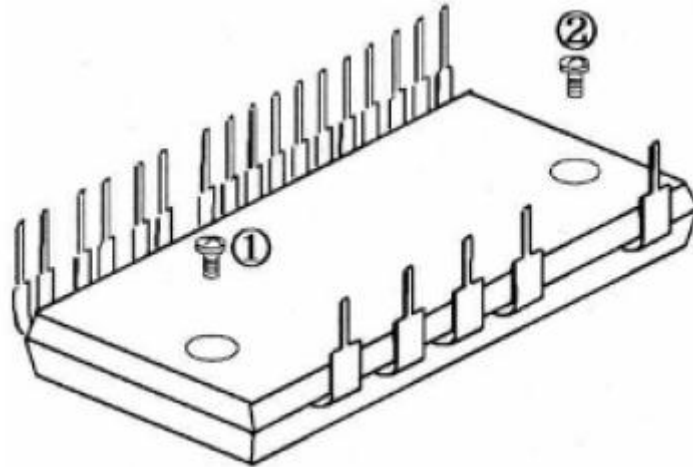
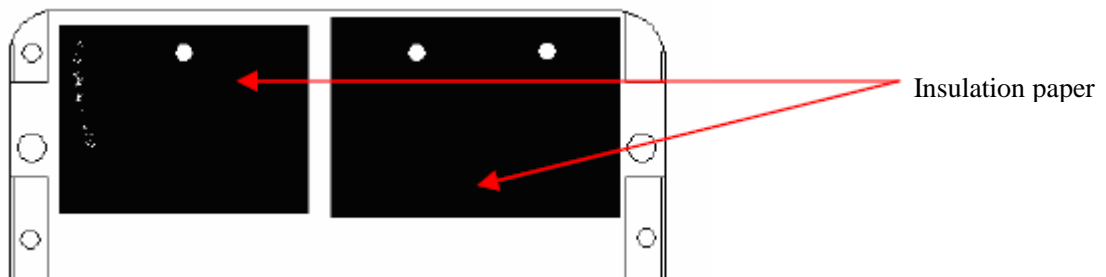


Figure Recommended Tightening Sequence for Screws

Other cautions: As the module is a precious and expensive element, never keep the new module close to magnetic object or touch the module with electrostatic object (including direct touch with your finger). Especially, touch with the port of signal terminal is easy to cause module internal breakdown and results in failure to use. If possible, you may wear electrostatic ring or glove.

2. Directive for Replacement of Power factor correction

- 1) Insulation paper must be attached between power diode, IGBT, rectifier and radiating fins. The screw locking torque is $7 \pm 0.5 \text{kgf.cm}$. Do not loosen the insulation paper after attaching it fully flat onto the radiator. To retighten after loosening, it is needed to eliminate the aluminum scraps on the radiator before retightening.



- 2) It is also needed apply the thermal grease evenly when replacing and installing the PFC with radiating substrate.

3. Directive for Replacement of Outdoor Power Source Board

- 1) The outdoor control is mostly the components carrying high current. The controller is designed of partial isolation and many circuits are commonly grounded with the high current. Take care on human safety.
- 2) As the high-current circuit is close to the light-current circuit, take care on the measuring position and safety problems during repair.
- 3) As there is large electrolytic capacitor on the outdoor power source board, plentiful residual electrons shall be discharged for a period of time after the power supply is cut off. In this

case, please wait patiently until the capacitor is fully discharged before proceeding to further operation. Full discharge may take approx. 30 seconds. You may also connect a load (e.g. electric iron) between DC- and DC+ for manual discharge. After thorough discharge, use the multimeter RX10K to measure. The pointer shall point to “0” position and then slowly return to “∞”. If not, the electrolytic capacitor is damaged.

- 4) Make sure to have some understanding to the circuit before carrying out repair. Most fundamentally, the operator must know the composition of the circuits, position of each part and the possible function.
- 5) It is an extremely unscientific repair method for starting the measurement immediately after getting the circuit board, or directly energizing it to start the test. This will probably cause secondary damage to the repair board.
- 6) The indoor and outdoor wires must be kept in correct order. If not, it might cause failure and damage to the electric controller. When removing the screws, take protective measures to prevent the screws or other objects from falling down onto the circuit board or into the electric control box. If any, be sure to eliminate them on time.