GD Midea Refrigeration Equipment Co.,Ltd

MULTI SPLIT TYPE, HEAT PUMP AIR CONDITIONERS

Technical service manual 2006

R410A Vertu Inverter multi Series

Indoor Models

MSV1I-09HRDN1

MSV1I-12HRDN1

Outdoor Models

M2OA-18HRIN1

M3OA-27HRIN1

M40A-27HRIN1

1. Product features
2. Dimensions
3. Refrigeration cycle diagram
4. Operation temperature limits
5. Indoor units combination
6. Wiring diagram
7. Wiring connection
8. Electric control functions
9. Troubleshooting

Annex 1 Characteristic of temp. sensor

Annex 2 Reference data

1 Product Features

1.1 Powerful at cooling/heating.

1.2 Low voltage start-up function.

1.3 Anti-icing function at cooling mode.

1.4 Anti-cold air function at heating mode.

1.5 Auto-defrosting.

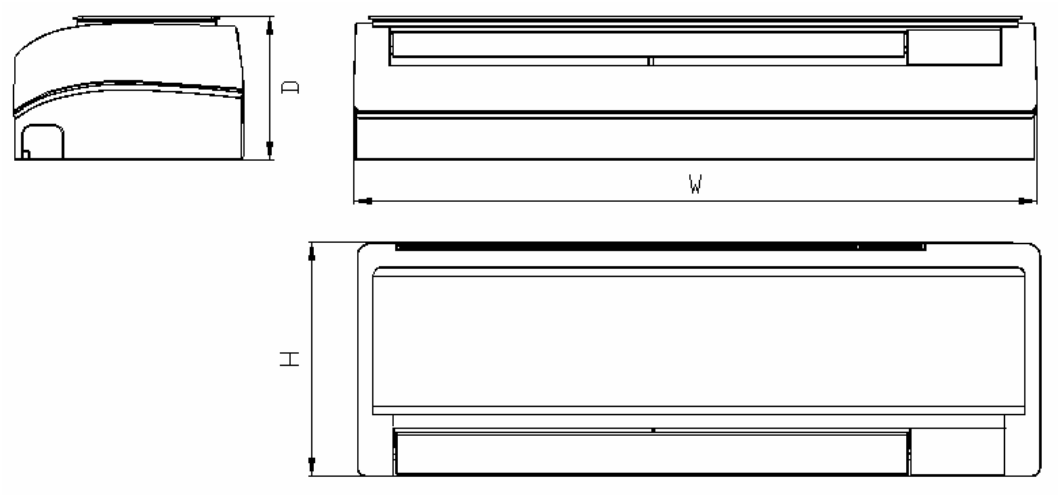
1.6 Outdoor electric current protection

1.7 Temperature protection of the outdoor compressor top.

1.8 Error self diagnosis function.

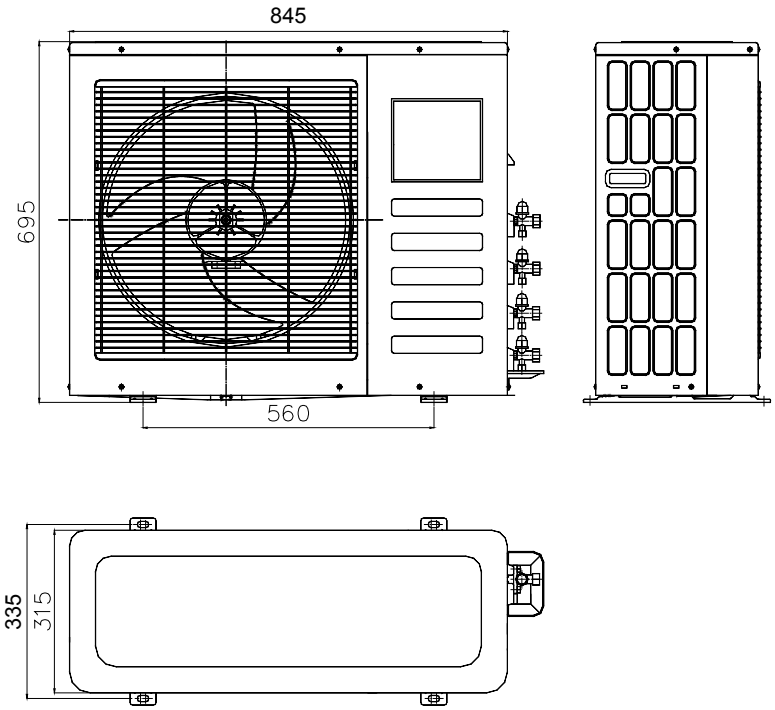
1.9 Free connection between indoor and outdoor unit

