ALTECH

MULTI SPLIT TYPE, HEAT PUMP AIR CONDITIONERS

Technical service manual 2009

R410A Alfa DC Inverter multi Series

Indoor Models

SKM021DCIMX01

SKM026DCIMX01

SKM035DCIMX01

SKM053DCIMX01

Outdoor Models

SKE053DCI2X03

SKE078DCI3X03

SKE080DCI4X03

CONTENT

11. Product features

Indoor unit

- **Operation by remote controller**
- **Sensing by room temperature**

  Room temperature sensor.
  Pipe temperature sensor.
- **Room temperature control**

  Maintain the room temperature in accordance w
  ith the setting temperature.
- **Anti-freezing control in cooling**

  Prevent the water being frozen on evaporator by sensing the evaporator pipe temperature in cooling mode
- **Time Delay Safety control**

  Restarting is for approx. 3 minutes..
- **Indoor fan speed control**

  high, med, low, breeze.
- **Two-direction air vane**

  The unit will decide the louver direction according to operation mode.
- **Sleep mode auto control**

  The fan is turn to low speed (cooling/heating).
  The unit will be turn off at the seventh hour.
- **Independent dehumidification**

  The function is usually used in rainy days in springtime or damp areas.
- **Air flow Direction control**

  The louver can be set at the desired position or swing up and down automatically
- **Auto mode**

  The mode can be change by the room temperature.
- **Temp. Compensation**
- **Tele Remote control (Optional)**
- **Self-diag. function**
- **Anti-cold function**

  Prevent the cold wind at the beginning of unit start.
- **Auto defrost**
- **Auto-restart function**

  When the power supply is interrupted and then restore, the air conditioners automatically restore the previous function setting.
- **Flexible wiring connection**

Outdoor unit

Power relay control

The unit has 3 mins delay between continuously ON/OFF operations.

Low noise air flow system

Bird tail propeller fan makes the outdoor unit run more quietly.

Hydrophilic aluminum fin

The hydrophilic fin can improve the heating efficiency at operation mode.

4 way valve control

It is only operated in the heating operation mode except defrosting operation.

Anti-rust cabinet

Made from electrolytic zinc steel sheet and anti-rust coated components.

Valve protection cover

It protects the valves and prevents water from dripping.

