

Hamilton Digital

Service Manual

DC Inverter Split type A/C

HDWI-93C

HDWI-123C

HDWI-183C

HDWI-243C

HDWI-MAXIMUS-94C

HDWI-MAXIMUS-124C

HDWI-MAXIMUS-184C

HDWI-MAXIMUS-244C

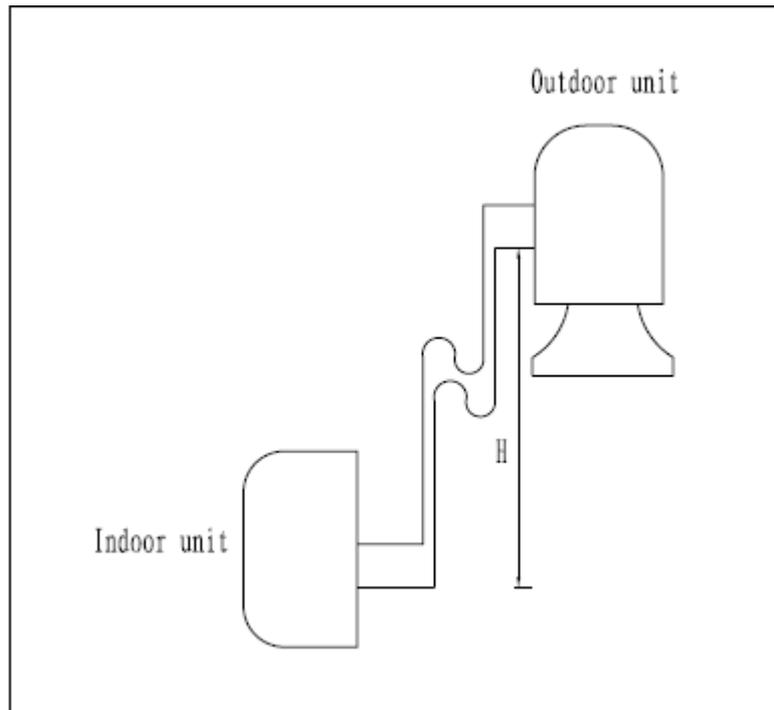
HDWI-DSGN-90C-GOLD/RED/WHITE

HDWI-DSGN-120C- GOLD/RED/WHITE

Remark: there can be a little difference between the unit you purchase and the universal version.

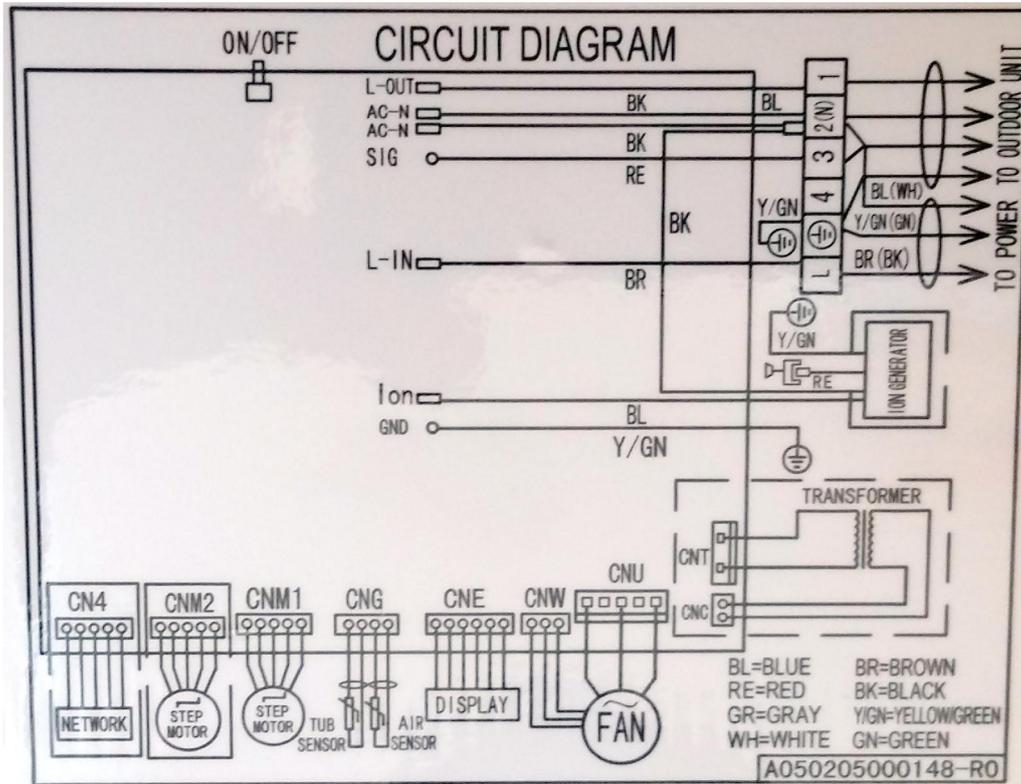
■ 1、 Content about adding oil trap.

Note: The oil trap should be added when the outdoor unit located at a certain height higher than the indoor unit. Our suggestion for this is, the height should be more than 5m. And for every another 5m, one oil trap should be added. See pic attached below:

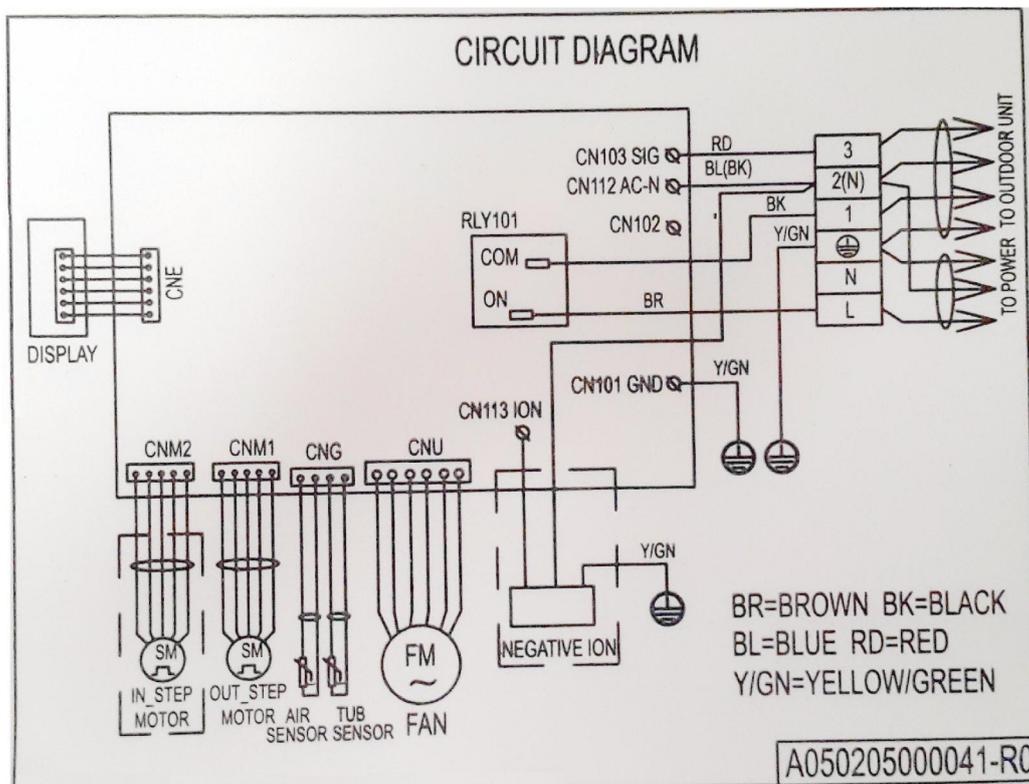


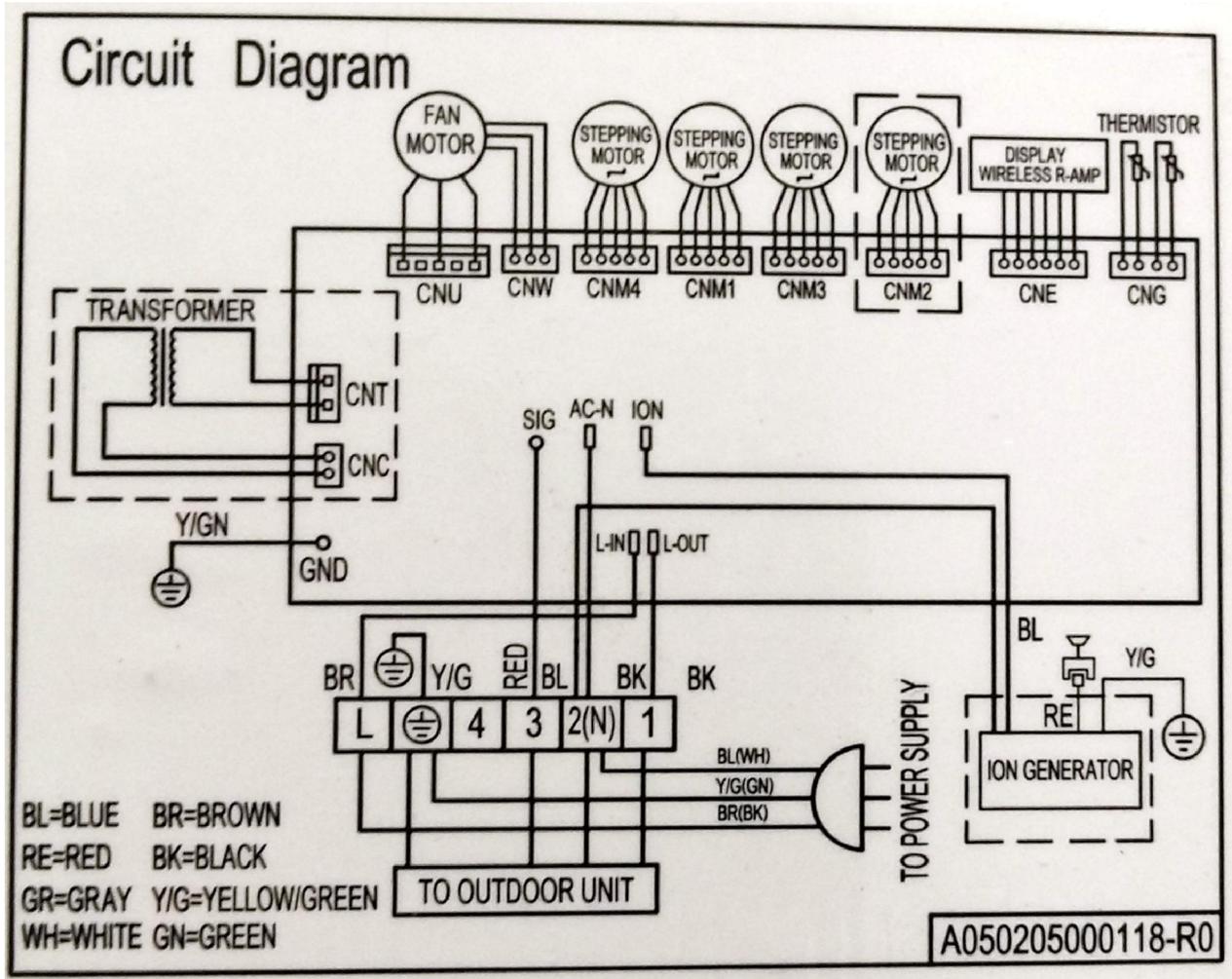
2. Wiring diagrams (outdoor and indoor, zoom in when reading please)