2 Dimensions
2.1 Indoor unit

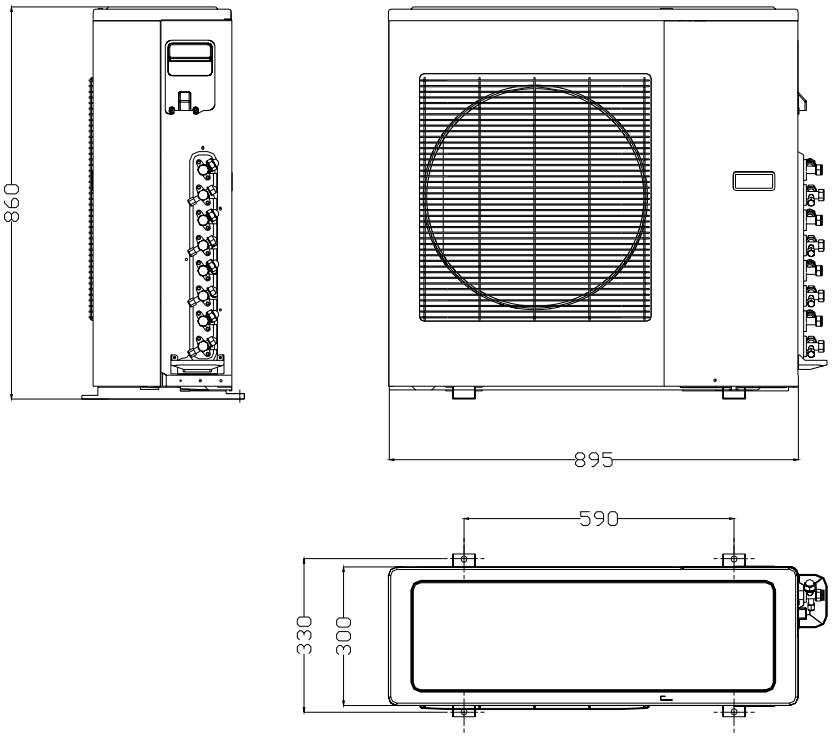


Dimension / Mode	W	H	D
9K	795	270	165
12K	845	286	165

2.2 Outdoor unit
a) Outdoor unit M2OA-18HRIN1& M3OA-27HRIN1

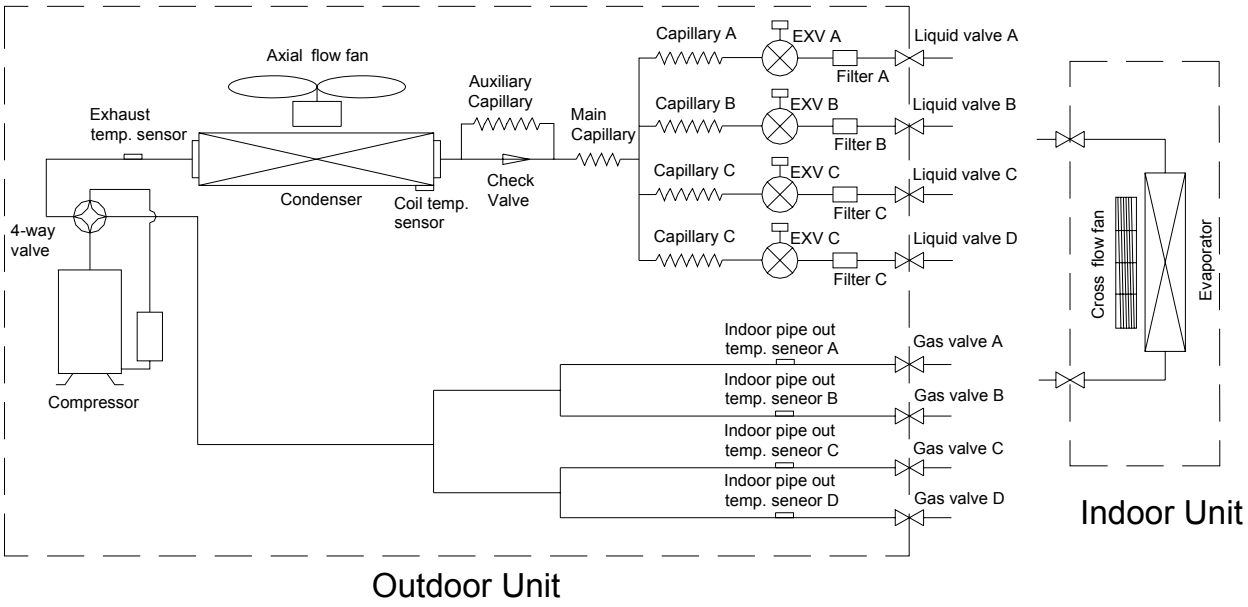


b) Outdoor unit M4OA-27HRIN1

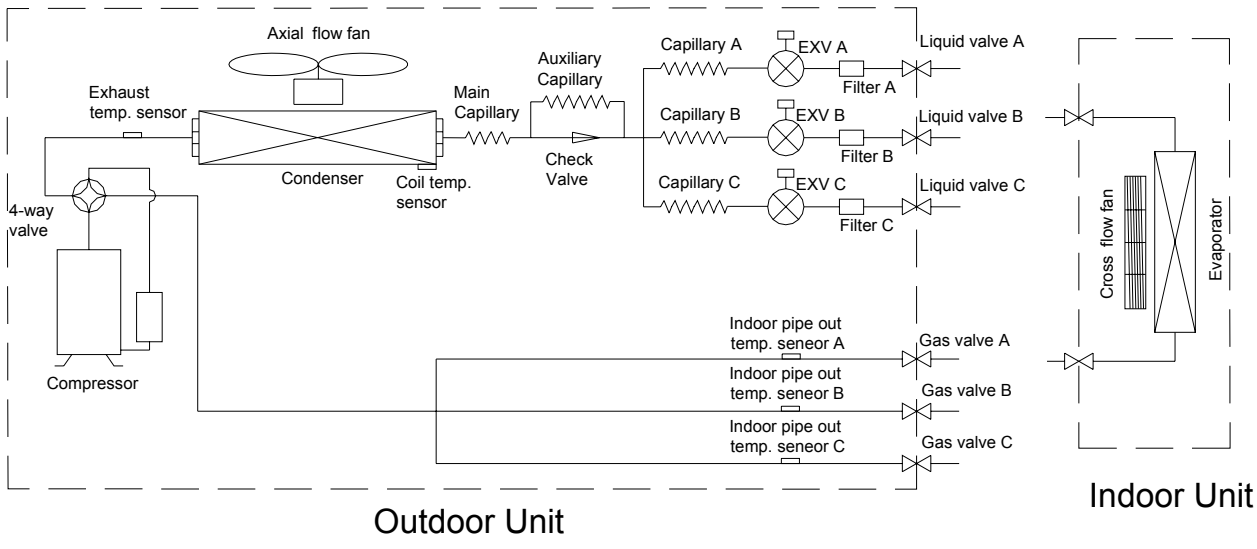


3 Refrigeration Cycle Diagram

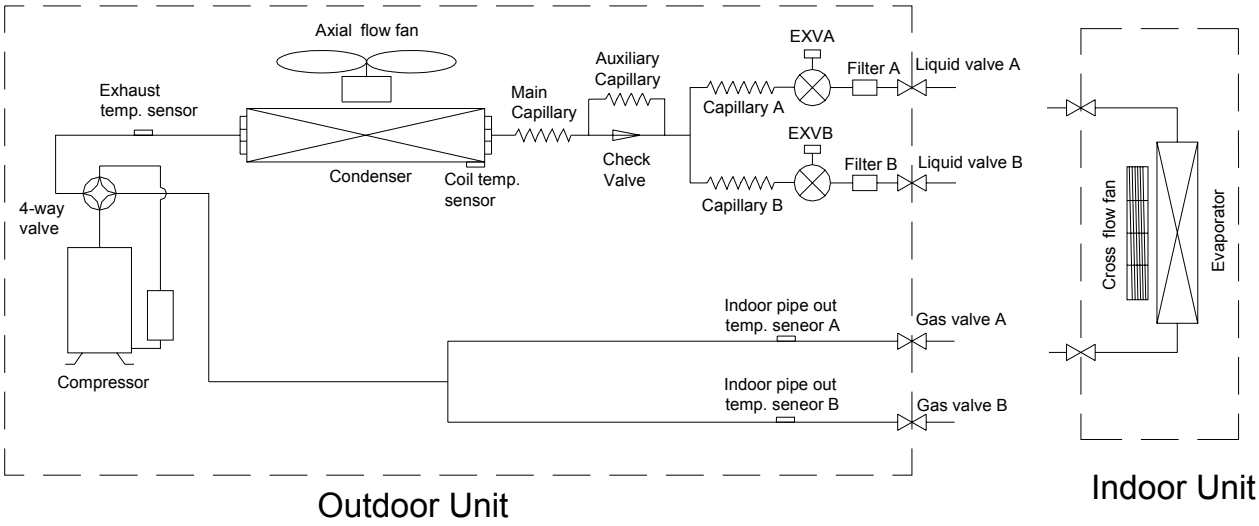
3.1 Refrigeration circuit drawing of inverter quadplex type



3.2 Refrigeration circuit drawing of inverter trinary type



3.2 Refrigeration circuit drawing of inverter binary type



4 Operation Temperature Limits

Cooling mode	Indoor temperature	17°C～32°C
	Outdoor temperature	0°C～50°C
Heating mode	Indoor temperature	<=30
	Outdoor temperature	-15°C～33°C
Dry mode	Indoor temperature	10°C～32°C
	Outdoor temperature	0°C～50°C

5 Indoor units combination

5.1 M2OA-18HRIN1

Indoor units can be combined by
7000Btu/h
9000 Btu/h
12000Btu/h
7000Btu/h+9000 Btu/h
7000Btu/h+12000Btu/h
9000Btu/h+9000 Btu/h
9000Btu/h+12000Btu/h
12000Btu/h+12000Btu/h
12000Btu/h+18000Btu/h
9000Btu/h+18000Btu/h
7000Btu/h+18000Btu/h

5.2 M3OA-27HRIN1

Indoor units can be combined by
7000Btu/h
9000 Btu/h
12000Btu/h
7000Btu/h+9000 Btu/h
7000Btu/h+12000Btu/h
9000Btu/h+9000 Btu/h
9000Btu/h+12000Btu/h
12000Btu/h+12000Btu/h
12000Btu/h+18000Btu/h
9000Btu/h+18000Btu/h
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7000Btu/h*2+18000 Btu/h
7000Btu/h*3
9000Btu/h*2+7000 Btu/h
9000Btu/h*2+12000 Btu/h
9000Btu/h*3
12000Btu/h*2+7000 Btu/h
12000Btu/h*2+9000 Btu/h
12000Btu/h+7000Btu/h+9000Btu/h

5.3 M4OA-27HRIN1

Indoor units can be combined by
7000Btu/h
9000 Btu/h
12000Btu/h

7000Btu/h+9000 Btu/h
7000Btu/h+12000Btu/h
9000Btu/h+9000 Btu/h
9000Btu/h+12000Btu/h
12000Btu/h+12000Btu/h
12000Btu/h+18000Btu/h
9000Btu/h+18000Btu/h
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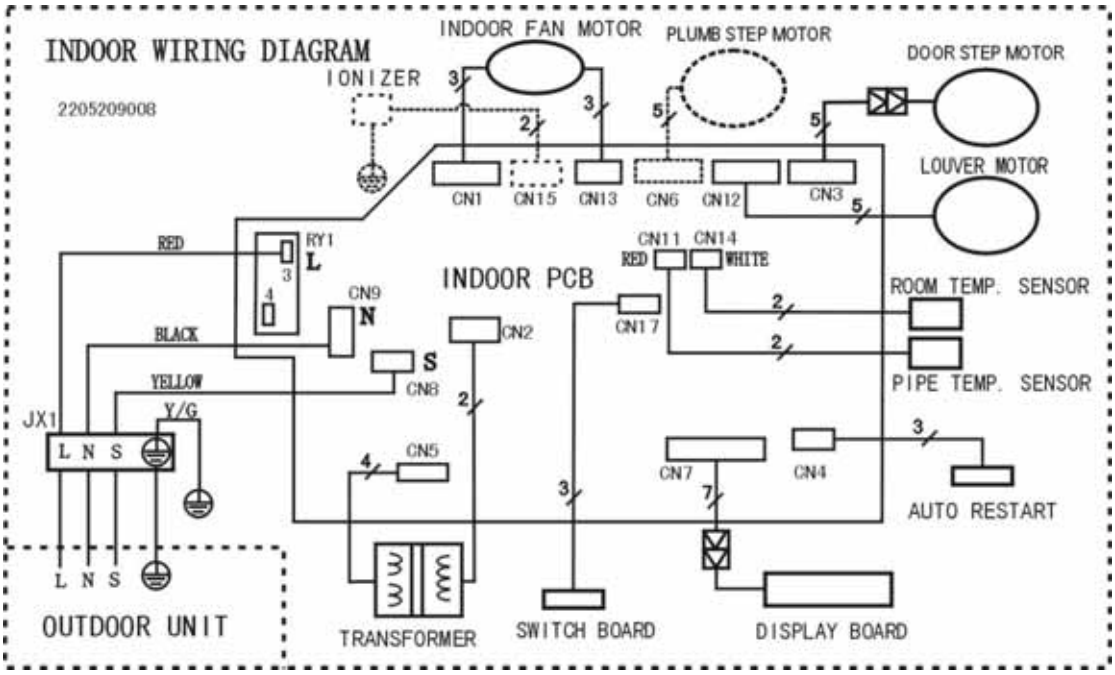
7000Btu/h*3+9000 Btu/h
7000Btu/h*3+12000 Btu/h
7000Btu/h*3+18000 Btu/h
7000Btu/h*4
9000Btu/h*2+7000 Btu/h+12000 Btu/h
9000Btu/h*3+7000 Btu/h
9000Btu/h*3+12000 Btu/h
97000Btu/h*4