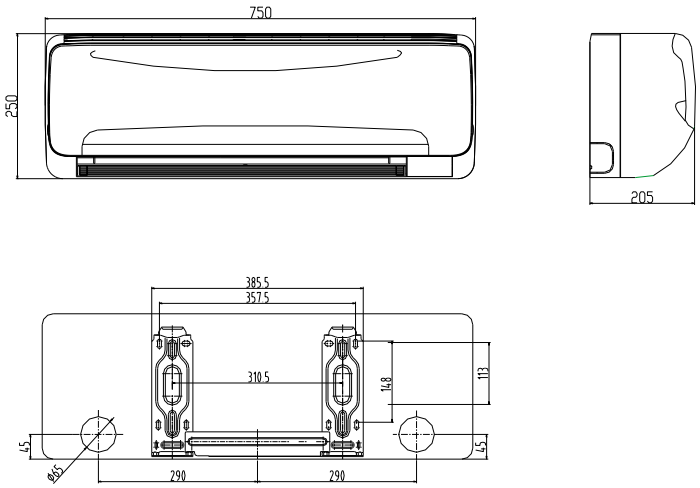
Discharge pipe temperature protect

Driving heating at -15℃

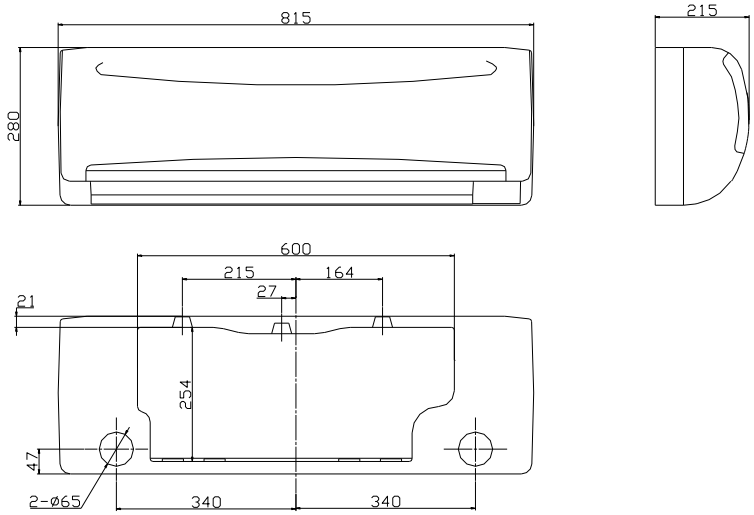
2 Dimensions

2.1 Alfa Series

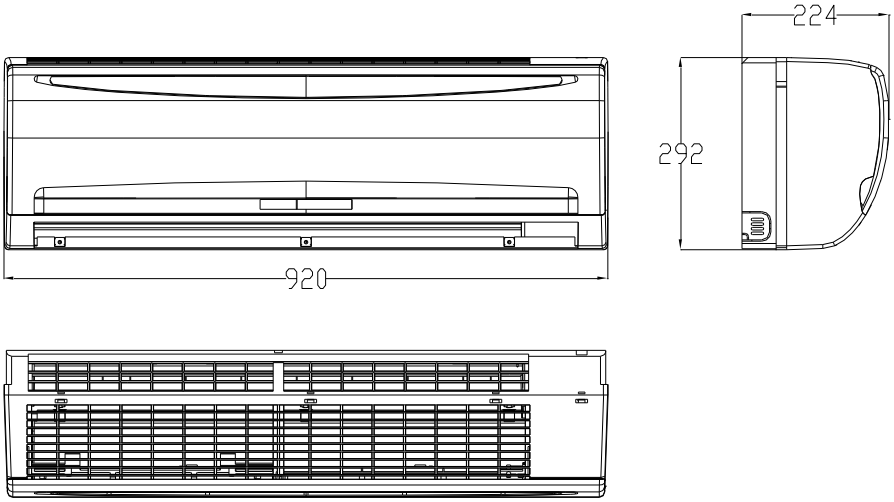
a) Indoor unit 7/9K



b) Indoor Unit 12K

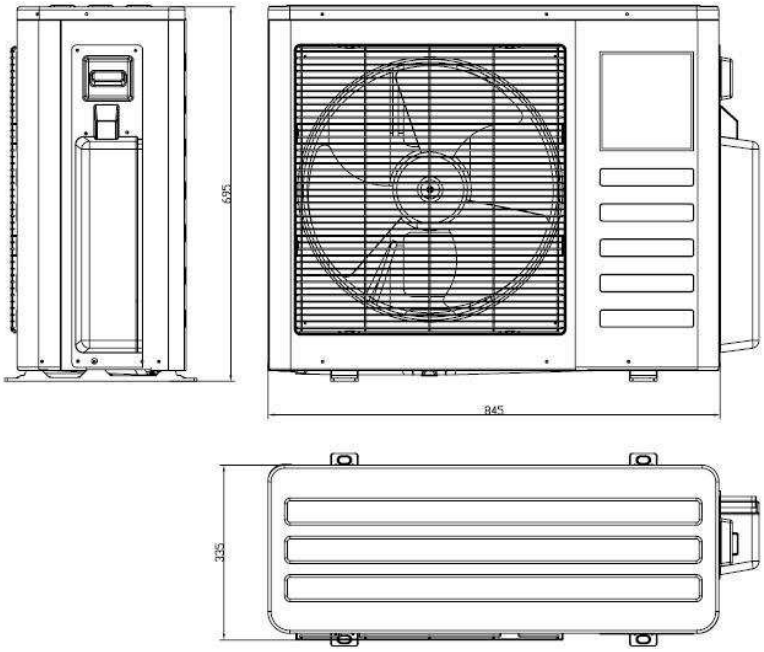


c) Indoor Unit 18K

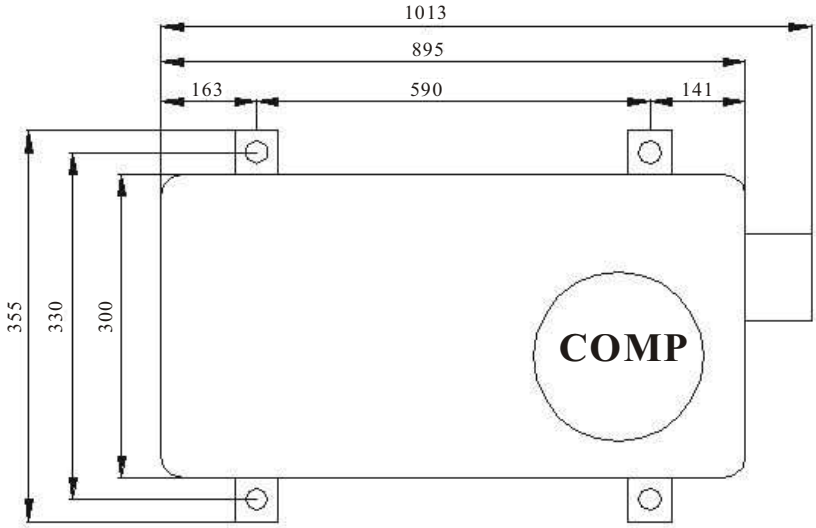


2.2 Outdoor unit

a) SKE053DCI2X03、SKE078DCI3X03

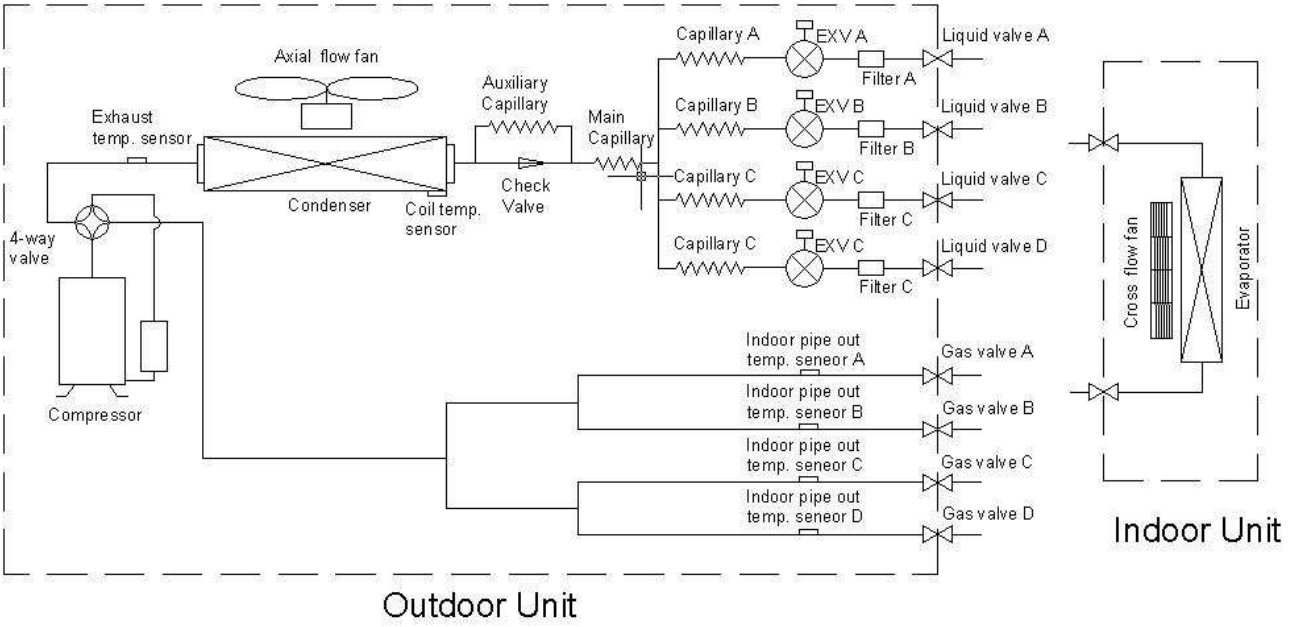


b) SKE080DCI4X03

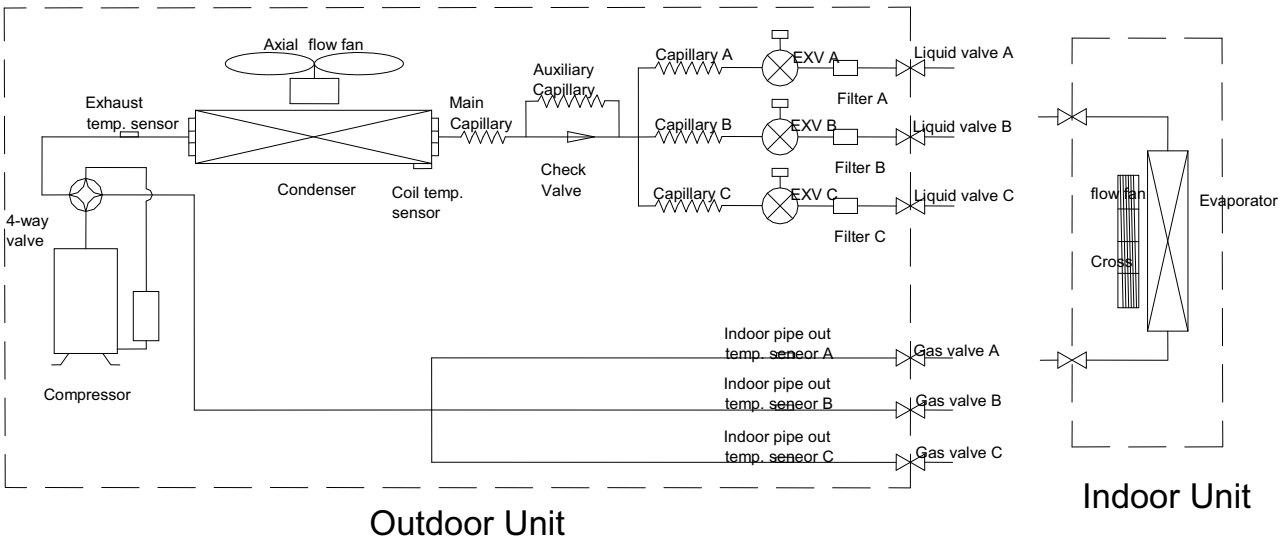


3 Refrigeration Cycle Diagram

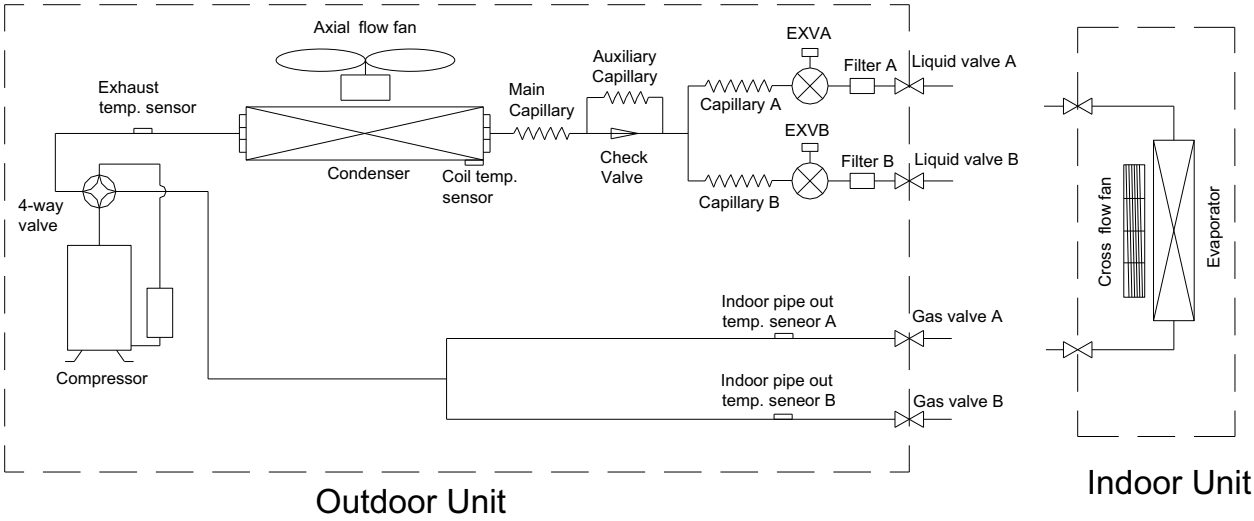
3.1 Refrigeration circuit drawing of inverter quadplex type



3.2 Refrigeration circuit drawing of inverter trinary type



3.3 Refrigeration circuit drawing of inverter binary type



4. Operation Limits

Cooling mode	Indoor temperature	≥17℃
	Outdoor temperature	0℃～43℃
Heating mode	Indoor temperature	<=30
	Outdoor temperature	-15℃～24℃
Dry mode	Indoor temperature	＞10℃
	Outdoor temperature	0℃～43℃

5. Indoor units combination

5.1 Indoor unit combination for SKE053DCI2X03

One unit	Two unit	
7	7+7	9+9
9	7+9	9+12
12	7+12	12+12
18	7+18	

Limit: The 18k indoor unit should not be cassette or duct unit.

5.2 Indoor unit combination for SKE078DCI3X03

One unit	Two unit			Three unit		
7	7+7	9+9	12+12	7+7+7	7+9+9	9+9+9
9	7+9	9+12	12+18	7+7+9	7+9+12	9+9+12
12	7+12			7+7+12	7+12+12	9+12+12
18	7+18			7+7+18		

Limit: The 18k indoor unit should not be cassette or duct unit.

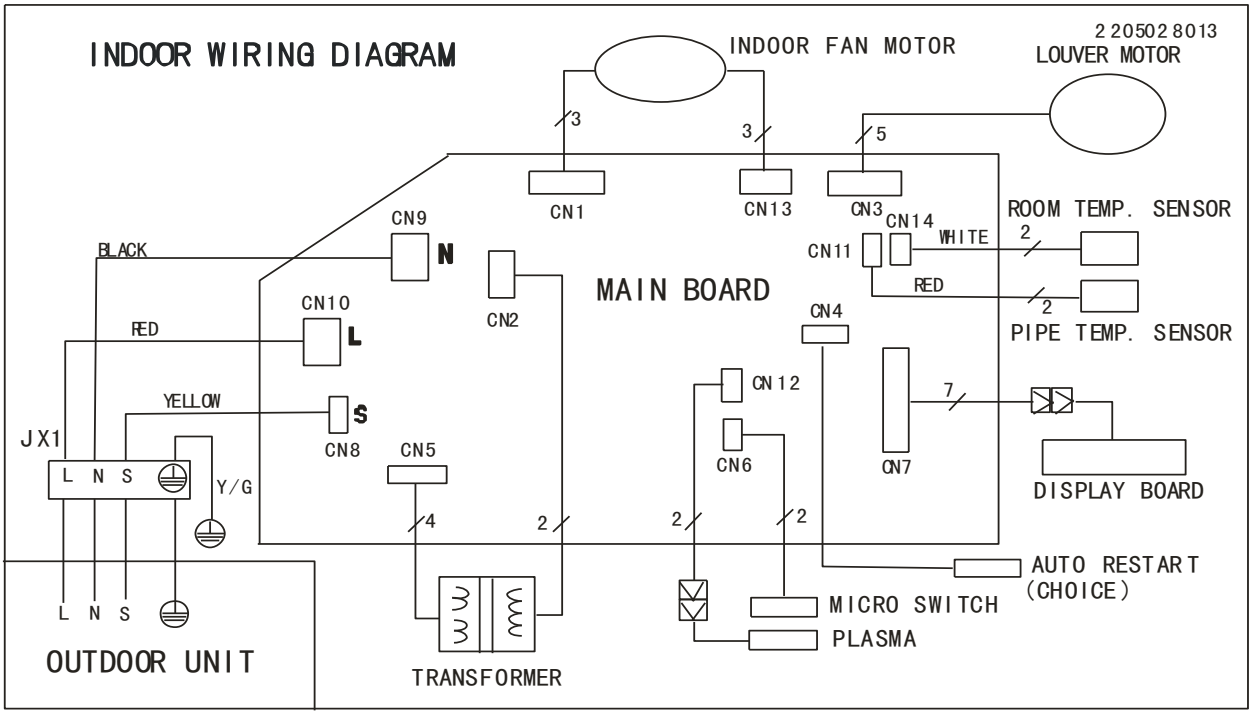
5.3 Indoor unit combination for SKE080DCI4X03

One unit	Two unit			Three unit			Four unit		
7	7+7	9+9	12+12	7+7+7	7+9+12	9+9+9	7+7+7+7	7+7+9+9	9+9+9+9
9	7+9	9+12	12+18	7+7+9	7+9+18	9+9+12	7+7+7+9	7+7+9+12	9+9+9+12
12	7+12	9+18	18+18	7+7+12	7+12+12	9+9+18	7+7+7+12	7+9+9+9	
18	7+18			7+7+18	7+12+18	9+12+12	7+7+7+18	7+9+9+12	
				7+9+9	12+12+12	9+12+18			

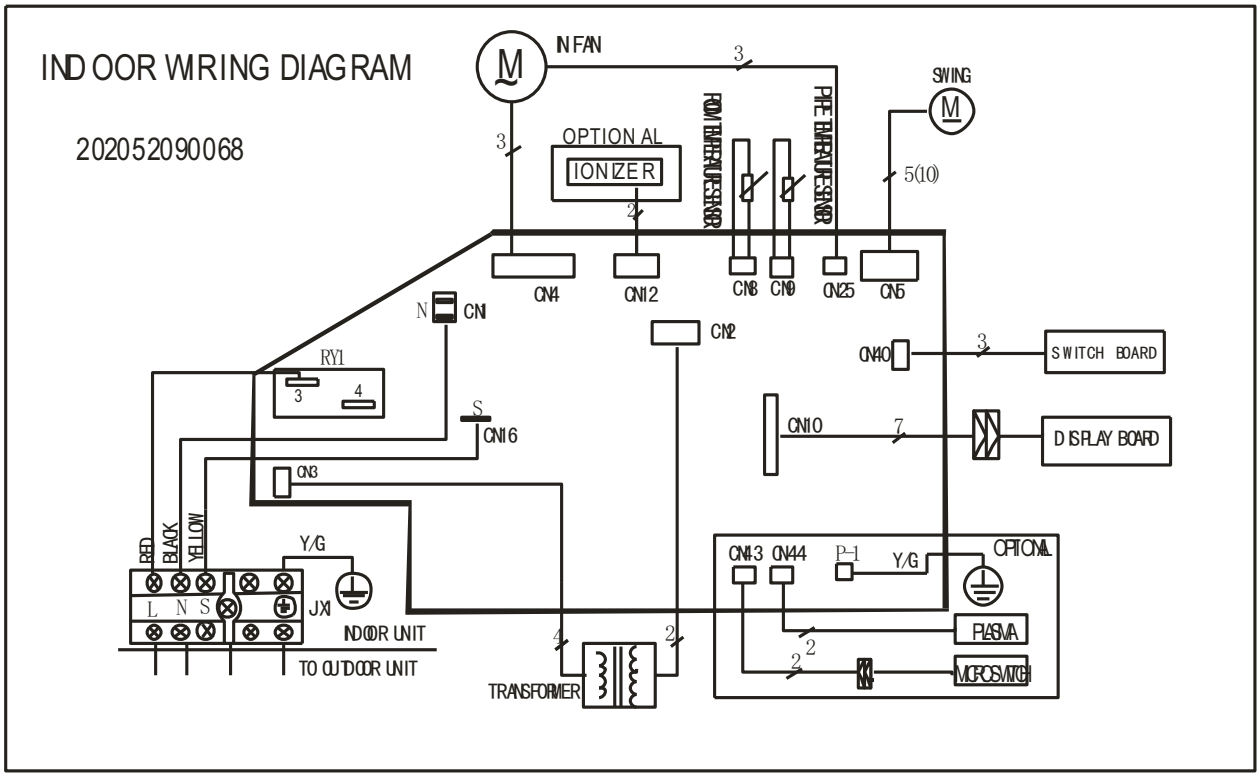
No limit.