HDWI-93C; HDWI-123C; HDWI-MAXIMUS-94C; HDWI-MAXIMUS-124C,



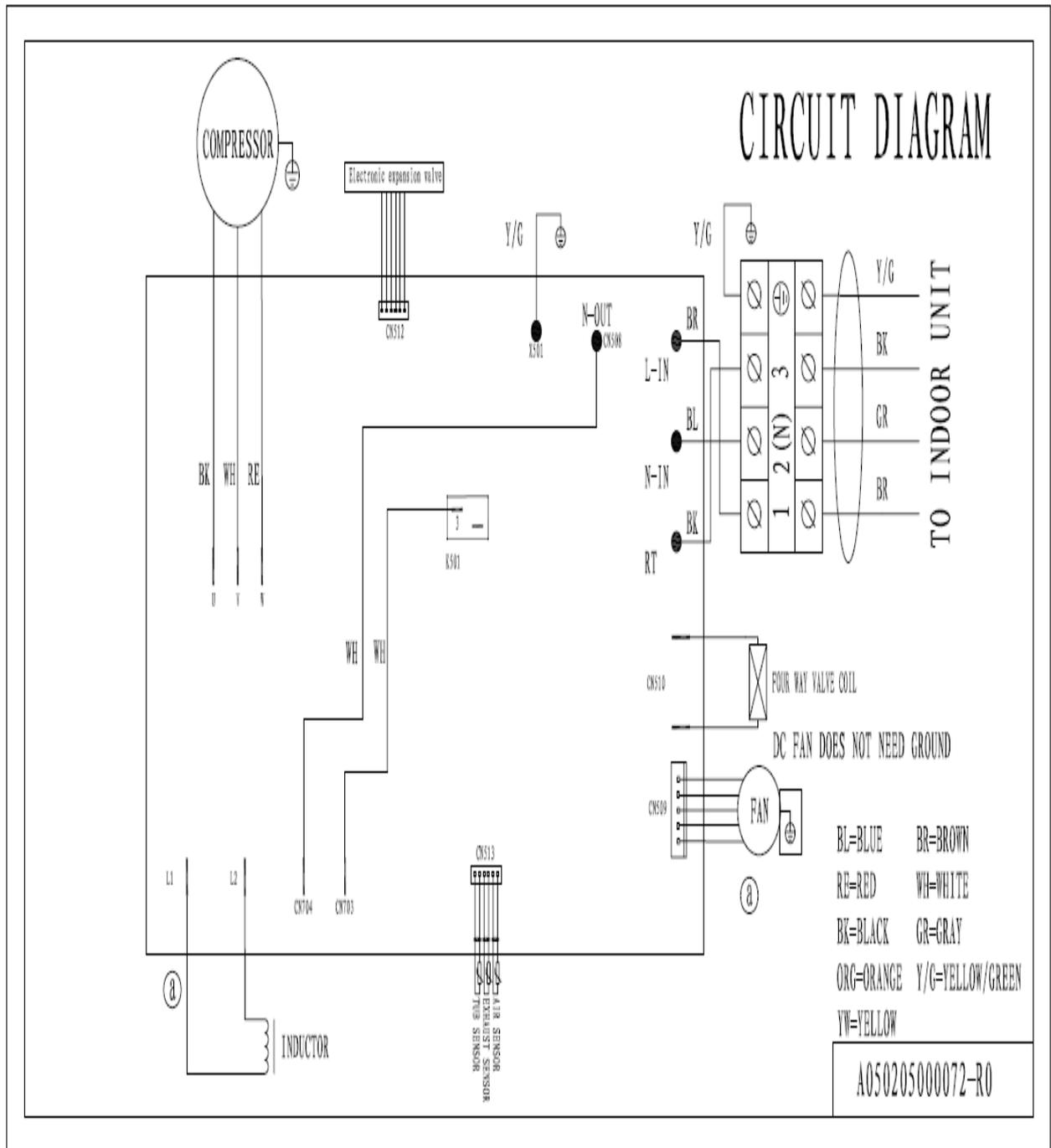
HDWI-183C; HDWI-243C; HDWI-MAXIMUS-184C; HDWI-MAXIMUS-244C





Outdoor unit

Each model



3. The specifications on common software functions for inverter AC

3.1 Universal basic requirement

The power voltage's sphere of application: Alternating current..50/60Hz are compatible, to permit the voltage wave range: 170V~264V

The ambient temperature and humidity of using the PCB: -20°C~85°C, φ=30%~95%;

3.2. Software function

3.2.1 The symbol and wind speed's definitions

(a) The symbol definition

Ts: the setting temp.

Tr: the indoor temp.

Tp: the indoor coil pipe temp.

(b) The wind speed definition

The indoor fan (PG motor) wind speed definition. Please refer to the following **form 2-1**.

Form 2-1

model	mode	Super high winds	High winds	Mid winds	Low winds	Slightly winds
Any	cooling	FS5	FS4	FS3	FS2	FS1
model	heating	FS10	FS9	FS8	FS7	FS6

NOTE : (1) The FS1~FS10 are programmable dates, and they are in the EEPROM;

(2) The motor rotate-speed should refer to the motor parameter, if the indoor motor uses the tapped control.

3.2.2 basic mode

The automatic mode

1. the models with the universal remote controller

(1) the setting temperature is 25°C, and it is unadjustable.

(2) If press the "emergency switch" button on standby or use the remote controller to set the automatic mode, the air-conditioner will enter the automatic operating mode, and its default setting temperature is 25°C.

(3) when enter the automatic mode, the system will decide the corresponding running mode according to the indoor ambient temperature, please refer to **form 2-3**:

Form 2-3

Indoor temp.	Tr<21°C	21°C ≤ Tr ≤ 26°C	26°C < Tr
Running mode	heating	ventilation	cooling

(4) once the running mode is confirmed:

a) the mode doesn't automatically change any more with the indoor temperature's vary.

b) when the user makes remote controller or emergency switch turn off the unit, and enter the automatic mode again, the indoor software will judge the running mode once more.

c) if different modes switching brings about the compressor's stop, but 3 min protect is still effective.

(5) working condition of the compressor: it is determined by the entering running mode.

(6) working condition of the four-way valve: it is determined by the entering running mode.

(7) working condition of the outdoor fan: it is determined by the entering running mode.

2. meanwhile the indoor electronic control has the function that discriminates Two kinds of universal remote controller yards, after receiving remote controller signal, the indoor electronic control can confirm and adopt the relevant function according to identification marks in remote control signal.

3.2.3 Cooling mode(The outdoor maximum operation temperature in cooling: 43°C)

1. the setting temperature's range: 16°C -32°C

2. working condition of the compressor:

In the cooling mode, the controller carries out the Fuzzy reasoning according to the deviation of current indoor environment temperature and setting temperature, and indoor temperature's vary rate and so on. Thus it can decide the compressor's running condition and indoor fan's wind speed in order to achieve use requirement.

3. the compressor's starting frequency, running frequency's going up and down, running condition and the outdoor fan's working condition refer to the instructions of outdoor software function.

4. the processing of turning on and turning off the unit:

In cooling mode, the following chart 2-1 is the compressor's processing curve of turning on and turning off the unit:

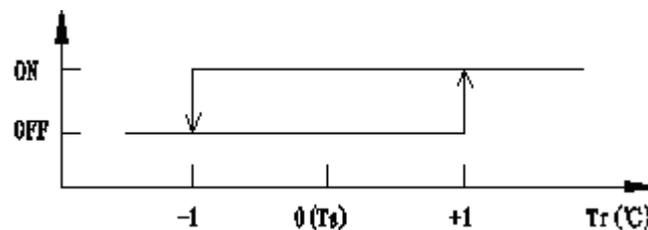


Chart 2-1

5. working condition of the indoor fan motor:

The indoor fan's speed can be chosen in automatic, high, mid, low condition; and runs at super high wind, high wind, mid wind or low wind speed.

when choose the automatic wind, the indoor fan's work is shown as the following chart 2-2:

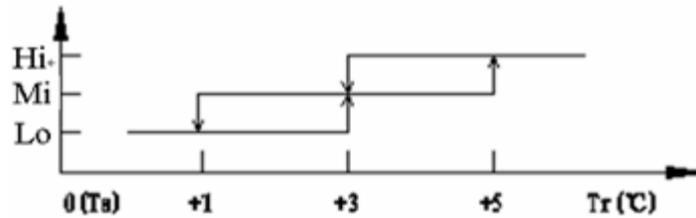


Chart 2-2

6. Blow remain cold function: when turning off the unit with the remote controller or emergency switch, the indoor fan is at low wind speed, and be turned off after time lag 30 seconds; the indoor wind swing times lag 35 seconds and be turned off, thus that can blowout the remaining cold energy and ensure the indoor unit dry.