Remark:

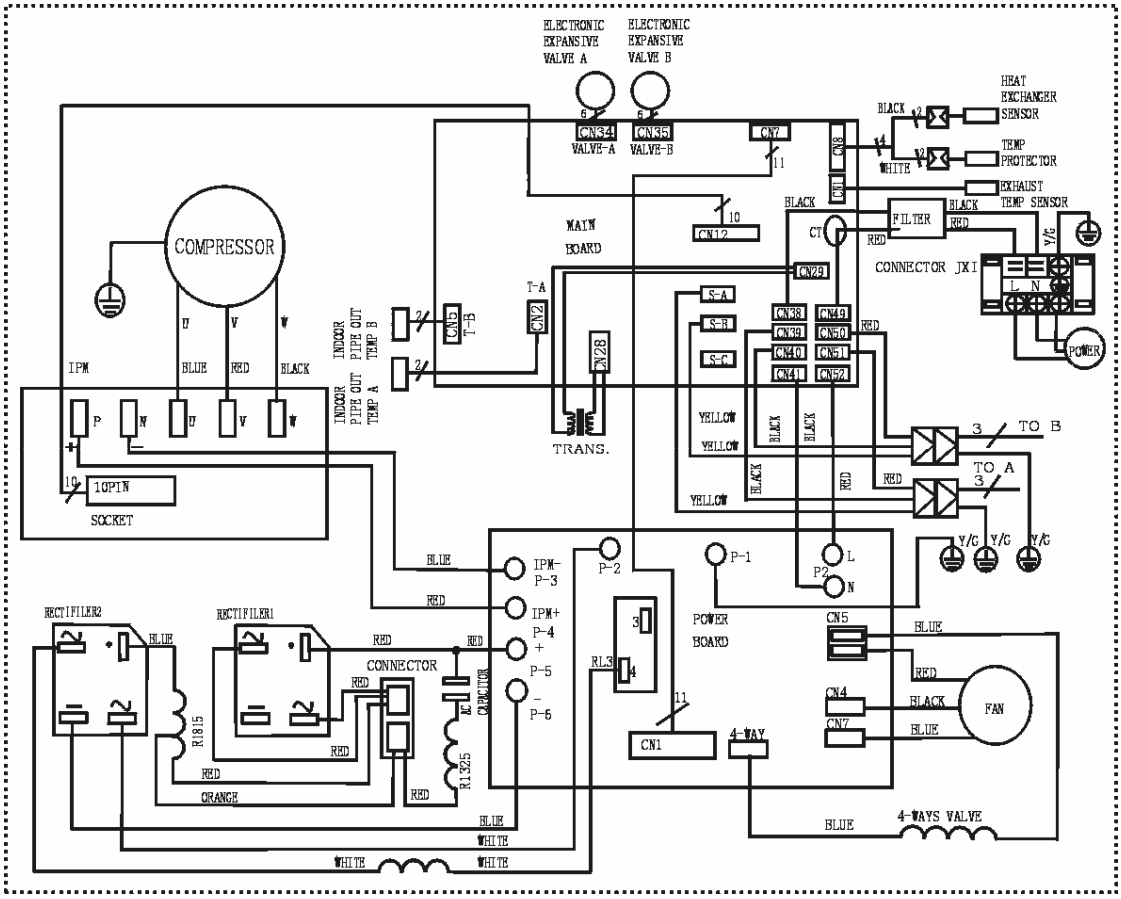
1. One, two, three or four indoor units can be connected according your need;
2. As 18000 Btu/h unit, just Cassette and duct are available.
3. There should be no more two duct indoor units and other indoor units should be all wall mounted in a system;
4. There should be no more one cassette and other indoor units should be all wall mounted in a system;
5. Cassette and duct can not be combined in a system;
6. When heating, capacity attenuate sharply if indoor unit capacity exceed too much.