6. Wiring Diagram

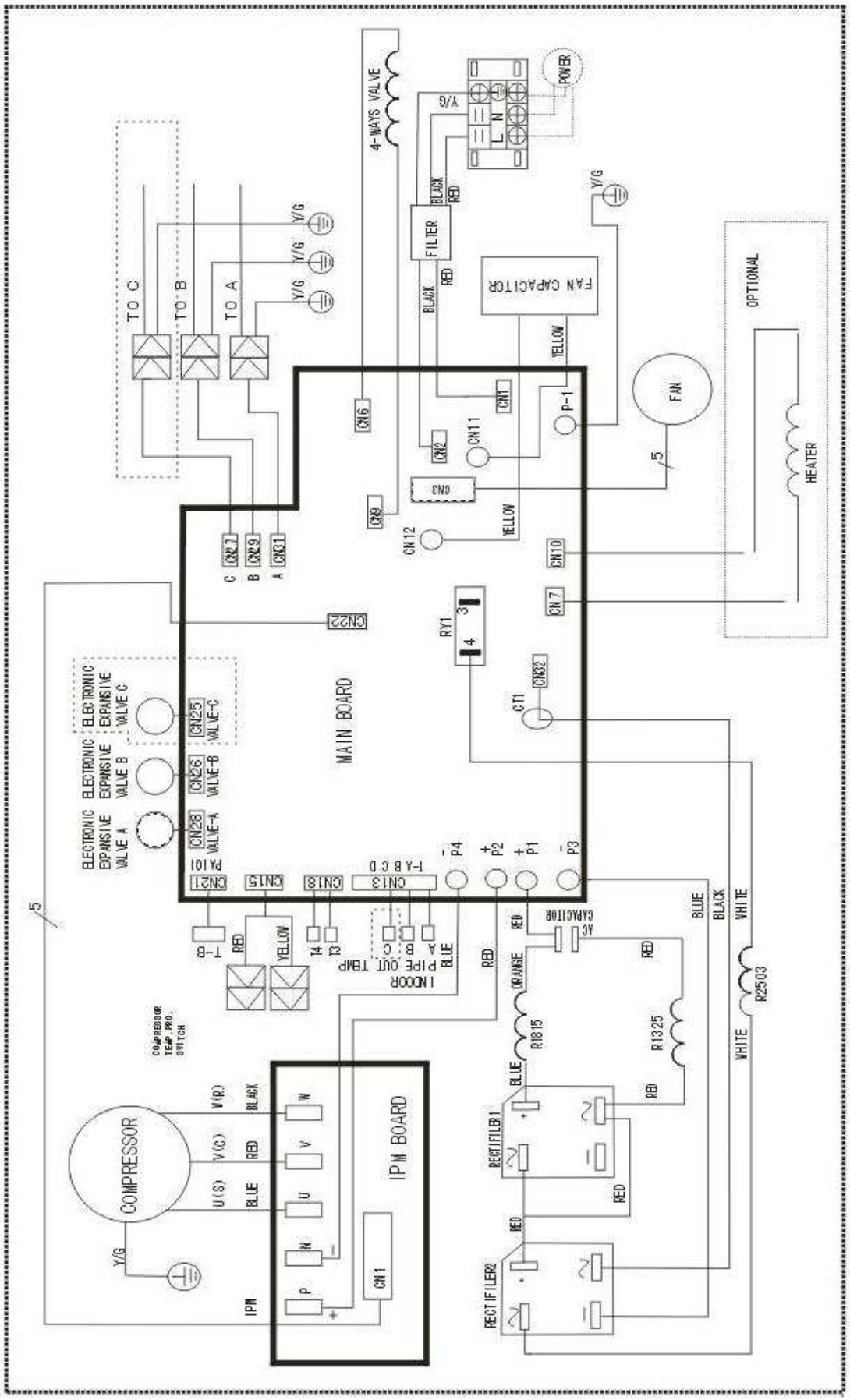
6.1 Indoor unit (7k/9k/12k)



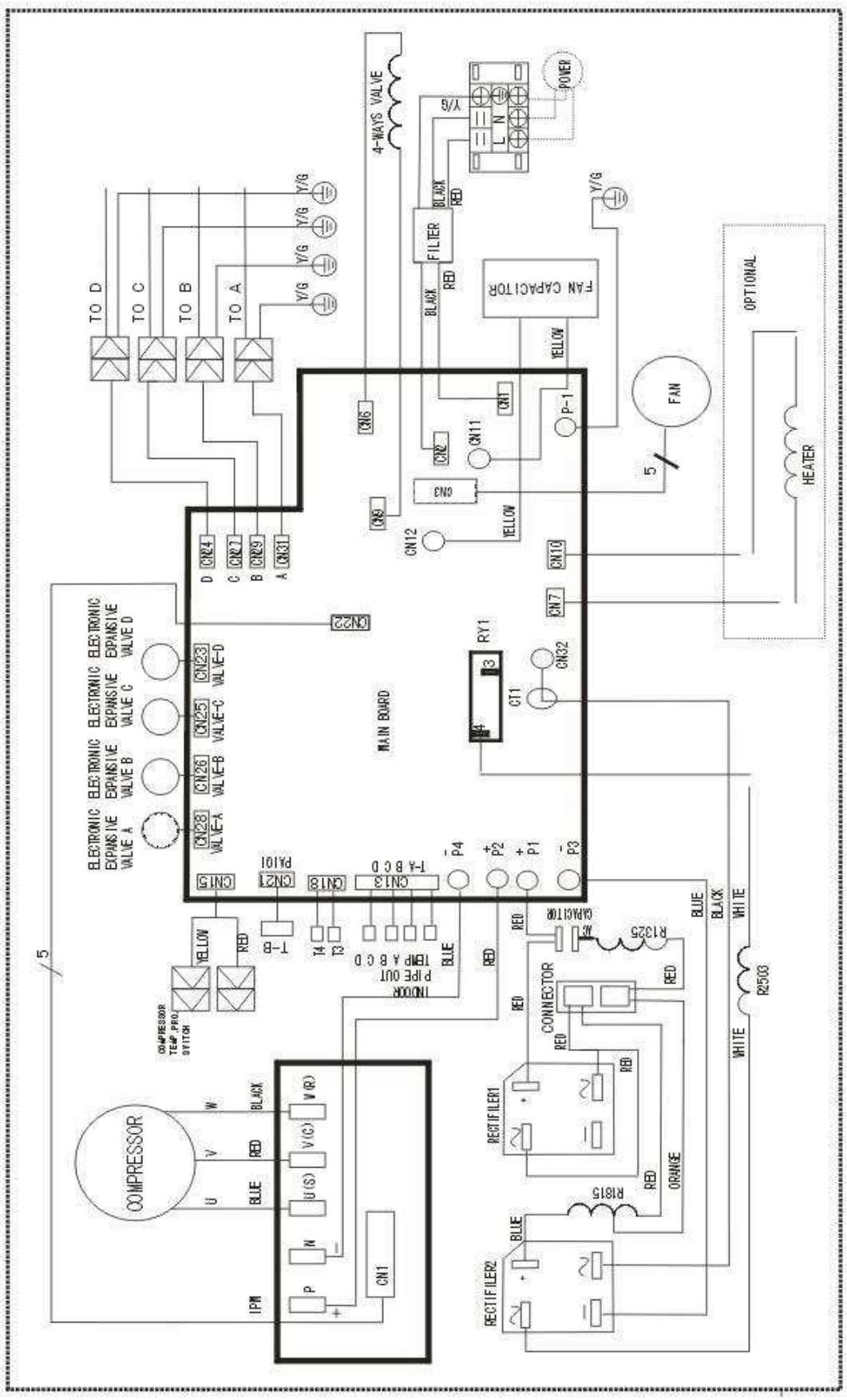
6.2 Indoor unit (18k)



6.3 Outdoor unit SKE053DCI2X03、SKE078DCI3X03



6.4Outdoor unit SKE080DCI4X03

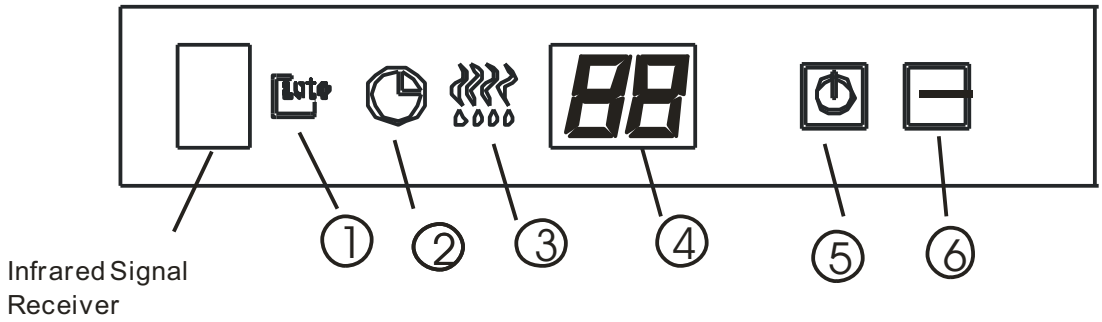


7 Electronic control function

7.1 Electric Control working environment.

7.1.1 Input voltage: 175~253V.
7.1.2 Input power frequency:50Hz.
7.1.3 Indoor fan normal working amp. is less than 1A.
7.1.4 Outdoor fan. Normal working amp. is less than 1.5A.
7.1.5 Four-way valve normal working amp. is less than 1A.
7.1.6 Swing motor: DC12V.

7.2 Indoor unit's display board



7.2.1 AUTO indicator
This indicator illuminates when the air conditioner is in AUTO operation.
7.2.2 TIMER indicator
This indicator illuminates when TIMER is set ON/OFF.
7.2.3 PRE.-DEF. Indicator (For Cooling & Heating models only)
This indicator illuminates when the air conditioner starts defrosting automatically or when the warm air control feature is activated in heating mode.
7.2.4 TEMPERATURE indicator
a) Usually it displays the temperature settings. When change the setting temperature, this indicator begins to flash, and stops 20 seconds later.
b) It displays the room temperature when the air conditioner is in FAN only operation.
c) When the unit stops operation, it returns to original factory settings.
d) Displays the malfunction code or protection code.
7.2.5 OPERATION indicator
This indicator flashes after power is on and illuminates when the unit is in operation.
7.2.6 SLEEP indicator
This indicator appears when the unit is in Energy-saving operation.

7.3.1 Digital display tube display function

- In standby , The LED displays the number of indoor units,
- In compressor operation, the LED display the frequency,
- In defrosting mode, The LED displays "dF"
- In compressor pre-heating, The LED displays "1 1"
- In protection or malfunction, the LEC displays error code or protection code.

7.4 Outdoor unit point check function

There is a check switch in outdoor PCB.