7. working condition of the four-way valve: the four-way valve is closed all the time in cooling mode.

8. working condition of the external air flap in cooling:

(1) confirm the air flap's full open position is Pch1, and the full closed position is Pch2.

(a) when the unit is electrified, firstly, the air flap opens to Pch1 position and then back to Pch2 position.

(b) turning on the unit, firstly, the air flap opens to Pch1 position and then back to Pch2 position.

(c) turning off the unit, firstly, the air flap opens to Pch1 position and then normally runs.

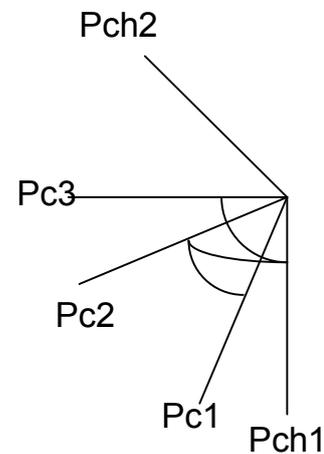


Chart 2-3

(2) working condition of the fixed wind in cooling:

(a) if the unit is electrified at the first, the condition is set fixed wind when turning on the unit, and firstly, the air flap opened to Pch1, and then stop to Pc2 position of the fixed wind.

(b) in the swing wind or natural wind, if it is transformed to fixed wind, the air flap will directly stop the current running position, and memories this position; next time the user starts the unit at the fixed wind, the wind pendulum is in last memory position.

(3) operating condition of the swing wind in cooling:

(a) when it is swing wind, the air flap's starting point position is Pc1.

(b) the air flap firstly back to full open position Pch1 and then work at the swing wind way from the fixed wind or natural wind to swing wind.

(c) The air flap swings to go back and forth between Pc1 and Pc3 in swing wind condition.

(4) the natural wind is achieved when the wind pendulum swings two circles and stops 30 seconds in the swing wind condition.

The definition of the external air flap's position is showed below table 2-4:

Table 2-4

Full open	Full close	Fixed wind	Starting point to swing wind	Destination to swing wind
Pc1	Pch2	Pc2	Pc1	Pc3

NOTE: Pch1.Pch2.Pc1~Pc3 are programmable dates that be stored in EEPROM.

9. when the units operate in cooling mode, the units have the relevant outdoor ambient temperature's limiting and protection, the protection to the indoor coil pipe preventing frostbite, the outdoor exhaust temperature overheating protection, overcurrent protection, low-voltage protection, the compressor overheating protection, indoor fan fault protection, sensor fault protection, system fault protection, IPM fault protection, communications fault protection, 3 minutes time lag protection of the compressor and so on.

3.2.4. Dehumidification mode

1. the range to the setting temperature: it is tolerated 25°C and is unadjustable.
2. working condition of the compressor:
the compressor chooses the relevant running way according to the indoor temperature in the dehumidification mode.
3. working condition of outdoor fan: the outdoor is the synchronous operation with compressor in the dehumidification mode.
4. working condition of indoor fan: the indoor fan's wind speed is FS11 and is not adjustable in the dehumidification mode (FS11 is programmable date, and stored in the indoor EEPROM) .
5. working condition of the four-way valve: the four-way valve is closed all the time in the dehumidification mode.
6. working condition of the external air flap: the external air flap is in the anti condensation position (P1) and can be not adjusted in the dehumidification mode.

NOTE:P1 is programmable date,and stored in the indoor EEPROM.

7. there are not the TURBO/ECONOMY functions in the dehumidification mode.
8. the indoor heat exchanger anti freezing function is still effective in the dehumidification mode.
9. when turn off the unit in the dehumidification mode, the indoor fan and the wind pendulum's running are the same as that in the cooling mode.

3.2.5. Heating mode(the outdoor minimum operation temperature in heating: -10°C)

1. the range to the setting temperature: 16°C -32°C
2. working condition of the compressor:

In the heating mode, the controller carries out the Fuzzy reasoning according to the deviation of

current indoor environment temperature and setting temperature ,and indoor temperature's vary rate and so on. Thus it can decide the compressor's running condition and indoor fan's wind speed in order to achieve use requirement.

3. the compressor's starting frequency, running frequency's going up and down, running condition refer to the instructions of outdoor software function.

4. the processing of turning on and turning off the unit:

In the heating mode, indoor ambient temperature increases 3°C temperature compensation. that is: when ΔT is less than 2°C, the compressor starts ($\Delta T = Tr - Ts$); when ΔT is greater than or equal to 4°C, the compressor is turned off.

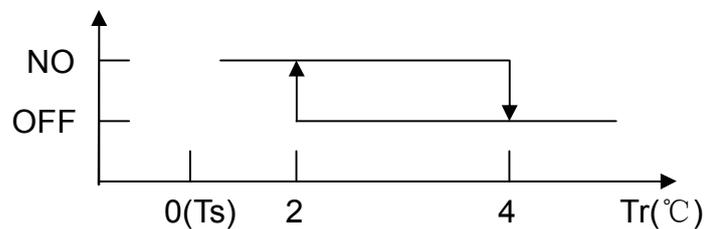


Chart 2-4

5. working condition of indoor fan:

The indoor fan's speed can be chosen in automatic, high, mid, low condition; and runs at super high wind, high wind, mid wind or low wind speed.