6. Wiring Diagram

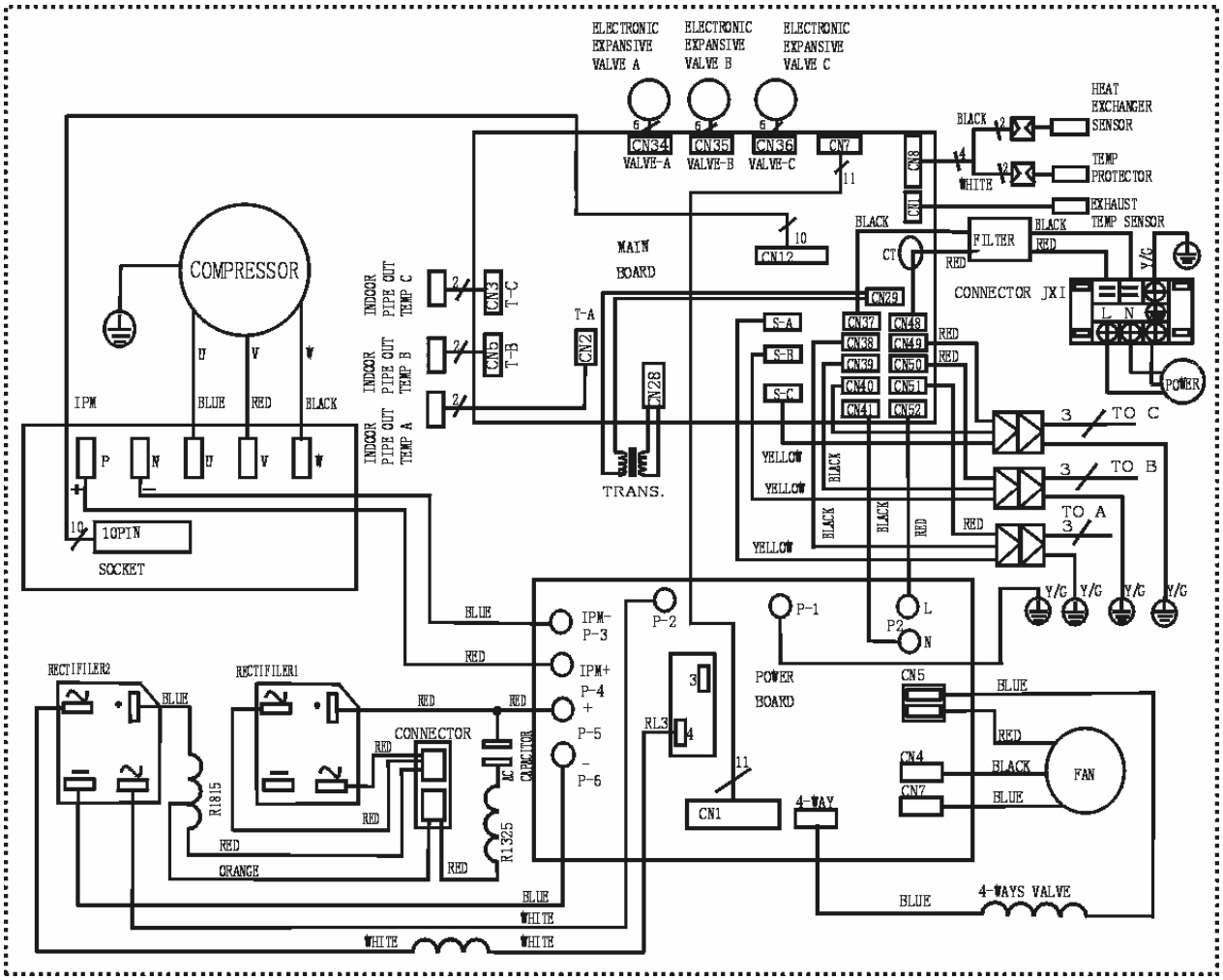
6.1 Indoor unit



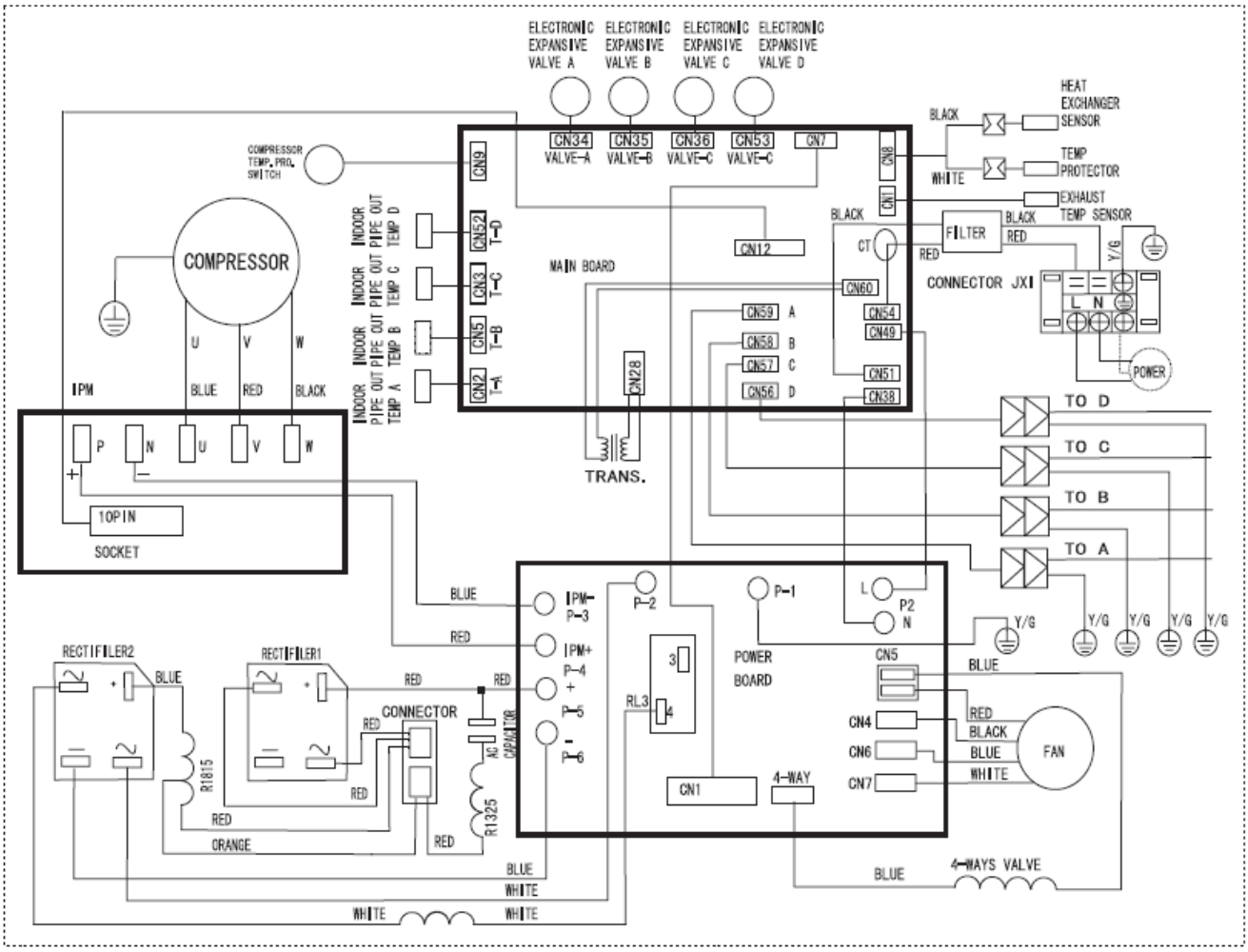
6.2 Outdoor unit M2OA-18HRIN1



6.3 Outdoor unit M3OA-27HRIN1



6.4 Outdoor unit M4OA-27HRIN1



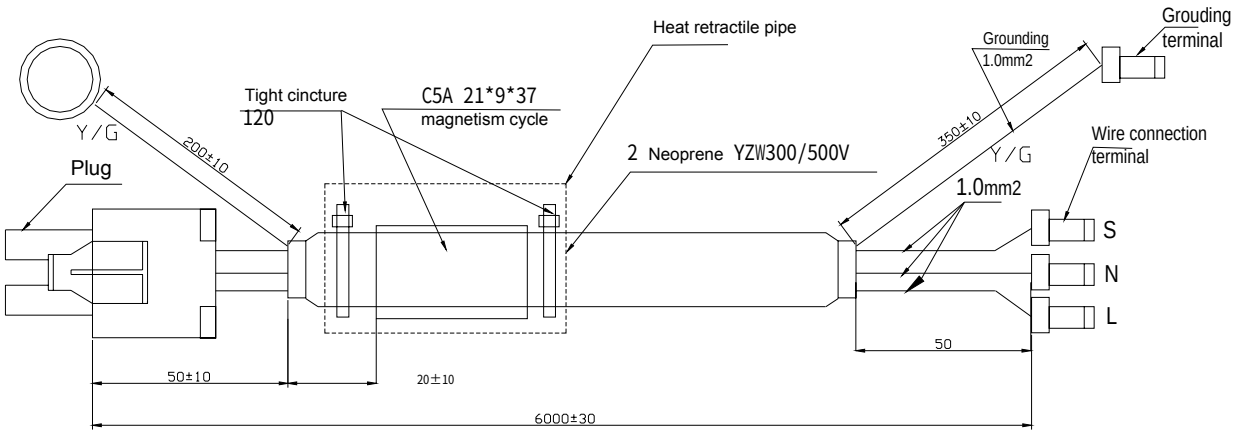
7 Wire connection

7.1 Connection wire specification

	Standard length(mm)	Cores	Thickness(mm^2)	Wire cover specification
Connection wire between indoor unit and outdoor unit	6000	4 (L,N,S,Grounding)	1.0	Neoprene YZW300/500V

Remark: The connection wire between indoor unit and outdoor unit is standard. And it is packaged in the indoor unit.

7.2 Connection wire drawing



8 Electronic control function

8.1 Protection

1. 3 minutes delay at restart for compressor.
2. Temperature protection of compressor top, compressor stops when the temp. of top of compressor is more than 120°C, compressor runs when the temp. of top of compressor is less than 105°C.
3. When AC voltage ≥ 270V for 30 seconds, Outdoor Unit stops operation and alarms. When AC voltage ≤ 260V for 30 seconds, outdoor unit resumes operation.
4. Inverter module protection, Inverter module Protection itself has a protection function against current, voltage and temperature.
5. Sensor protection at open circuit and breaking disconnection.
6. 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. Cross 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.
8. Current protection: When the current is more than 25A, the compressor stops.
9. Outdoor condenser high temperature protection: Under cooling mode, if T3>65°C for 3 minutes, the compressor will stop. When T3<52°C, the protection is not valid.
10. Outdoor low temperature protection: If the outdoor temperature is lower than -15°C for 1hour, the compressor and fan motor will stop. If the outdoor temperature is higher than -12°C for 10 minutes and the compressor stops operation for 1h, or the outdoor temperature is higher than 5°C for 10 minutes, then restart and enter into the prior operation mode.
11. Compressor pre-heating function: When the outdoor temperature is lower than 3°C and the compressor stops operation for more than 3 hours, or the outdoor temperature is lower than 3°C and the power is just put on, the compressor enters into pre-heating condition. When outdoor temp. is more than 5°C or user operate it, pre-heating condition will finish.

8.2 Operating mode

8.2.1 Cooling mode

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

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

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

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

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

8.2.2 Dehumidifying mode

1.The indoor fan is fixed in low speed

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

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

8.2.3 Heating mode

1. Indoor 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

Auto 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

Indoor evaporator high-temperature protection at heating mode

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

8.2.4 Defrost operation

1. Defrosting condition:

The temperature of outdoor heat exchanger remains consecutively lower than -2°c for more than 40 minutes,

2. Ending condition of defrosting

If one of following conditions is satisfied, end the defrosting 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.

3. Defrosting 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.

4. Automatic 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°C	Cooling
-1°C≤TA-TS≤+2°C	Fan-only
TA-TS<-1°C	Heating (air-only for cooling only type)

8.3 Mode conflict

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

Heating mode has a priority.

8.3.1Definition

	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

8.3.2 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.

8.4 Manual switch

Mode changes when push this button.

Cooing mode→ Auto mode→Unit off→ Cooing mode

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

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

8.5 Timer Function

1. The maximum length of timer is 24 hours and the minimum resolving power is 15 minutes.
2. Timer on: first turn off the A/C, the A/C will be automatically on at the set time.
3. Timer off: first turn on the A/C, the A/C will be automatically off at the set time
4. Timer 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.
5. Timer 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.