Push the switch SW1 to check the states of unit when the unit is running. The digital display tube will display the follow procedure when push SW1 each time:

	Display	**Remark**
1	Indoor unit capacity demand code	
2	Outdoor unit running mode code	Off:0, Cooling:1, Heating:2
3	Amendatory capacity demand code	
4	Outdoor unit fan motor state	Off:0, Low speed:1, High speed:2
5	Evaporator outlet temp. for 1# indoor unit	Actual data
6	Evaporator outlet temp. for 2# indoor unit	Actual data
7	Evaporator outlet temp. for 3# indoor unit	Actual data
8	Evaporator outlet temp. for 4# indoor unit	Actual data
9	Condenser pipe temp.	Actual data
10	Ambient temp.	Actual data
11	Compressor discharge temp.	Actual data
12	Inverter current	Actual data
13	EXV open angle for 1# indoor unit	Actual data×8
14	EXV open angle for 2# indoor unit	Actual data×8
15	EXV open angle for 3# indoor unit	Actual data×8
16	EXV open angle for 4# indoor unit	Actual data×8
17	Indoor unit number	The indoor unit can communicate with outdoor unit well.
18	The last error or protection code	00 means no malfunction
19	——	Check point over

7.4.1 Frequency of compressor:

Display	Frequency of compressor (Hz)
30	30
--	Stand by
60	60

7.4.2 Running mode:

Display	Corresponding mode
0	Off
1	Cooling mode
2	Heating mode

7.4.3 Capacity demand:

Cooling mode

Capacity	2000-2500	2000-2500	3000-3800	4500-5000	5000-5500	5500-6100	6100-7000	7000-7500	7500-8000	7500-8000
Corresponding Code	1	2	3	4	5	6	7	8	9	>=10

Heating mode

Capacity	2000-2500	2000-2500	3000-3800	4500-5000	5500-6100	6100-7000	6100-7000	7000-7500	7500-8000	8000-8900
Corresponding Code	1	2	3	4	5	6	7	8	9-10	>=11

Note:

The capacity is just for reference.

7.4.4Number of indoor unit

Display	Number of indoor unit
1	1
2	2
3	3

7.4.5Outdoor ambient temp:

Display	Corresponding temp.	Display	Corresponding temp.	Display	Corresponding temp.
15	-7.5	50	10	80	25
16	-7	51	10.5	81	25.5
17	-6.5	52	11	82	26
18	-6	53	11.5	83	26.5
19	-5.5	53	11.5	84	27
20	-5	54	12	85	27.5
21	-4.5	55	12.5	86	28
22	-4	56	13	87	28.5
23	-3.5	57	13.5	88	29
24	-3	58	14	89	29.5
26	-2	59	14.5	90	30
27	-1.5	60	15	91	30.5
28	-1	61	15.5	92	31
29	-0.5	62	16	93	31.5
30	0	63	16.5	93	31.5
31	0.5	63	16.5	94	32
32	1	64	17	95	32.5
33	1.5	65	17.5	96	33
34	2	65	17.5	97	33.5
35	2.5	66	18	98	34
36	3	67	18.5	99	34.5

37	3.5	68	19	10.	35~40
38	4	69	19.5	11.	40~45
39	4.5	70	20	12.	45~50
40	5	71	20.5	13.	50~55
41	5.5	72	21	14.	55~60
42	6	73	21.5	15.	60~65
43	6.5	74	22	16.	65~70
44	7	75	22.5		
45	7.5	75	22.5		
46	8	76	23		
47	8.5	77	23.5		
48	9	78	24		
49	9.5	79	24.5		

7.4.6Current of outdoor unit

Display	Corresponding mode
44	6.0 A
46	6.2 A
54	7.4 A
55	7.6 A
58	7.6 A
62	8.0 A
66	8.6 A
67	8.8 A
68	9.0 A
70	9.2 A
72	9.5 A
76	10.0 A
78	10.2 A
80	10.4 A
82	10.6 A
84	11.0 A
88	11.6 A
92	12.0 A
94	12.2 A

7.4.7 No. 1 opening degree of electronic expansion valve:
Opening degree equals the display data times 8
7.4.8 No. 2 opening degree of electronic expansion valve:
Opening degree equals the display data times 8
7.4.9 No. 3 opening degree of electronic expansion valve:
Opening degree equals the display data times 8

7.5 Protection

7.5.1 3 minutes delay at restart for compressor.

7.5.2 Discharge temperature protection of compressor, compressor stops when the temp. of discharge is more than 115℃ and last out 5 s. compressor runs when the temp. of discharge is less than 90℃.

7.5.3 Temperature protection of compressor top, compressor stops when the temp. of top of compressor is more than 120℃, compressor runs when the temp. of top of compressor is less than 105℃.

7.5.4When AC voltage ≥ 265V for 30 seconds, Outdoor Unit stops operation and alarms. When AC voltage ≤ 265V for 30 seconds, Outdoor Unit resumes operation.

7.5.5Inverter module Protection , Inverter module Protection itself has a protection function against current, voltage and temperature.

7.5.6Sensor protection at open circuit and breaking disconnection

7.5.7 Fan Speed is out of control. When Indoor Fan Speed is too high(higher than High Fan+300RPM)or too low(lower than 400RPM), the unit stops and LED displays failure information and can't return to normal operation automatically.

7.5.8Cross Zero signal error warning. If there is no Cross Zero signals in 4 minutes, the unit stops and LED displays failure information and can't return to normal operation automatically.

7.5.9Current protection: When the current is more than 16A, the compressor stops.

7.5.10Outdoor condenser high temperature protection: Under cooling mode, if T3>65℃ for 3 minutes, the compressor will stop. When T3<52℃, the protection is not valid.

7.5.11Outdoor low temperature protection: If the outdoor temperature is lower than -15℃ for 1 hour, the compressor and fan motor will stop. If the outdoor temperature is higher than -12℃ for 10 minutes and the compressor stops operation for 1h, or the outdoor temperature is higher than 5℃ for 10 minutes, then restart and enter into the prior operation mode.

7.5.12Compressor pre-heating function: When the outdoor temperature is lower than 3℃ and the compressor stops operation for more than 3 hours, or the outdoor temperature is lower than 3℃ and the power is just put on, the compressor enters into pre-heating condition. When outdoor temp. is more than 5℃ or user operate it, pre-heating condition will finish.

7. 6 Fan-only mode

Fan speed is high/mid/low/ Auto

7.7 Cooling mode

7.7.1 Indoor fan keeps running, fan speed can be set in high/mid/low/ Auto:

7.7.2Auto fan at cooling mode: (T=Indoor Temp.-Setting Temp.)

	Condition	Indoor fan speed
Room temp. up	T<1.5℃	Low
	1.5℃<T<4℃	Mid.
	T>4℃	High
Room temp. down	T> 3℃	High
	1℃<T<3℃	Mid.

	T<1℃	Low

7.7.3Anti-freezing control to indoor evaporator at cooling mode(T: evaporator temp.)

	Evaporator Temp.	Compressor
	T< 4℃	Off
	T > 8℃	On

7.8 Dehumidifying mode

7.8.1the indoor fan is fixed in low speed

7.8.2Low room temperature protection:

When room temperature decreases to below 10℃, indoor fan stop, when room temperature restores to over 12℃, indoor fan start.

7.8.3At dehumidifying mode, the anti-freezing function of the indoor heat exchanger is the same as that of cooling mode.

7.9Heating mode

7.9.1Indoor Fan actions at heating mode

Indoor Fan can be set at HIGH/MID/LOW/AUTO by using a remote controller, but Anti-cold wind function prevails.

Anti-cold wind control function at heating mode

	Condition T= Indoor exchanger temp.	Indoor fan speed
Indoor exchanger temp. up	T<34℃	Off
	34℃<T<37℃	Breeze
	37℃<T<44℃	Low speed
	T> 44℃	Setting fan speed
Indoor exchanger temp. down	T> 38℃	Setting fan speed
	33℃<T<38℃	Low speed
	24℃<T<33℃	Breeze
	T<24℃	Off

7.9.2Auto wind at heating mode

	Condition T=Indoor Temp.-Setting Temp.	Indoor fan speed
Room temp. up	T<1.5℃	High
	1.5℃<T<2.5℃	Mid.
	T>2.5℃	Low
Room temp. down	T<1.0℃	High
	1.0℃<T<2.0℃	Mid.
	T>2.0℃	Low

7.9.3Indoor evaporator high-temperature protection at heating mode

Condition T= Indoor exchanger temp.	Compressor
T<48℃	On
53℃<T<63℃	Decrease frequency of compressor
T>63℃	Off

Defrosting operation (Available for heating only).

7.10 Defrosting

7.10.1Defrosting condition:

The temperature of outdoor heat exchanger remains consecutively lower than 5°c for more than 40 minutes,

7.10.2Ending condition of defrosting

If one of following conditions is satisfied, end the defrost and turn into heating mode:

a. The defrost time has reached to 10 minutes.

b. When the temperature of outdoor heat exchanger rises up to 15°C

7.10.3Defrosting Actions:

a. Compressor runs.

b. 4 way valve switches off,

c. Outdoor fan switches off

d. Indoor fan running according to anti-cold wind function in heating mode.

7.11Automatic operation mode

The air conditioner automatically selects one of the following operation modes: cooling, heating or fan only according to the temp. difference between room temp. (TA) and set temp. (TS).

TA—TS	Operation mode
TA—TS>2℃	Cooling
-1℃≤TA-TS≤+2℃	Fan-only
TA-TS<-1℃	Heating (air-only for cooling only type)

7.12Manual switch

7.12.1Mode changes when push this button .

Cooing mode→ Auto mode→Unit off→ Cooing mode

7.12.2At Cooing mode, after 30 minutes cooling operation whose fan speed is set as low, the A/C operates with a setting temp. of 24℃.

7.12.3At auto mode, the A/C operates with a set temp. of 24℃

7.13Timer Function

7.13.1The maximum length of timer is 24 hours and the minimum resolving power is 15 minutes.

7.13.2Timer on: first turn off the A/C, the A/C will be automatically on at the set time.

7.13.3Timer off: first turn on the A/C, the A/C will be automatically off at the set time

7.13.4Timer on/off function(on time is earlier than off time): first turn off the A/C, it will be automatically on at set time, and later be off at the set time, then unit turns on at set time.

7.13.5Timer off/on function(off time is earlier than on time): first turn on the A/C, it will be

automatically off at set time, and later be on at the set time, then unit turns off at set time.

7.14Sleep mode

7.14.1It is available at cooling, heating or auto mode.

7.14.2 Cooling:

The set temperature rise 1℃ per hour. Two hours later, the set temperature will maintain as a constant and the fan speed is kept at low speed.

7.14.3 Heating:

The set temperature decrease 1℃ per hour. Two hours later, the set temperature will maintain as a constant and the air circulation is kept at low speed (Cold air proof function takes precedence over all).

7.14.4 Auto:

The Sleep Mode running function operates in accordance with selected running mode by auto mode.

7.14.5 Auto restart function

In case of a sudden power failure, this function automatically sets the unit to previous settings before the power failure when power returns.

7.15 Plasma (Optional)

Plasma turns on when the indoor fan runs.

Plasma turns off automatically when front panel is opened.

7.16 Mode conflict

The indoor units can not work cooling mode and heating at same time.

Heating mode has a priority.

7.16.1Definition

	Cooling mode	Heating Mode	Fan	Off
Cooling mode	No	Yes	No	No
Heating Mode	Yes	No	Yes	No
Fan	No	Yes	No	No
Off	No	No	No	No

No: No mode conflict;

Yes: Mode conflict

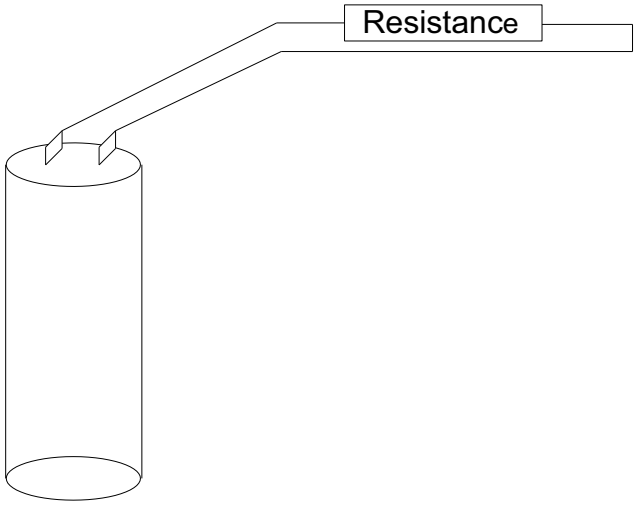
7.16.2 Unit action

- In case of one Indoor unit working in cooling mode or fan mode, and another indoor unit is set to heating mode, the indoor unit working in cooling mode or fan mode will change to stand by. The outdoor unit will work in heating mode.
- In case of one Indoor unit working in heating mode, and another indoor unit is set to cooling mode or fan mode, the indoor unit setting to cooling mode or fan mode will change to stand by.