- you could set the high wind, mid wind, low wind and automatic wind to run in the heating mode.
- in the heating mode, the relation curve about the indoor fan and the indoor coil pipe temperature (T_p) as follows:

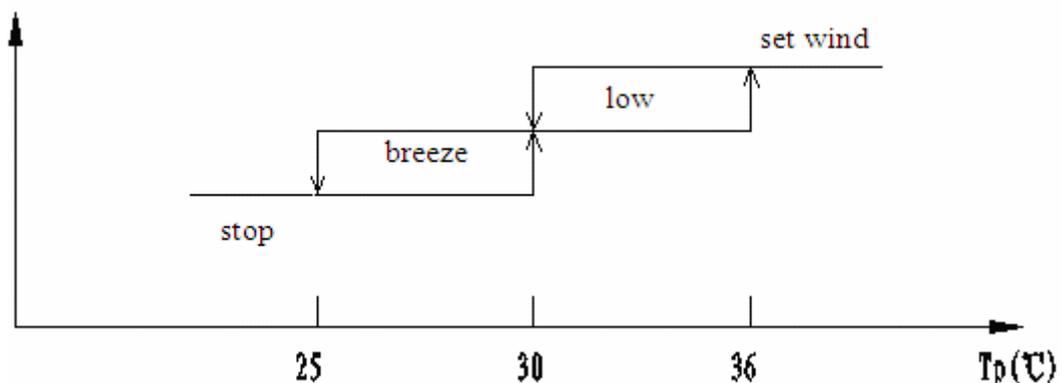


Chart 2-5

NOTE:

- when T_p is less than 30°C and the external air flap is in the anti cold wind angle, the indoor fan

blows Slightly wind.

- a) Indoor coil temperature rise from 25 °C to 30 °C process, the indoor fan blows tiny wind.
 - b) Indoor coil temperature reduces from 30 °C to 25 °C process, the indoor fan blows low wind.
 - c) when T_p is greater than or equal to 30°C, the indoor fan blows low wind and quit the anti cold wind state, this moment, the external air flap returns to the condition before the anti cold wind.
- when T_p is less than 25°C, the indoor fan stops running; when T_p is greater than or equal to 25°C, the air flap enters the anti cold condition, until T_p is greater than or equal to 30°C, quits the anti cold wind state.
 - when the compressor stops running, the air flap is in the anti cold condition, the indoor fan blows tiny wind, satisfy.
 - the indoor fan's operation of curve as follows when set to automatic wind in the heating mode:

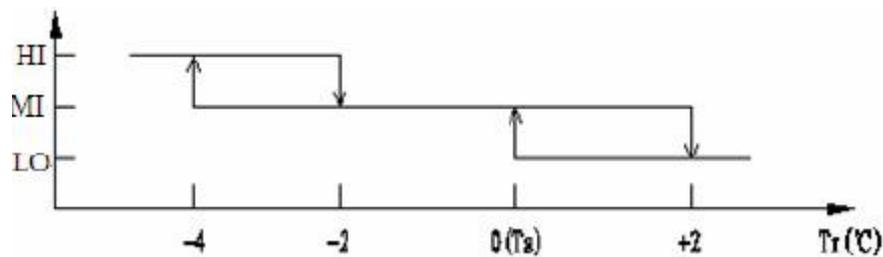


Chart 2-6

NOTE: Until conditions (2) meets the conditions (3) can run by the above curve.

6. anti cold wind function: the heating mode light flashes by 1 Hz way in anti cold wind mode. if this style has not the heating mode icon, the running light will flash at 1 Hz way.
7. blow the remaining heat function: turn off the unit with remote controller or emergency switch button, the indoor fan will time lag 30 seconds to turn off, meanwhile the remaining heat is blown to the room. The indoor pendulum do time lag 35 seconds to shut down.
8. working condition of the outdoor fan: except that it runs at defrost in defrost mode, others are the same with the cooling mode.
9. working condition of the four-way valve:
 - (1) the four-way is open at all the time in the defrosting condition.
 - (2) when the unit enters the defrosting condition, the four-way valve satisfies the defrosting work requirements.
 - (3) when heating mode conversion to cooling, dehumidification or ventilation mode, or the unit turns off in the heating mode, until the compressor shuts down for 2 minutes, the four-way turns off, except defrosting mode.

10. operating condition of the air flap:

(1) confirm the air flap's full open position is Pch1, and the full closed position is Pch2.

(a) when the unit is electrified, firstly, the air flap opens to Pch1 position and then back to Pch2 position.

(b) turning off the unit, firstly, the air flap opens to Pch1 position and then back to Pch2 position.

(c) turning on the unit, firstly, the air flap returns to Pch1 position and then normally runs.

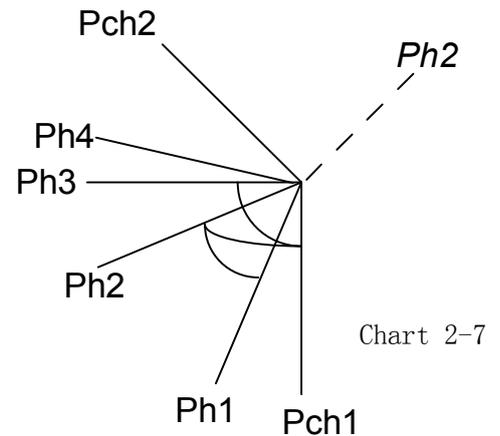


Chart 2-7

(2) when the compressor stops in heating mode, and the unit is

in the anti cold wing or defrosting condition, the air flap is in the position Ph4. When the system quits the anti cold wind condition, the air flap returns to the position before preventing cold wind.

(3) working condition on fixed wind in heating mode:

(a) if the unit is electrified at the first, the condition is set fixed wind when turning on the unit, and firstly, the air flap opened to Pch1, and then stop to Ph2 position of the fixed wind. If no electrified at the first, the air flap stops the last memory position.

(b) in the swing wind or natural wind, if it is transformed to fixed wind, the air flap will directly stop the current running position.

(4) working condition of the swinging wind in heating mode:

(a) the air flap's starting point position is Ph1 in the swinging wind condition.

(b) the air flap firstly back to full open position Pch1 and then work at the swing wind way from the fixed wind or natural wind to swing wind.

(c) The air flap swings to go back and forth between Ph1 and Ph3 in swing wind condition.

(5) the natural wind is achieved when the wind pendulum swings two circles and stops 30 seconds in the swing wind condition, at the moment the air flap stops the starting position.

the external air flap's position is defined as follow table 2-5:

Table 2-5

Full open	Full close	Fixed wind	Swing wind starting point	Swing wind destination	Anti cold wind
Pch1	Pch2	Ph2	Ph1	Ph3	Ph4

NOTE:(1) Pch1.Pch2.Ph1~Ph4 are programmable dates that are stored in indoor EEPROM.

(2) broken line“Ph2” is the position where the M kernel fixed wind.