8.6 Sleep mode

8.6.1It is available at cooling, heating or auto mode.

8.6.2Cooling:

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.

8.6.3Heating:

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).

8.6.4 Auto:

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

8.6.5After 7 hours, unit cancels this mode automatically.

J2	On	On	Off	Off
J3	On	Off	On	Off
Stop time	7 hours	8 hours	6 hours	7 hours

8.7 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.

8.8 Capacity test frequency locked.

When test the cooling capacity, the frequency can be locked at Rated Frequency by following the below:

1. Set the indoor temp. to 17℃ and high speed;
2. Push the outdoor check button for 5 seconds, then its frequency can be fixed at Rated Frequency.

After the test is over, turn off the indoor to exit.

When test the heating capacity, the frequency can be locked at 85Hz by following the below:

1. Set the indoor temp. to 30℃ and high speed;
2. Push the outdoor check button for 5 seconds, then its frequency can be fixed at Rated Frequency.

After the test is over, turn off the indoor to exit.

8.9 Indoor unit indicator displayer

8.9.1 OPERATION indicator

This indicator flashes after power is on and illuminates when the unit is in operation.

8.9.2 AUTO indicator

This indicator illuminates when the air conditioner is in AUTO operation.

8.9.3 TIMER indicator

This indicator illuminates when TIMER is set ON/OFF.

8.9.4 CLEAN AIR indication lamp

Lights up when CLEAN AIR feature is activated and Ionizer can generate abundant anions to fill the room with refreshing and natural air.

8.9.5 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.

8.9.6 TURBO indication lamp

Lights up when select TURBO function on cooling operation or on heating operation.

8.9.7 FREQUENCY indicator

This indicator appears only when the compressor is in operation and indicates the current operating frequency.

8.9.8 TEMPERATURE indicator

Usually it displays the temperature settings. When change the setting temperature, this indicator begins to flash, and stops 20 seconds later.
It displays the room temperature when the air conditioner is in FAN only operation.
When the unit stops operation, it returns to original factory settings.

Displays the malfunction code or protection code.

8.9.9 FAN SPEED indication lamp

Displays the selected fan speed: AUTO(nothing) and three fan speed levels: LOW, MED and HIGH.

8.10 Outdoor unit LED display function:

1. When stand-by it display number of indoor unit online;
2. When operation it display frequency of outdoor unit;
3. When defrost it display “df”;
4. When a protection or error occurred, it displays error code or protection code.

8.11 Check function:

There is a check button on outdoor pcb. When push this button, the outdoor LED can display in sequence:

Capacity demand→Running mode →revised capacity → fan state →No.1 evaporator pipe temp. →No.2 evaporator pipe temp.→No.3 evaporator pipe temp.→No.4 evaporator pipe temp.→outdoor pipe temp. → Outdoor temp. →discharge gas temp.→current of outdoor unit → No. 1 opening degree of electronic expansion valve → No. 2 opening degree of EXV → No. 3 opening degree of EXV→No. 4 opening degree of EXV→indoor unit number→last protection/error code→capacity demand(cycle)

Explanation for the some display content:

1. Running mode:

Display	Corresponding mode
0	Off
1	Cooling mode
2	Heating mode

2. Fan state:

Display	Corresponding mode
0	Off
1	Low fan
2	High fan

3. Opening degree of EXV:

Opening degree equals the display data times 8;

4. Number of indoor unit

The indoor unit that can communicate with outdoor unit normally.

8.12 Outdoor fan speed control

There is one fan with two-speed, the fan speed is controlled according ambient temp. After the compressor stop, 30 seconds later the fan stops.

When cooling:

Ambient temp.rise	> 27	High speed
	<27	Low speed
Ambient temp.decline	>25	High speed
	<25	Low speed

When heating:

Ambient temp.rise	> 14	Low speed
	<14	High speed
Ambient temp.decline	>12	Low speed
	<12	High speed

8.13 Oil return function

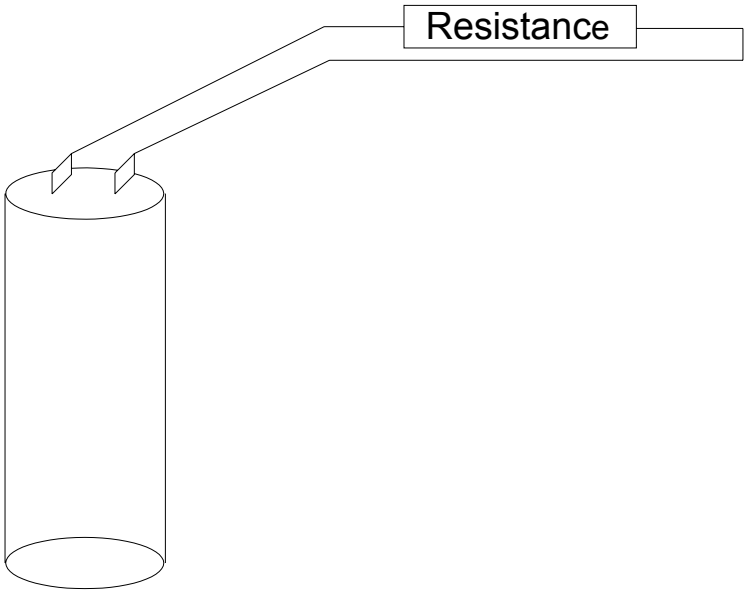
If operation frequency is lower than 54Hz in 2 hours consecutively, it will be increased to 62Hz for 3 minutes. Then it recovers to the former operation frequency.

9 Troubleshooting for outdoor unit

9.1 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 ohm to 2000 ohm



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

The voltage in P5 and P6 in outdoor PCB is high voltage about 310V

9.2 LED error code display for indoor unit

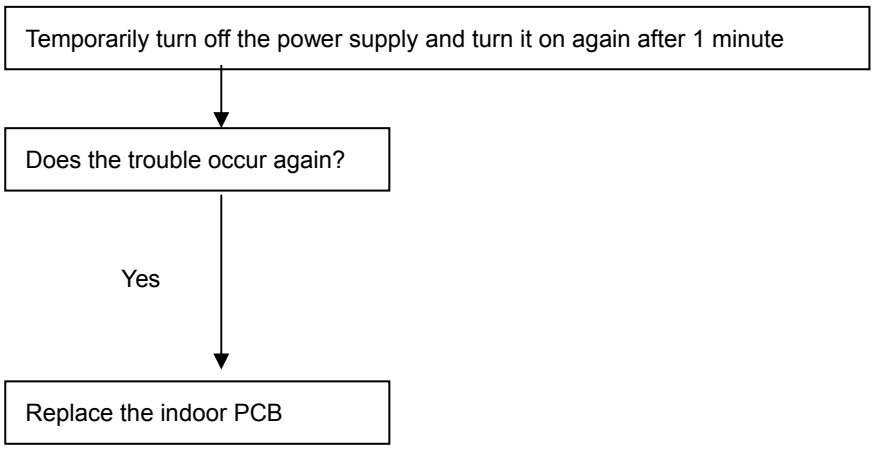
Display	LED STATUS
E0	EEPROM error
E1	Indoor and outdoor unit communication error
E2	Zero-crossing examination error
E3	Fan speed beyond control
E5	Outdoor units temp. sensor or connector of temp. sensor is defective
E6	Indoor units temp. sensor or connector of temp. sensor is defective
P0	Inverter module protection
P1	Outdoor unit voltage protection
P2	Compressor top temperature protection
P3	Outdoor low temp. protection
P4	Inverter compressor drive protection
P5	Mode conflict protection

9.3 LED error code display for outdoor unit

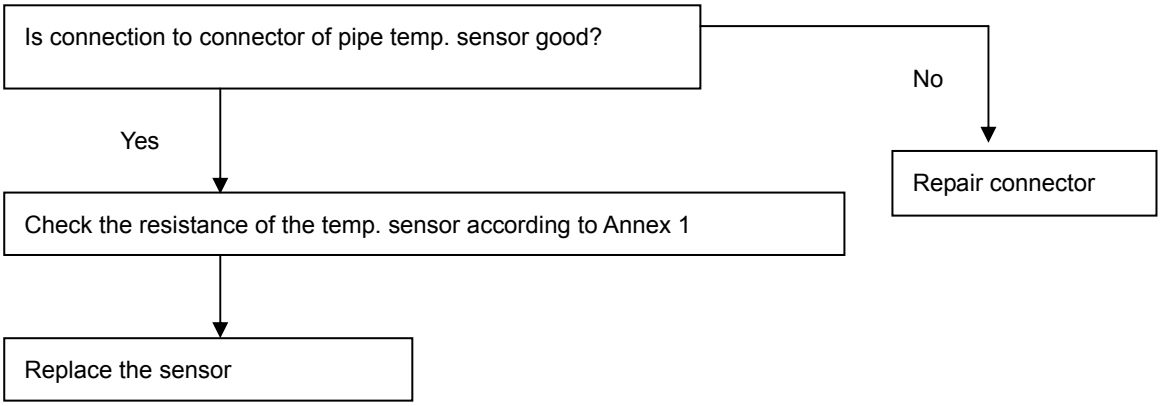
Display	Explanation
E0	EEPROM error
E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E4	Outdoor temp. sensor or connector of temp. sensor is defective
E5	Compressor voltage protection
E6	No 4 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E7	Outdoor inverter communication error
P0	Compressor top protection against temperature
P1	High pressure protection (reserve)
P2	Low pressure protection (reserve)
P3	Compressor current protection
P4	Inverter module protection
P5	Outdoor low temp. protection
P6	Condenser high-temperature protection