8.Troubleshooting

8.1 Safety

Because of there are capacitors in PCB and relative circuit in outdoor unit, even shut down the power supply, electricity power still are kept in capacitors, do not forget to discharge the electricity power in capacitor.
The value of resistance is about 1500 ohms to 2000 ohms



The voltage in P3 and P4 in outdoor PCB is high voltage about 310V
The voltage in P6 in outdoor PCB is high voltage about 310V

8.2 Troubleshooting for indoor unit

Display	LED STATUS
E0	EEPROM error
E1	outdoor communication error
E2	Zero-crossing examination error
E3	Fan speed beyond control
E5	Outdoor units temp. sensor or connector of temp. sensor is defective
E6	Indoor units temp. sensor or connector of temp. sensor is defective
P0	Inverter module protection
P1	Outdoor voltage protection
P2	Compressor top protection against temperature
P3	Compressor current protection

8.3 LED error code display for outdoor unit

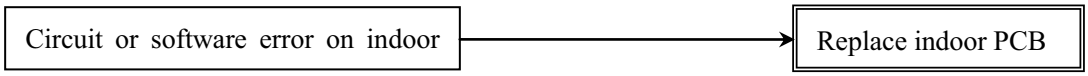
Display	LED STATUS
E0	EEPROM error

E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E6	No 4 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E4	Outdoor temp. sensor or connector of temp. sensor is defective
E5	Compressor volt protection
E7	Indoor and outdoor communication error
P0	Compressor top protection against temperature
P3	Compressor current protection
P4	Inverter module protection
P6	Condenser high-temperature protection

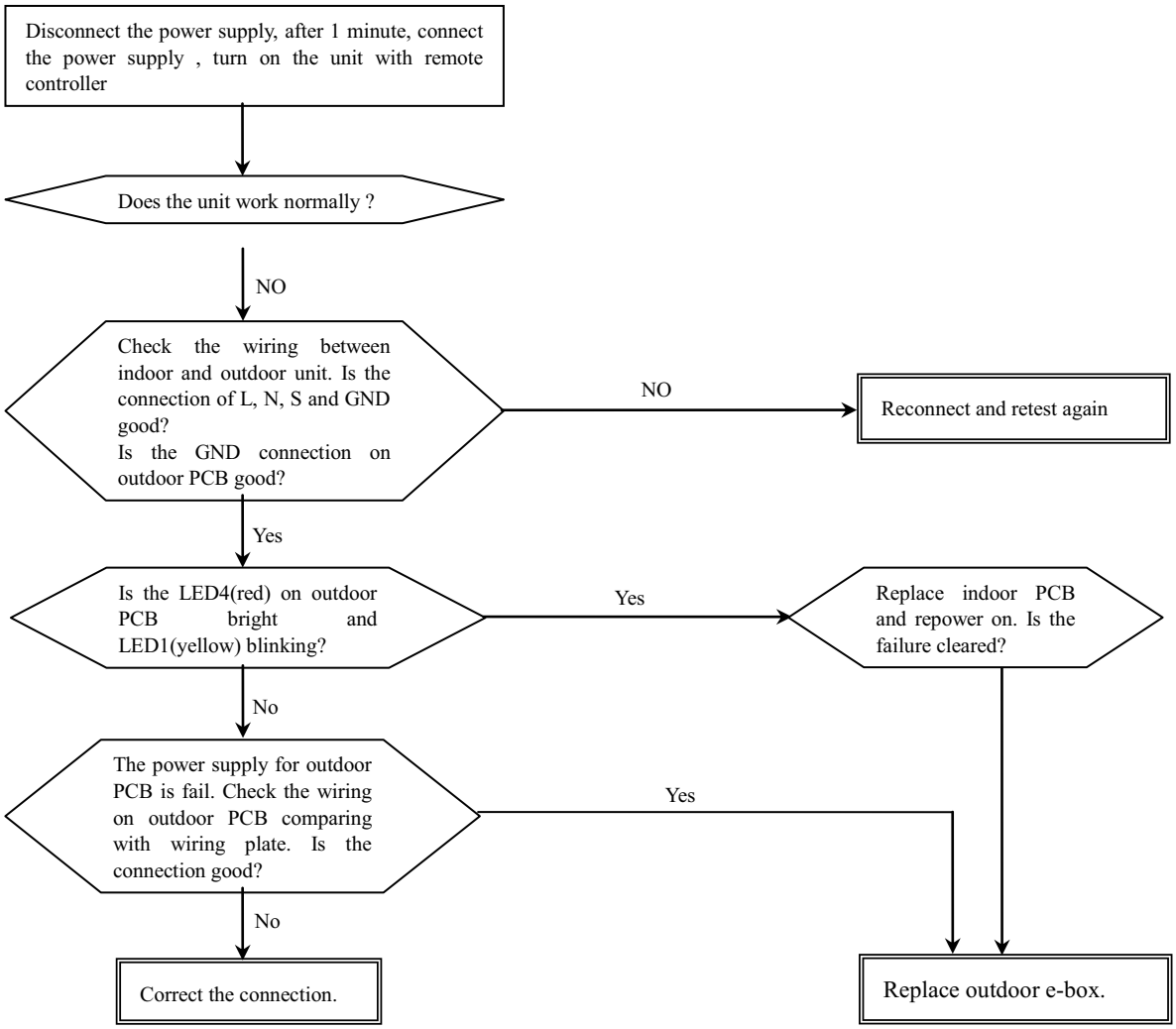
8.4 Troubleshooting

8.4.1 Indoor unit trouble shooting

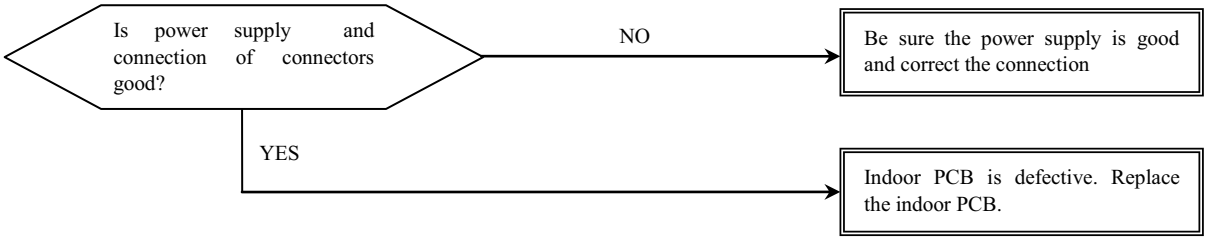
Indoor unit display	LED STATUS
E0	EEPROM error



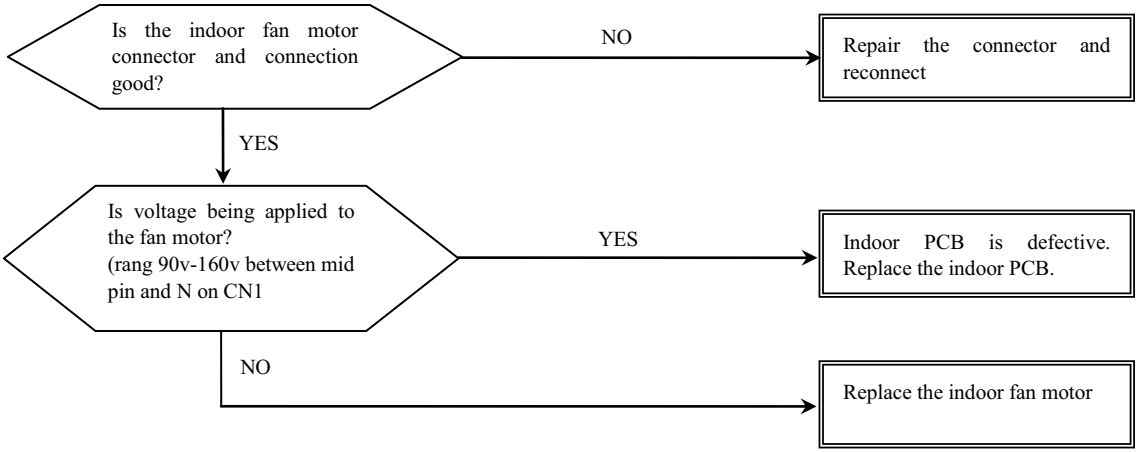
Indoor unit display	LED STATUS
E1	outdoor communication error



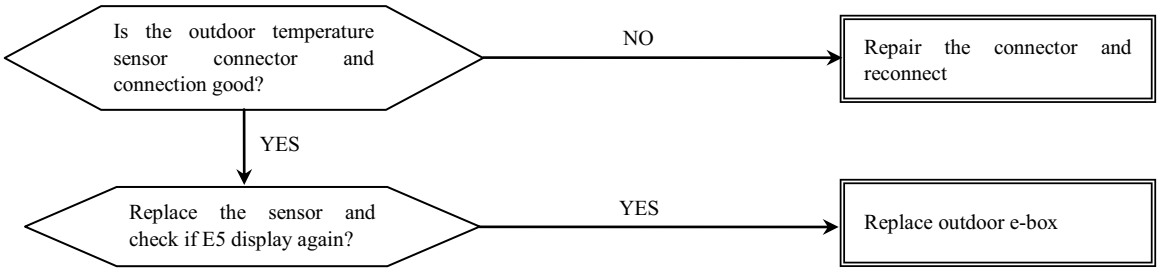
Indoor unit display	LED STATUS
E2	Zero-crossing examination error



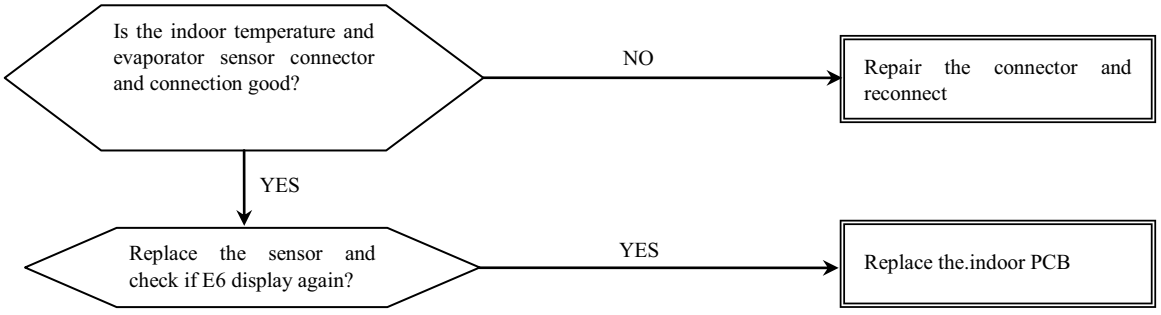
Indoor unit display	LED STATUS
E3	Fan speed beyond control