11. when the units operate in heating mode, the units have the relevant protection to the indoor coil pipe preventing frostbite, the outdoor exhaust temperature overheating protection, overcurrent protection, low-voltage protection, the compressor overheating protection, indoor fan fault protection, sensor fault protection, system fault protection, IPM fault protection, communications fault protection, 3 minutes time lag protection of the compressor and so on, please see details in Indoor general protection function and outdoor software functions and specifications.
12. defrosting function: please see the outdoor software functions specifications.

3.2.6. ventilation mode

1. the range to setting temperature: 16°C -32°C
2. working condition of the compressor:

Compressor is closed all the time in the ventilation mode.

3. outdoor fan working condition:

Outdoor fan is closed all the time in the ventilation mode.

4. working condition of indoor fan:

In ventilation mode, indoor fan running is the same with that in cooling.

5. working condition of the four-way valve:

The four-way valve is closed all the time in the ventilation mode.

6. working condition of the external air flap:

In ventilation mode, the external air flap runs at the same with that in cooling.

7. there aren't the blowing remain cool and heat functions in the ventilation mode. The indoor fan directly turned off when the unit is turned off, so does the wind pendulum.

3.2.7 mode conflict definition

mode conflict is applied to DC Inverter Multi-Split Air-Conditioner Unit, its definition is as follows:

1. ventilation mode doesn't conflict with any modes, but cooling (dehumidification) and heating exist mode conflict;
2. if one unit is the cooling or dehumidification condition, the other plans to run heating mode, the unit which runs heating mode displays mode conflict "dI", Vice versa;
3. when the mode conflict is appeared, the unit displays malfunction code, and the indoor fan will run at setting wind speed in cooling mode, or it will stop running in heating mode.

3.2.8 sleeping function

1. press button of "sleep", air-conditioners will in the state of sleep. Fan of indoor is running with low winds, then click "sleep" button, and then will cancel "sleep", resume previous running state .close unit

if press "on / off" button, at the same time cancel the sleep settings.

2. after setting sleep by remote 5s, display screen only display logo of “sleep” or the light of running and sleep is light, other logo is close. That is the sleep close screen.

(1) For multicolored screen only logo of sleep is light when in the state of sleep;

(2) For Nixie tube and LED light: the light of running and sleep is light, other logo is close.

Note: during the sleep operation, if the unit receives the timing time that has been adjusted, the twinkling of the 8LED on the display screen means that the status is being revised, if the unit receives that the set temperature has been adjusted, the 8LED will be directly lighten, the air conditioning will be adjusted to the operation status the same as the status before the sleep during the changing status, it will be closed if there is not any change in five seconds.

3. When the sleep is set at the refrigerating mode, the temperature is $T_s+1^{\circ}\text{C}$ after one hour, $T_e+2^{\circ}\text{C}$ after two hours, and then retain constant after this..

4. When the sleep is set at the heating mode, the temperature is $T_s-1^{\circ}\text{C}$ after one hour, $T_s-3^{\circ}\text{C}$ after two hours, $T_s-5^{\circ}\text{C}$ after three hours, and then retain constant after this..

5. When the sleep is set at the dehumidification mode, it still operates as the dehumidification mode; only the sleeping screen off is carried out..

6. When the sleep is set at the ventilation mode, the temperature setting is not adjusted; only the sleeping screen off is carried out..

7. When the sleep is set at the auto mode, the sleep function runs at the time of the sleep is set according to the corresponding mode which the auto mode enters into.

8. Under the sleep mode, the default of the indoor fan speed is low wind, but it can be adjusted according to the remote control signal of the users (except the dehumidification mode).

9. sleeping function and turbo function can't run at the same time,namely when turbo function runs, the sleeping function can't run,vice versa.

3.2.9 high-efficiency mode (economy)

(1) when press the “ECONO” button on the remote controller,the system enters high-efficiency mode,the indoor will run at high winds , and the wind speed is adjustable;press “ECONO” button again, the system can exit the high-efficiency mode;

(2)Compressor objective frequency is intermediate frequency test frequency of the corresponding modes, all various protections are effective under high—efficiency mode;

(3) the system doesn't run this function in starting default status, after conversion mode, automatically

cancelled this function.

3.2.10 Three-dimensional air function (support the style with tridimensional air pendulum)

- (1) Three-dimensional air: the internal air door swings the wind from up to down and from right to left in the start-up condition matching with the external air door..
- (2) Operation condition of the internal air door: the working angle range of the air flap is defined between 0° and 120° as one cycle.
- (3) When power on for the first time, the internal air flap will swing to one side firstly and return back the middle position.
- (4) During start-up, the original air flap is set in the middle position.
- (5) Pressing the “wind direction” button, the internal air door will switch in the method of swing --- stop..
- (6) The air flap works repeatedly between α_1 and α_2 during swing.
- (7) Under the swing condition, pressing the “wind direction”, the internal air door will stop directly at current position..

remark: α_1 is the swing wind starting point angle of internal air flap, α_2 is the swing wind destination angle of internal air flap, and they are stored in indoor EEPROM.

3.2.11. Turbo function

The turbo function is only applicable in the cooling and heating modes, when the remote control enters into the turbo, the indoor fan is super high wind, and the compressor is operating at the maximum frequency at present;

- (1) When pressing the “turbo” button of the remote controller, the remote controller will switch circularly as “turbo” → “cancel” → “turbo”; when receiving the signal of the turbo button on the remote controller, the indoor “turbo lamp” will lighted immediately (when there is the “turbo lamp” on the display lamp board).
- (2) During the turbo operation, the compressor will operate at the current allowable maximum frequency point; the wind speed of the air conditioner is set at the “super high wind”, at this moment, the wind speed on the remote controller although can be set, but it is ineffective for the air conditioner;
- (3) During the turbo operation, the user can set the operating status with pressing other buttons (except on/off and modes), the air conditioner will not refresh the turbo operating time any more when receiving the turbo code;
- (4) Ending conditions of the turbo operation:
 - a) When the operating time is longer than 20 minutes, the turbo operation will be cancelled automatically..

- b) Cancel with the turbo button of the remote controller.
- (5) It will operate according to the corresponding work frequency of cooling/heating when the turbo is automatically cancelled, while it will operate according to the setting mode of the remote controller when cancelled in the method of remote control.
- (6) The turbo operation can be set under the status of timing turn-on, when it is the time of the fixed time, the turbo method will start running..
- (7) During the turbo operation, all conditions of limitation and protection will act.