9.3 Trouble shooting

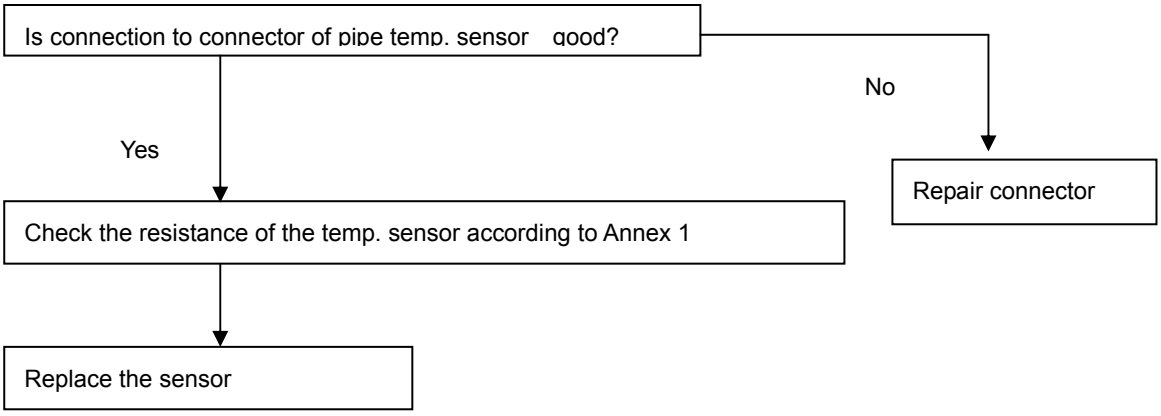
Display	LED STATUS
E0	EEPROM error



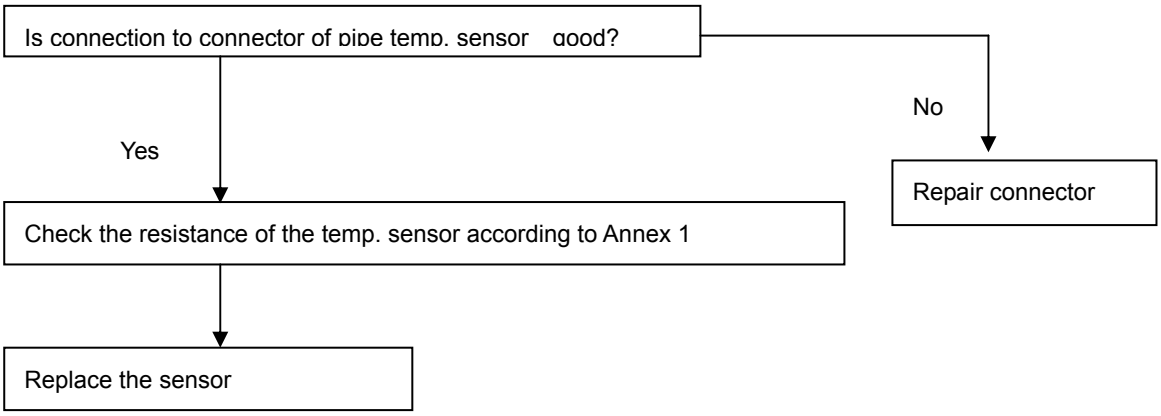
Display	LED STATUS
E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



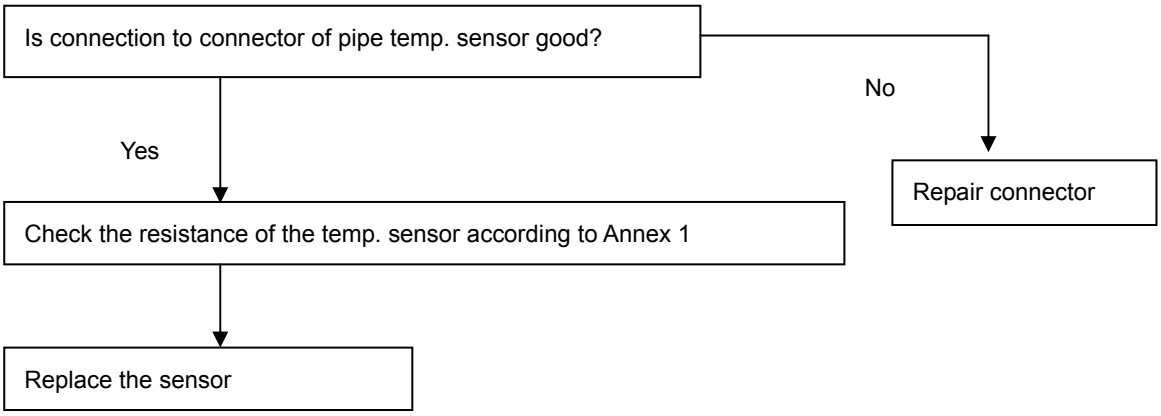
Display	LED STATUS
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



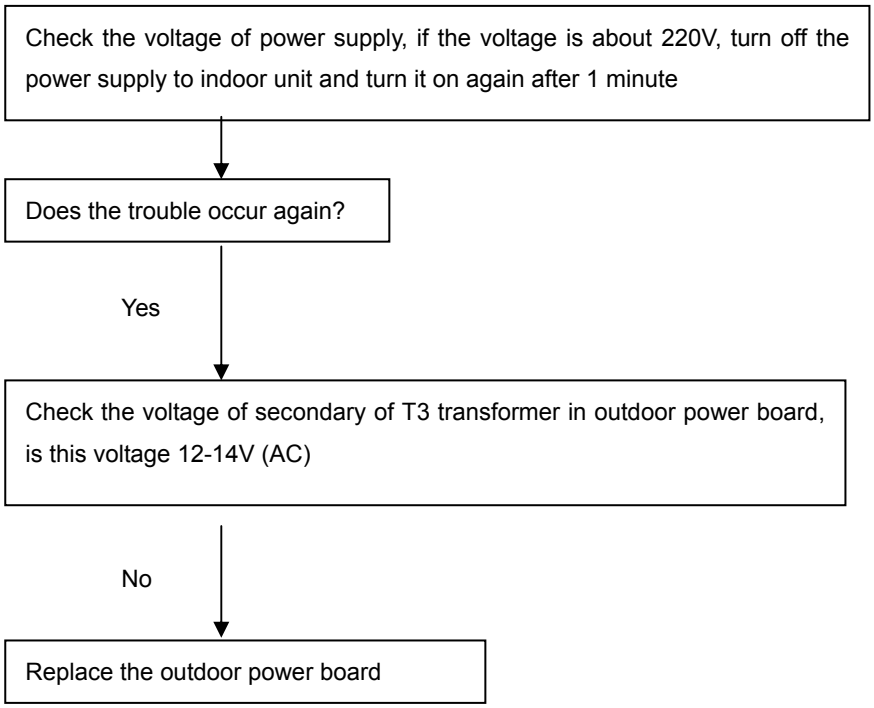
Display	LED STATUS
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective