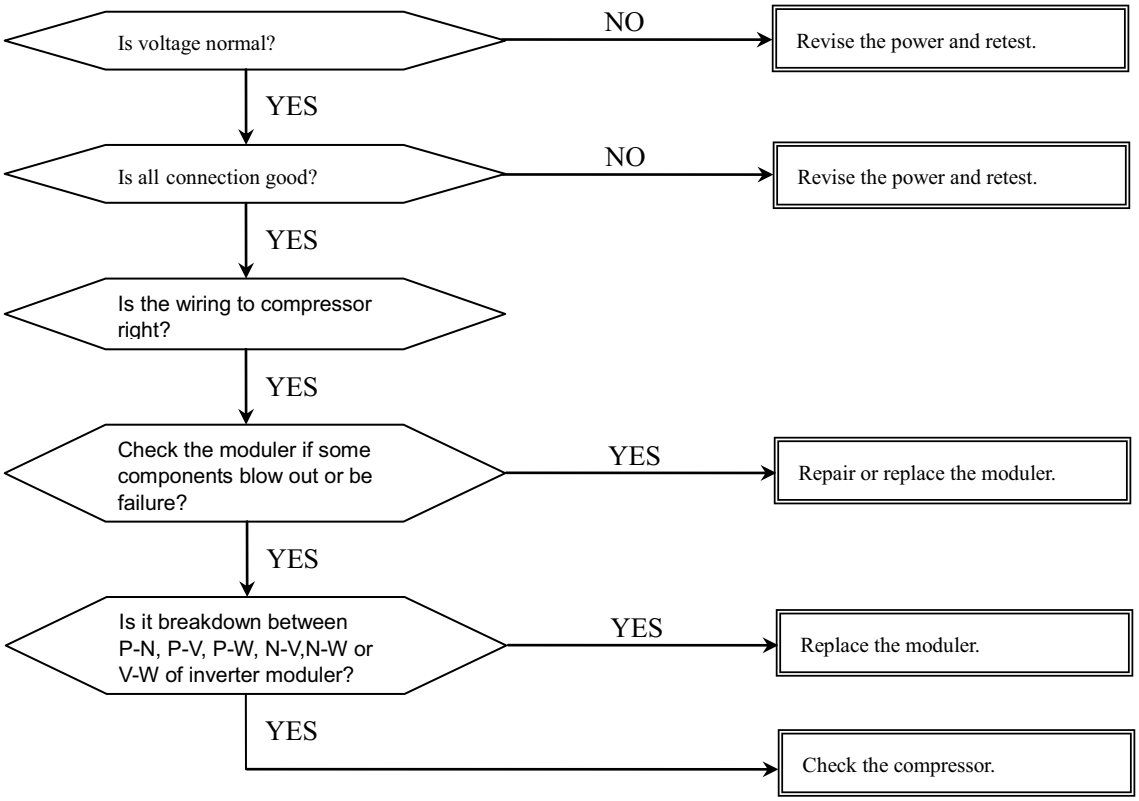
Indoor unit display	LED STATUS
E5	Outdoor units temp. sensor or connector of temp. sensor is defective



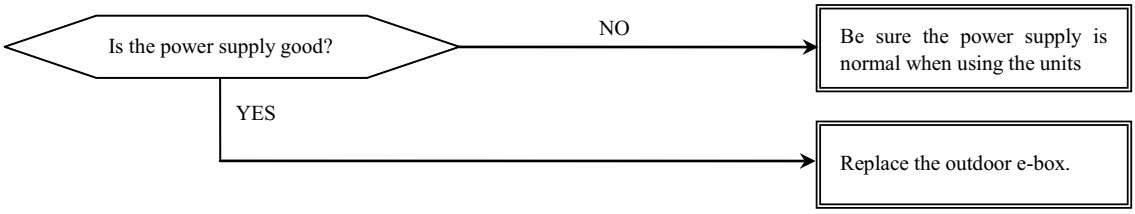
Indoor unit display	LED STATUS
E6	Indoor units temp. sensor or connector of temp. sensor is defective



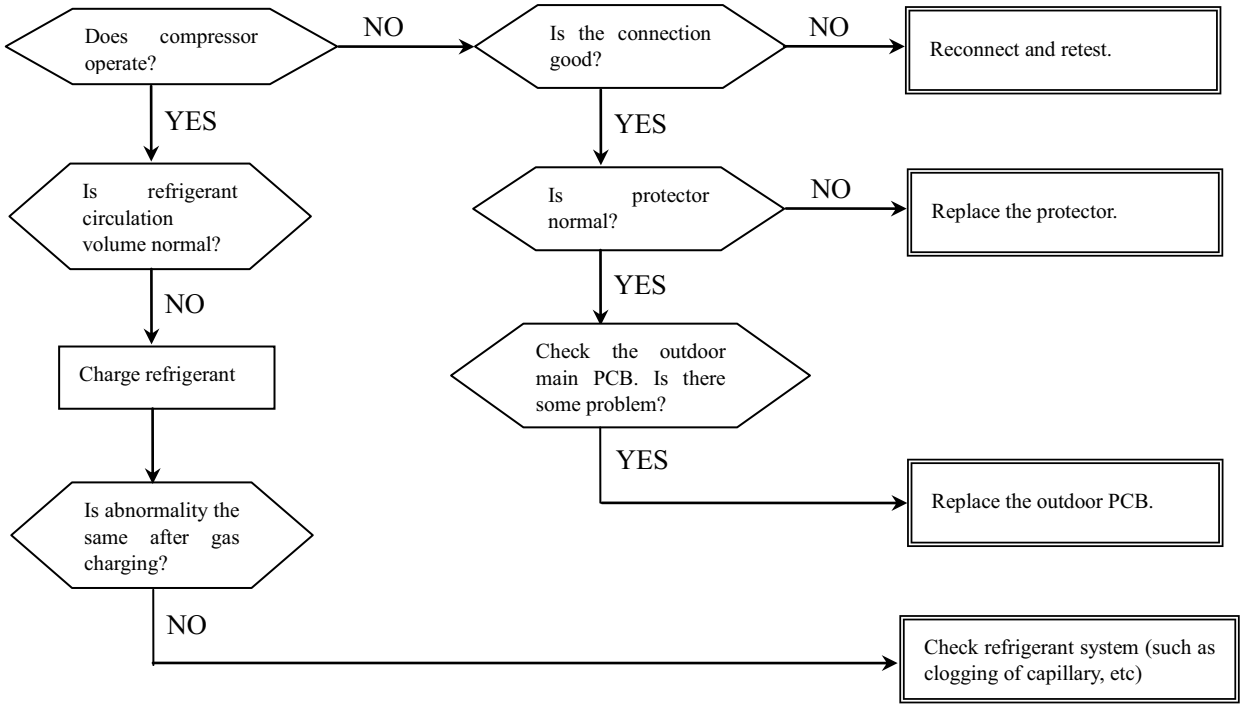
Indoor unit display	LED STATUS
P0	Inverter module protection



Indoor unit display	LED STATUS
P1	Outdoor voltage protection



Indoor unit display	LED STATUS
P2	Compressor top protection against temperature



Indoor unit display	LED STATUS
P3	Compressor current protection

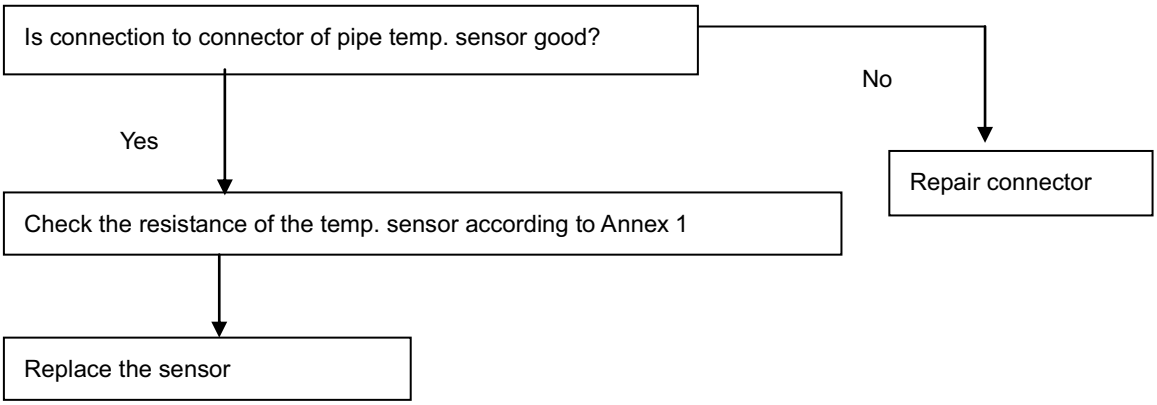
The trouble shooting is same with one of outdoor unit P3 protection.

8.4.1 Outdoor unit trouble shooting

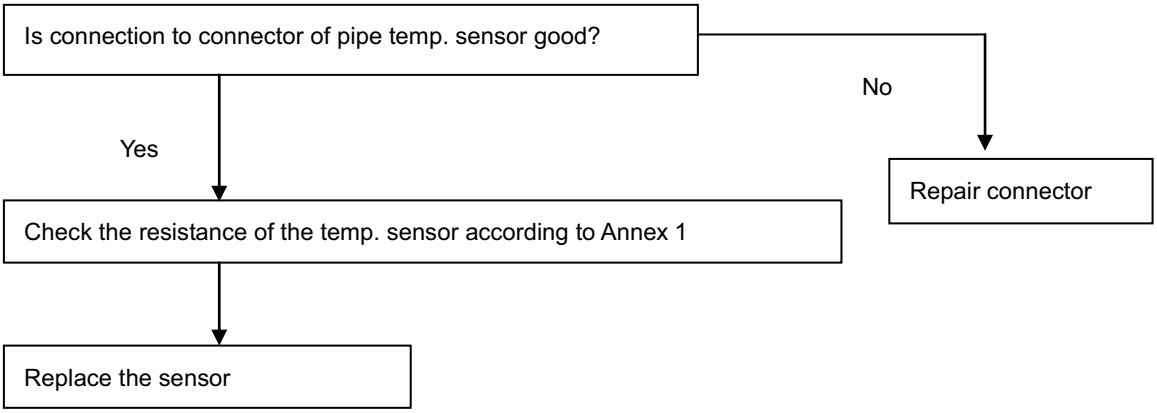
Outdoor unit display	LED STATUS
E0	EEPROM error

Circuit or software error on indoor → Replace indoor PCB

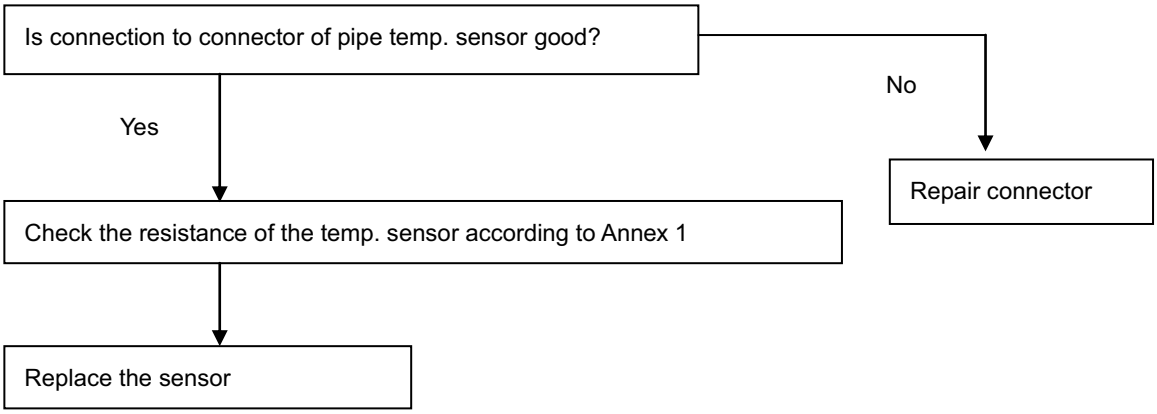
Outdoor unit display	LED STATUS
E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