Auxiliary function

3.3 Self- check function

- (1) the indoor unit possesses self-checking function. firstly press the emergency switch button ,and then switch on the power supply, thus enter the self-check state, all the delivery outlets output the relevant information in turn:

Model code (0.5S) — the running lamp brighten (0.5S) — the timing lamp brighten (0.5S) — the turbo lamp brighten(0.5S) — the economical operation lamp brighten(0.5S) — the high bit of the digital tubes all brighten (0.5S) — the low bit of the digital tubes all brighten (0.5S) — the indoor fan starts (time lag 0.5s)- power supply outputs(outdoor relay electrifies for 0.5S) — the buzzer sends 1 sound like “di” (time lag 0.5S) — the buzzer sends the second sound and shows to end all the exports.

Remark: different types vary due to the difference between display lamp boards; the LED lamps and digital tubes will be lightened according to corresponding display.

- (2) in self-check status, the external air flap runs at closing motion, and the internal air flap operates at swing wind way.
- (3) when the indoor fan starts, “the running lamp ”indicates the indoor fan’s feedback condition. If the running lamp flickers, it shows the feedback signal, or else absence of feedback; quick twinkle shows the indoor fan runs at quick speed, or else low speed.
- (4) model code: “25” stands for 25GW, “35” stands for 35GW, the rest may be deduced by analogy.

3.4 power-off memory function

EEPROM stores the running parameter before the air conditioner is shut down, after power on again, the air condition will return to the running status before power down.

- (1) when the unit receives the correct remote control code in the starting up or standby status, the effective control code and data validation are checked and wrote in the designated unit EEPROM..
- (2) when turn on or turn off the unit with the emergency switch button,or press any buttons to set the air conditioner the relevant condition, thus the operation results will be key to control code written into

the specified unit of EEPROM.

- (3) timing time is renovated and stored in EEPROM every one hour, electrify again after power cut, the unit will run according to the timing time stored before power cut.
- (4) because the sleeping function has not the operation timing turning off the unit, when have set the sleeping function, electrify again after power cut, the system will choose to turn on the unit, meanwhile doesn't memory sleeping function any more; shut down the unit because of malfunction, electrify again after power cut, the system will select turning on the unit .
- (5) power-off memory only memories the operating mode, but don't remember these auxiliary functions like turbo, highly efficiency, sleeping function and so on .

3.5 Emergency switch function

Press the emergency switch button in the starting condition, the unit is shut down; vice versa, and its setting temp. is permitted to be 25°C. Press the emergency switch button every time, the buzzer sends one time sound.

3.6 Sound,light prompt function

- (1) the controller possesses the buzzer. When it receives the order of the remote controller, and the system electrifies or shut down in the starting condition, the buzzer will send one “di” sound.
- (2) when the system appears the malfunction, the nixietube or LED indicate the relevant fault or protection code.
- (3) when Air Conditioning System is DC inverter Multi-Split Air-Conditioner Unit, if the indoor unit and outdoor unit appear the mode conflict, the indoor double 8 nixietube will display ”DI”.

display shutting screen function (support the model with this function)

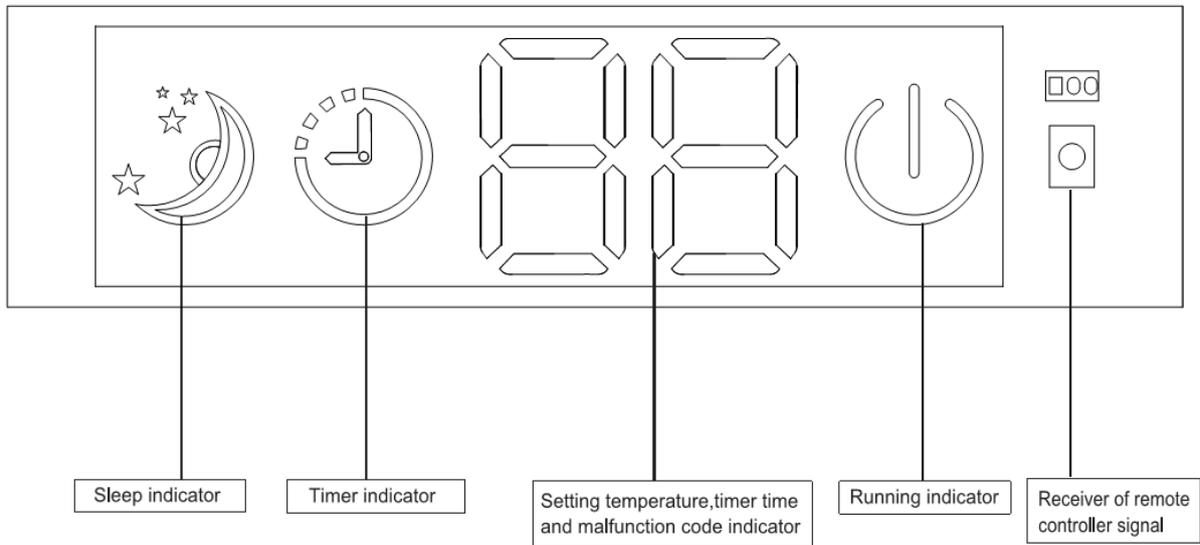
- (1) when the air conditioner is starting, pressing the “LAMP” button on remote controller enter the display shutting screen function condition, shut all the indicator on the display lamp panel; press it again can exit the display shutting screen function, the display lamp panel display original status.
- (2) when the unit receives the remote controller signal in the display shutting screen condition, the display lamp panel will show at the setting requirement, and then all the display lamp are shut after 10s.
- (3) the system doesn't run this function in starting default status, after conversion mode automatically cancelled this function.

3.7 outdoor defrosting electrical heat tape function (support the model with this function)

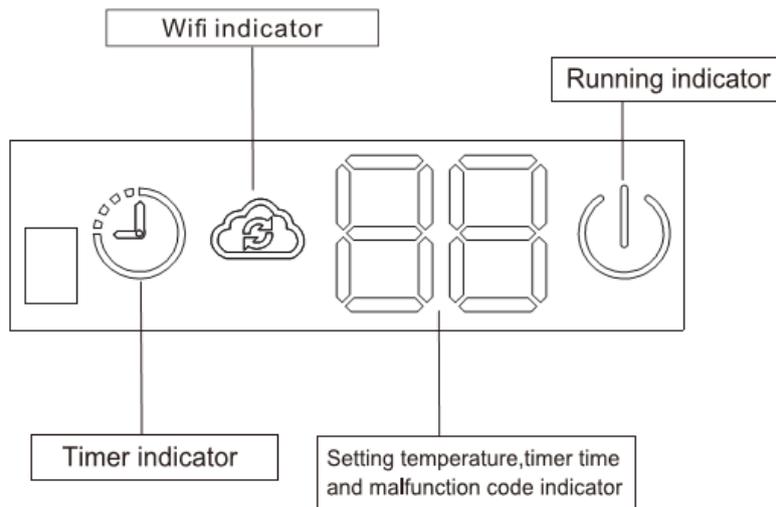
When the ambient temperature is less 0°C, the system will start the outdoor defrosting electrical heat tape function.