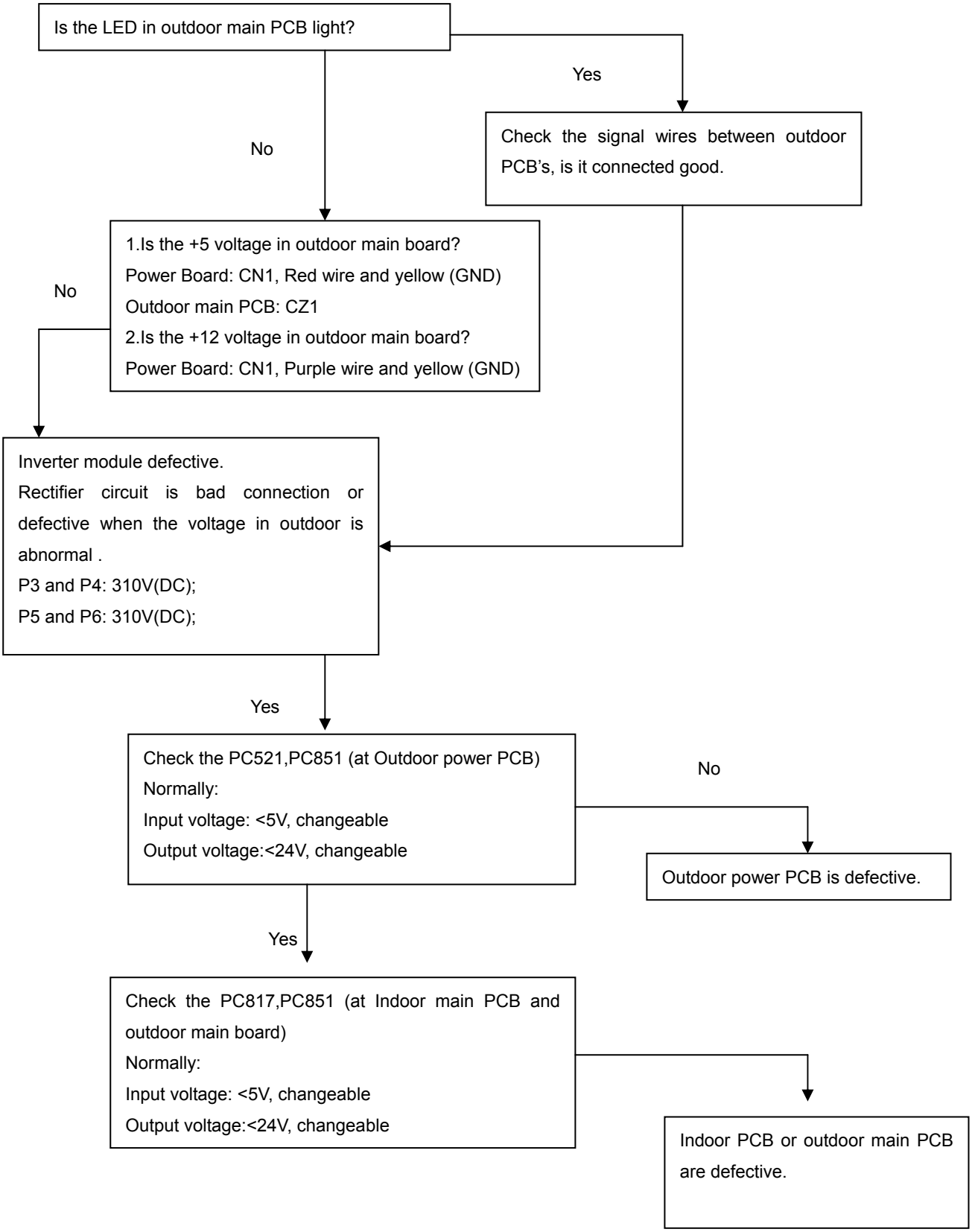
Display	LED STATUS
E4	Outdoor units temp. sensor or connector of temp. sensor is defective