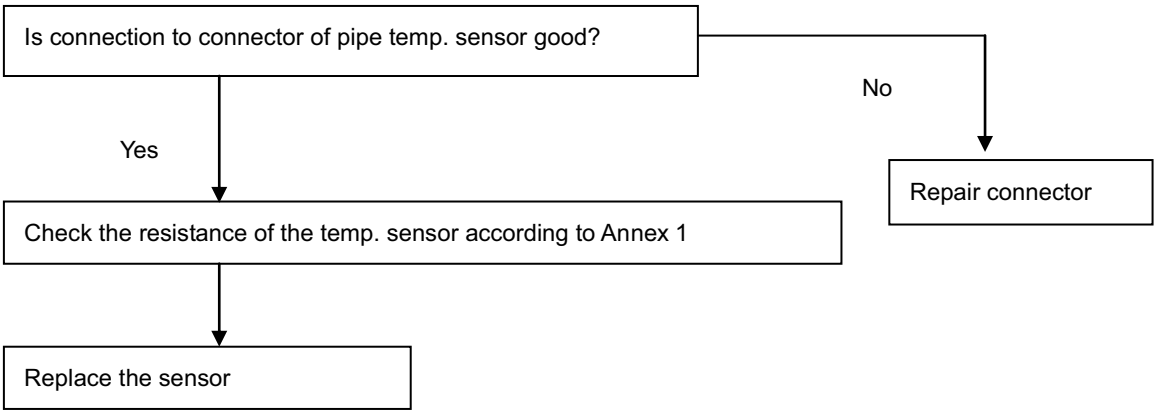
Outdoor unit display	LED STATUS
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



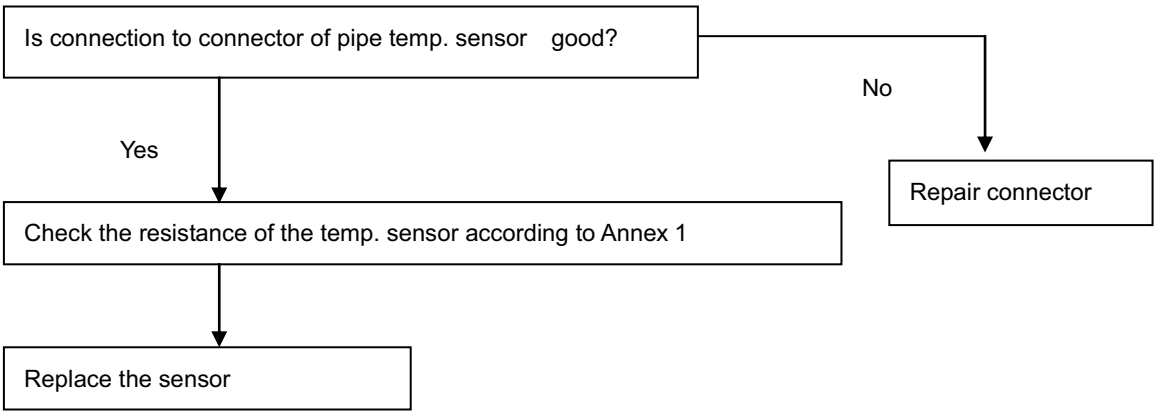
Outdoor unit display	LED STATUS
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



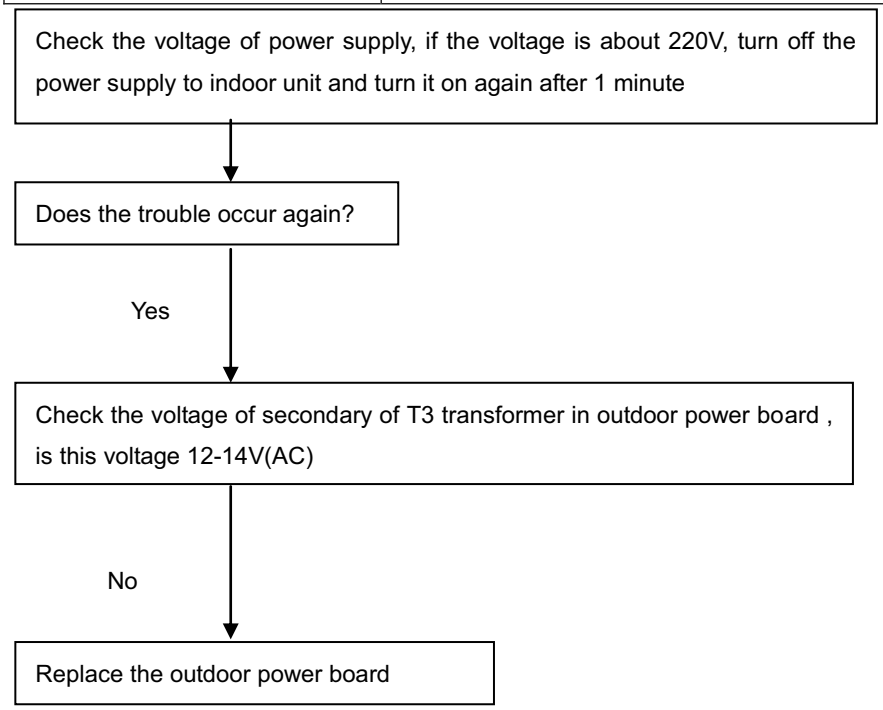
Outdoor unit display	LED STATUS
E6	No 4 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



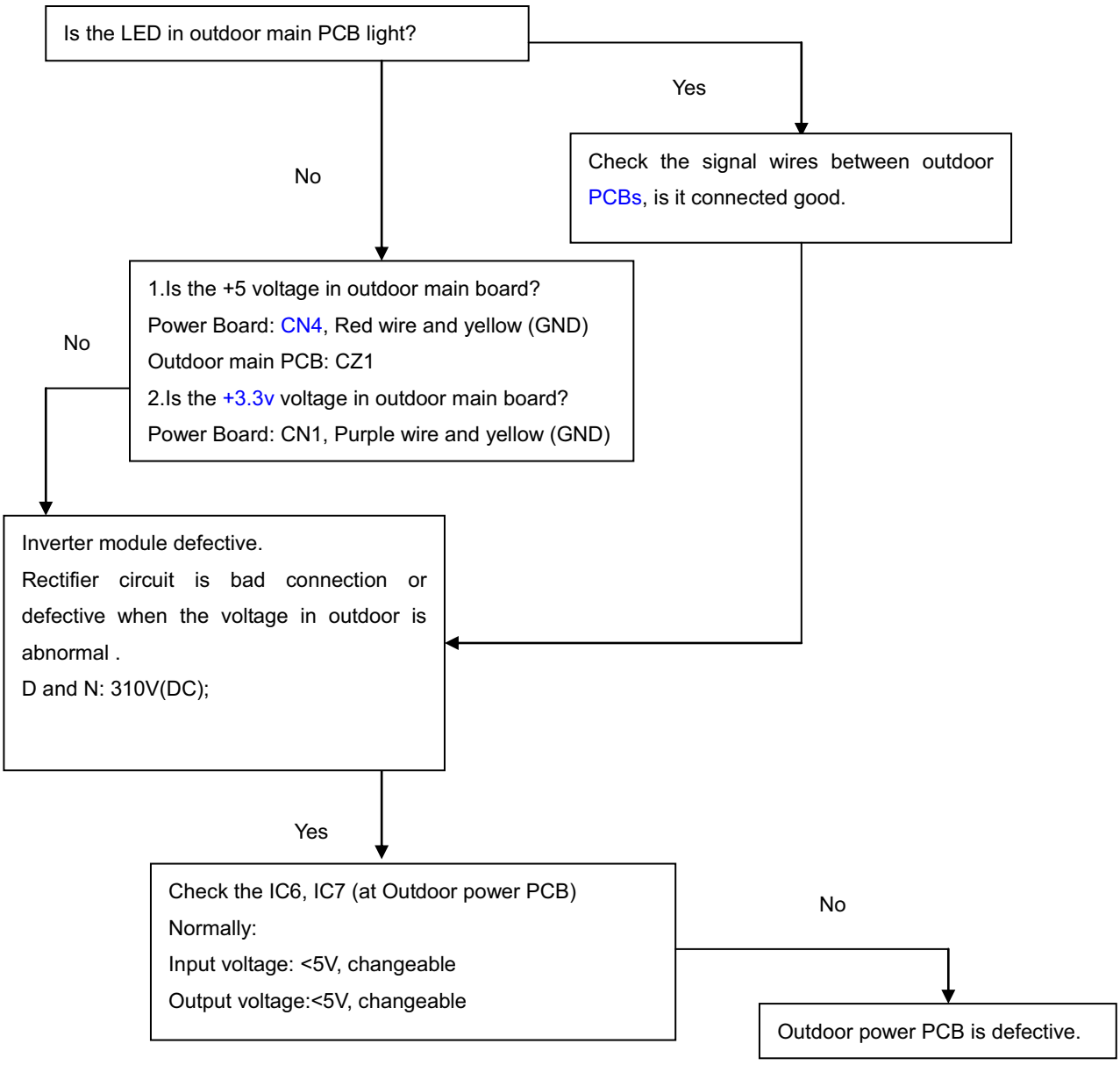
Outdoor unit display	LED STATUS
E4	Outdoor units temp. sensor or connector of temp. sensor is defective



Outdoor unit display	LED STATUS
E5	Compressor volt protection



Outdoor unit display	LED STATUS
E7	outdoor units communication protection

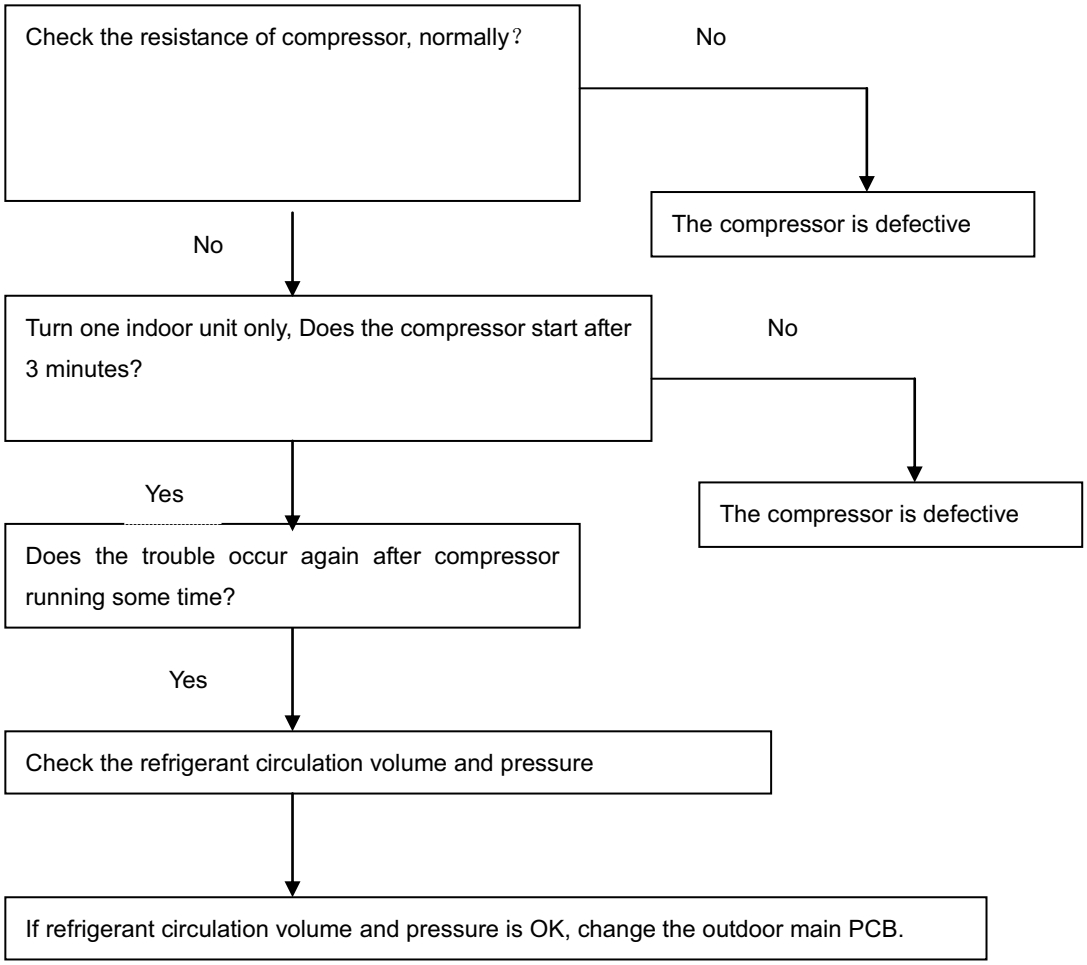


Outdoor unit display	LED STATUS
P0	Compressor top protection against temperature

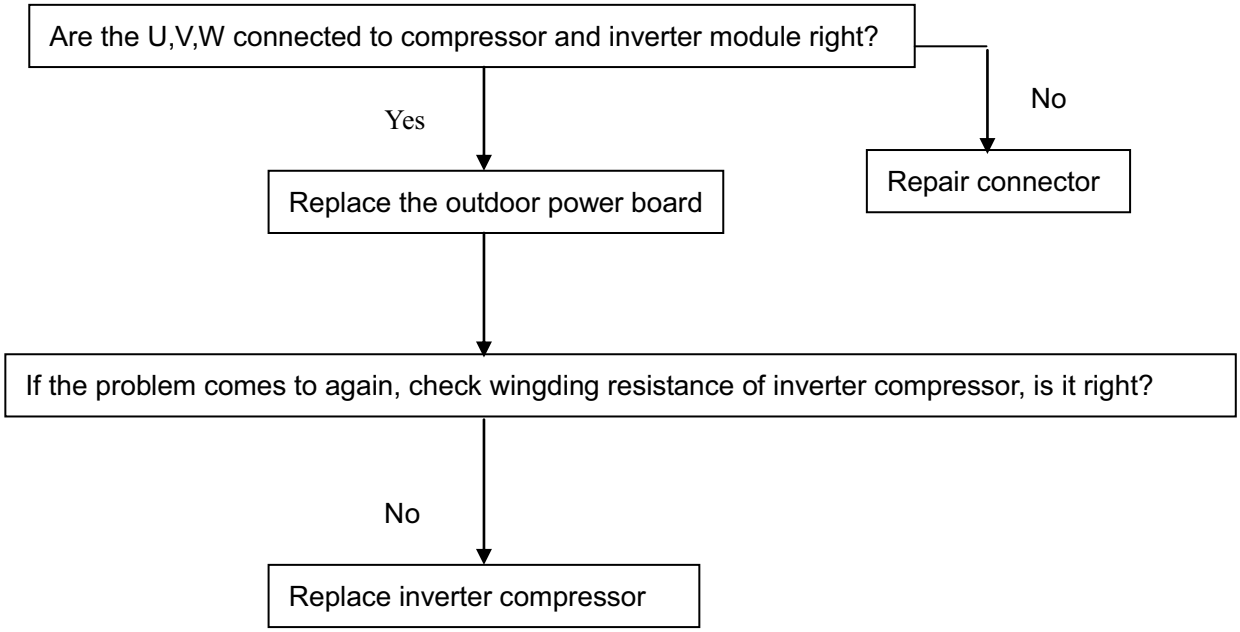
Off: 105c; On: 90c

The trouble shooting is same with the one of indoor unit P2 protection.

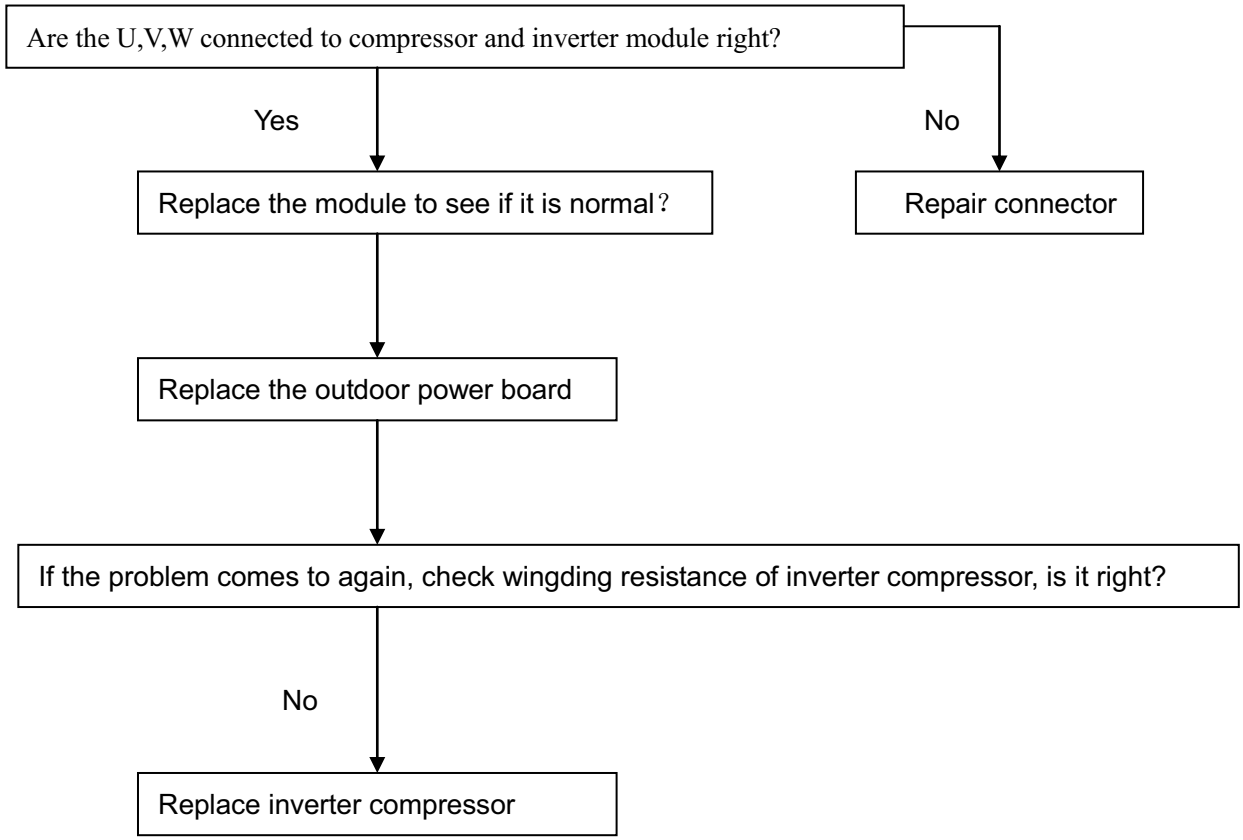
Outdoor unit display	LED STATUS
P3	Compressor current protection



Outdoor unit display	LED STATUS
P4	Compressor drive malfunction（drive protection arose）

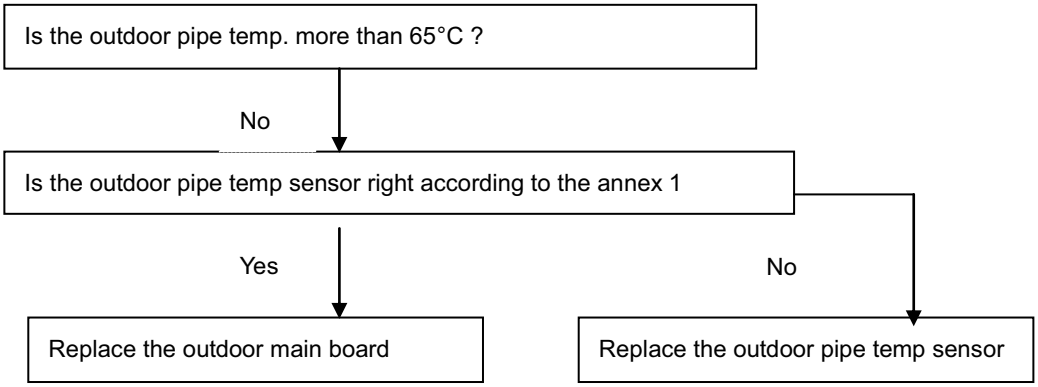


Outdoor unit display	LED STATUS
P4(LED flashes for nine times)	Compressor drive malfunction（module protection arose）



Outdoor unit display	LED STATUS
P6	Condenser high-temperature protection

When outdoor pipe temp. is more than 65°C, the unit will stop, and unit runs again when outdoor pipe temp. less than 52°C.



Annex 1

Characteristic of temp. sensor

Temp.℃	Resistance KΩ		Temp.℃	Resistance KΩ		Temp.℃	Resistance KΩ
-10	62.2756		17	14.6181		44	4.3874
-9	58.7079		18	13.918		45	4.2126
-8	56.3694		19	13.2631		46	4.0459
-7	52.2438		20	12.6431		47	3.8867
-6	49.3161		21	12.0561		48	3.7348
-5	46.5725		22	11.5		49	3.5896
-4	44		23	10.9731		50	3.451
-3	41.5878		24	10.4736		51	3.3185
-2	39.8239		25	10		52	3.1918
-1	37.1988		26	9.5507		53	3.0707
0	35.2024		27	9.1245		54	2.959
1	33.3269		28	8.7198		55	2.8442
2	31.5635		29	8.3357		56	2.7382
3	29.9058		30	7.9708		57	2.6368
4	28.3459		31	7.6241		58	2.5397
5	26.8778		32	7.2946		59	2.4468
6	25.4954		33	6.9814		60	2.3577
7	24.1932		34	6.6835		61	2.2725
8	22.5662		35	6.4002		62	2.1907
9	21.8094		36	6.1306		63	2.1124
10	20.7184		37	5.8736		64	2.0373
11	19.6891		38	5.6296		65	1.9653
12	18.7177		39	5.3969		66	1.8963
13	17.8005		40	5.1752		67	1.830
14	16.9341		41	4.9639		68	1.7665
15	16.1156		42	4.7625		69	1.7055
16	15.3418		43	4.5705		70	1.6469

Annex 2

1. Reference voltage data:

   a) Rectifier : Input :220-230V(AC), output :310V(DC)

   b) Inverter module: U,V, W 3ph.

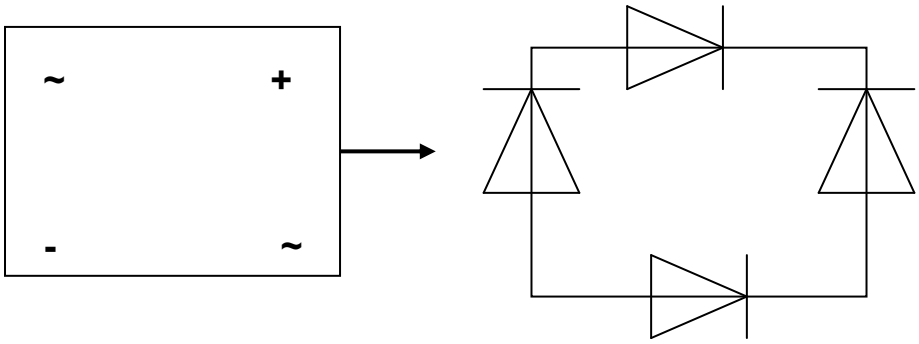
	Result
U-V	60-150V(AC)
U-W	60-150V(AC)
V-W	60-150V(AC)
P-N	DC 310V

   c) Photo-couple PC817, PC851: Control side <+5V, AC side :< 24V(AC)

   d) S terminal and N: changeable from 0-24V

2. Check the Diode Bridge component (In wiring diagram, rectifier)

Remark: If this part is abnormal, the LED will not light.



Multi-meter		Result	
		Forward Resistance	Backward Resistance
+	−	Infinite	Infinite
~	+	~500 ohm	Infinite
~			
-	~	~500 ohm	Infinite
	~		