Display	LED STATUS
E5	Compressor voltage protection

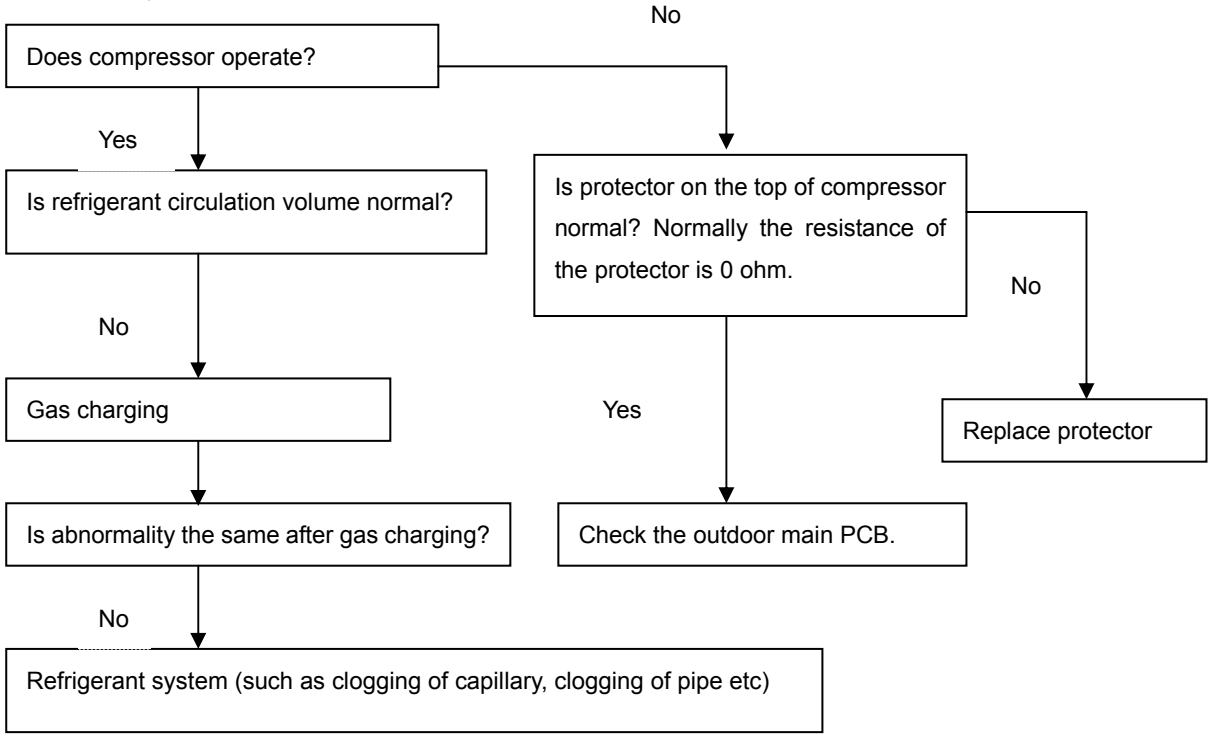


Display	LED STATUS
E7	Indoor / outdoor units communication protection

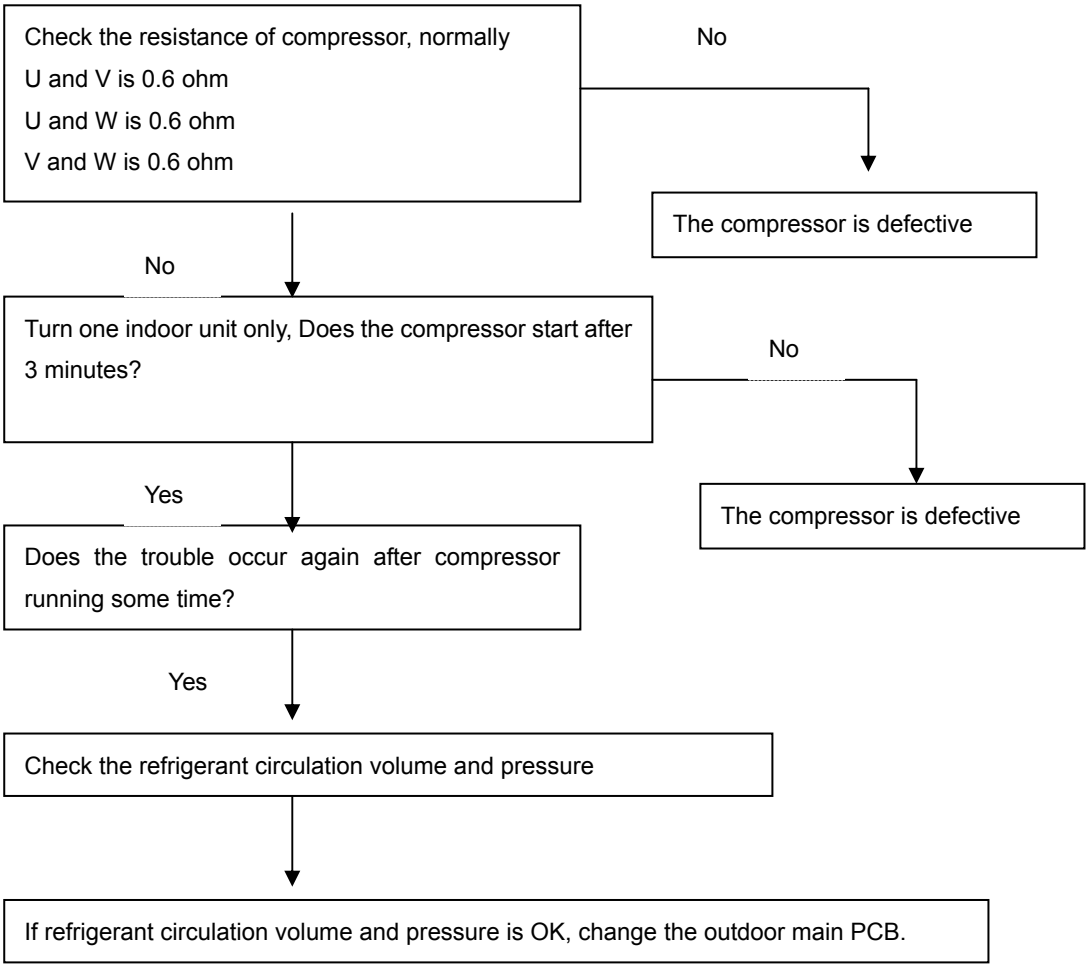


Display	LED STATUS
P0	Compressor top protection against temperature

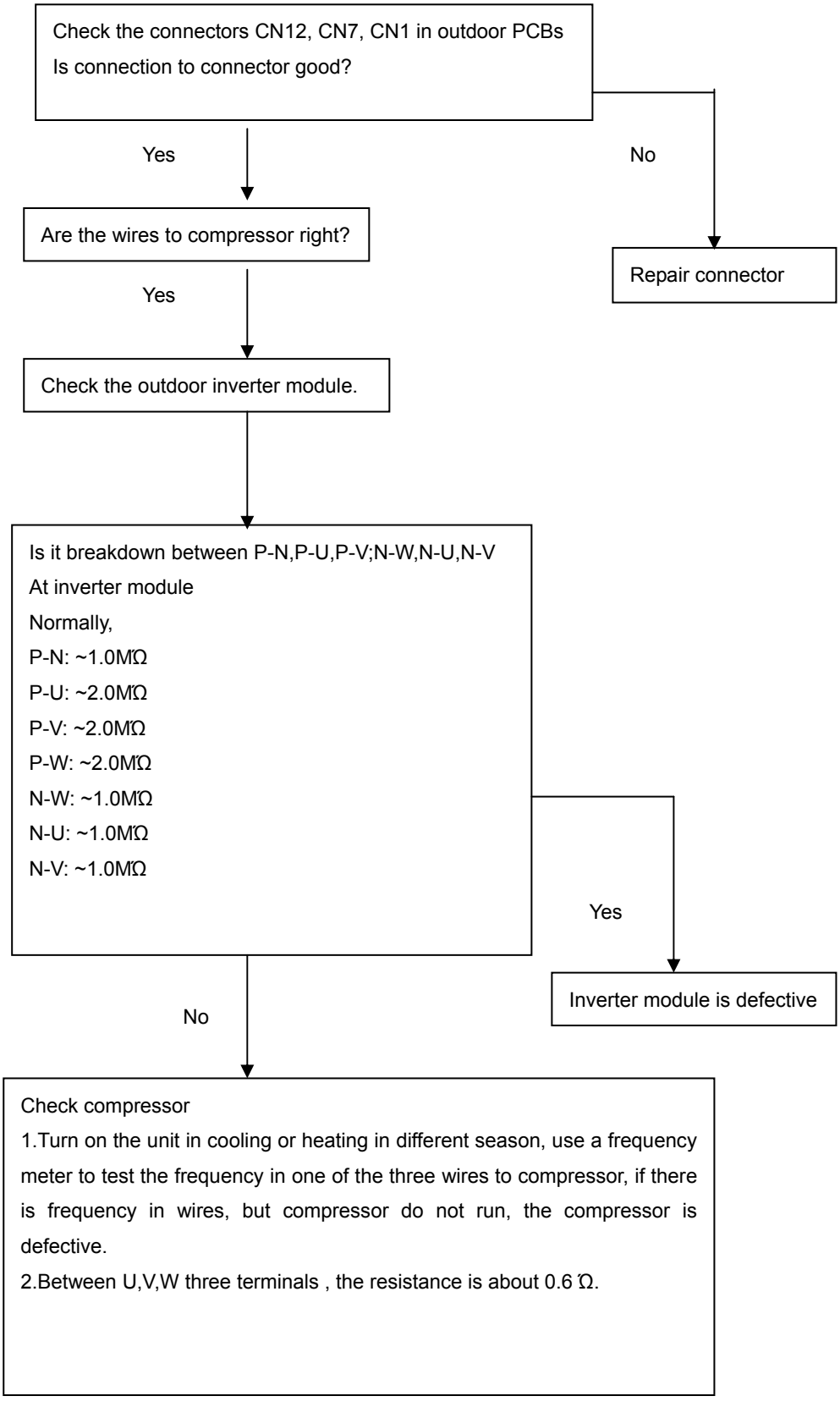
Off: 120°C; On: 105°C



Display	LED STATUS
P3	Compressor current protection



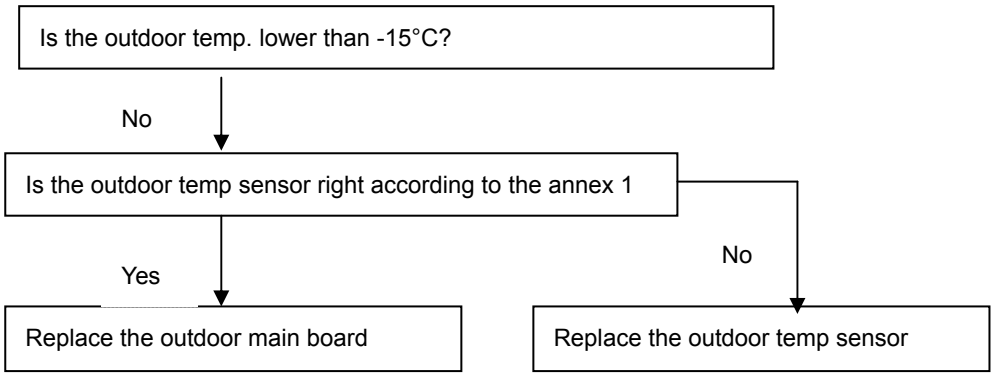
Display	LED STATUS
P4	Inverter module protection



Display	LED STATUS
P5	Outdoor low temp. protection

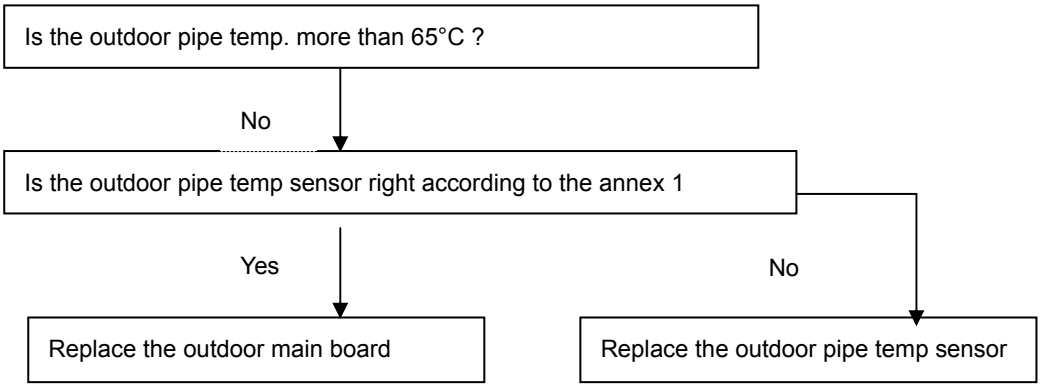
This is optional, factory standard unit does not have this function.

Unit stops when outdoor temp. is lower than -15°C and lasting time more than 60 minutes, and unit runs again when outdoor temp. more than -12°C.



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. is 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)

Normally In power board:

P3 and P4: 310V(DC)

P5 and P6: 310V(DC)

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

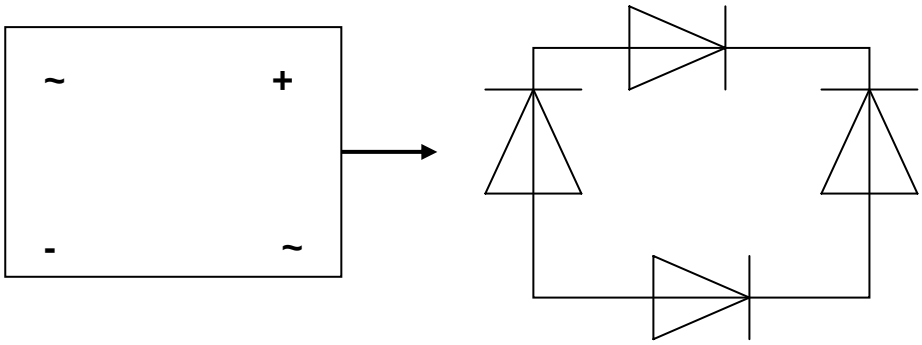
	Result
U-V	60-150V(AC)
U-W	60-150V(AC)
V-W	60-150V(AC)
P-N	DC 310V

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
	~		