3.8 display lamp panel

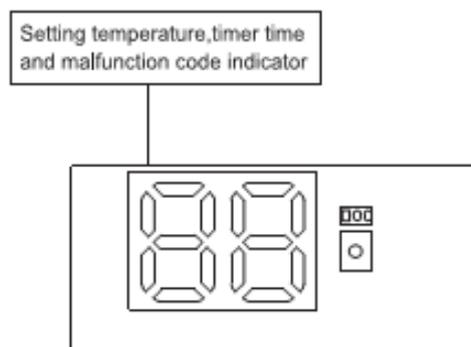
HDWI-93C HDWI-123C HDWI-183C HDWI-243C



HDWI-MAXIMUS-94C; HDWI-MAXIMUS-124C, HDWI-MAXIMUS-184C, HDWI-MAXIMUS-244C



HDWI-DSGN-90C-GOLD/RED/WHITE; HDWI-DSGN-120C- GOLD/RED/WHITE



Note: when the system electrifies at first time, all the patterns on display lamp panel and LED lamp all lighten, and extinguish after 2s.

Display modes of two LED-indicating lamps and double-8-LED

- (1) Running lamp: Lightened when starting-up with power on, extinguished when turning off, flash at the frequency of one time /one second in the mode of anti-cooling air.◦
- (2) Timing lamp: lightened during timing condition, extinguishing in other conditions.◦
- (3) Display of the digital tube:
 - a) The digital tube displays the set temperature of the air conditioner under the normal condition.;
 - b) When the user has set the timed turning on or off, the digital tube will display the time of the timed turning on or off, after the time has been set, it will return back to display the set temperature after the set time flashes for five seconds.;
 - c) Only the remaining time is displayed at the time of timed turn on.;
 - d) Only the “dF” is displayed during defrosting.;
 - e) The faults or protection codes are displayed at the time of the faults or protection.◦

4. Indoor common malfunction / protection function

4.1 sensor malfunction protection

1. when indoor ambient temp. sensor and outdoor temp. sensor are short circuit or open circuit, the unit displays malfunction code, the total units stop running;
2. when inlet and outlet temp. sensor of indoor evaporator appears malfunction for DC inverter single-split series, the unit runs with fault and sends the middle part of indoor coil temperature to outdoor unit;
3. when inlet and outlet temp. sensor of indoor evaporator appears malfunction for DC Inverter Multi-Split Air-Conditioner Unit, the current indoor unit will shut down and display the relevant malfunction code.

4.2 communication error protection

If the communication is abnormal for continuous 3min, the system will stop the compressor and display the relevant malfunction code. When the communication is normal and fault code disappears for 1 minute, the system will automatically start.

4.3 PG motor protection function

If the system checks the PG motor has not the feedback signal for continuous 20 seconds in the PG motor running, the PG motor will enter the running within fault; if the system checks the speed of PG motor is lower than 200rpm for continuous 60 seconds, thus the system considers PG motor faulty, and then the total units stop running and report the relevant malfunction code.

The following is the setting motor speed during operation within fault:

- (1) the system will break-over controlled silicon after zero passage 1mS in the high wind;
- (2) the system will break-over controlled silicon after zero passage 2mS in the mid wind;
- (3) the system will break-over controlled silicon after zero passage 2.5mS in the low wind;
- (4) the system will break-over controlled silicon after zero passage 3mS in the slightly wind;

if the feedback signal returns to be normal during PG motor operation within fault, the PG motor still runs within fault, until the system starts again next time.

remark: there is not PG motor protection function in producing self-check.

4.4 indoor coil pipe antifreeze protection in cooling

- (1) when indoor coil pipe temperature is less than 6°C in cooling, the compressor doesn't run.
- (2) when indoor coil pipe temperature is less than 1°C, the system stops compressor and displays indoor coil pipe overcooling/overheating protecting code;
- (3) when indoor coil pipe temperature is less than 3°C, the compressor's frequency will drop, until lowest running frequency, thus the compressor stops running and the system displays indoor coil

pipe overcooling/ overheating protecting code;

(4) when indoor coil pipe temperature is greater than or equal to 3°C, but is less than 6°C, compressor frequency forbids rising;

(5) when indoor coil pipe temperature is greater than or equal to 6°C, the system runs normally;

(7) after this protection code appears for 1 minute, the system could start automatically.

4.5 indoor coil pipe overheating protection in heating

(1) when indoor coil pipe temperature is greater than or equal to 48°C in heating, the compressor doesn't run;

(2) when indoor coil pipe temperature is greater than or equal to 73°C, the compressor stops running and the system displays indoor coil pipe overcooling/overheating protecting code;

(3) when indoor coil pipe temperature is greater than or equal to 63°C, the compressor's frequency will drop, until lowest running frequency, thus the compressor stops running and the system displays indoor coil pipe overcooling/ overheating protecting code ;

(4) when indoor coil pipe temperature is greater than or equal to 52°C, but is less than 63°C, compressor frequency forbids rising;

(5) when indoor coil pipe temperature is less than 52°C, the system runs normally;

(6) after this protection code appears for 1 minute, the system could start automatically.

4.6 system lacking refrigerant or 4-way valve fault

(1) during cooling:

After the compressor has operated for five minutes (which has been set in the EEPROM), if the temperature of the indoor coil can not be 5°C lower than the room temperature, the indoor fan will automatically turn to the breeze operation, 13 minutes later, if above requirements can not be met with, the compressor will be stopped to display the fault code; it can only operate again after switching off..

(2) during heating:

When the temperature of the indoor coil is lower than 20°C (which is set in the EEPROM) for 20 minutes, the compressor will be stopped to display the fault code; it can only operate again after switching off.

The system fault can only be determined within 20 minutes after the compressor is switched on, after that the faults will not be determined. After stopping in remote controlling or emergency or power off, the system fault should be determined within 20 minutes after starting on again. After the system fault occurs, the indoor fan will not work, and the flap will not be closed..

Appendix:malfunction and protection display

1. Indoor fault and protection explanation

- (1) when the indoor unit has not the nixietube, the malfunction and protection can display by LED lamp:
 firstly light 3 seconds, then flicker n at 1Hz,looping execution;
- (2)when the indoor unit has the nixietube:
 a) the nixietube shows “dF” code in defrosting;
 b) under normal circumstances, the nixietube only shows the latest malfunction code or protection code;
- (3) when malfunction and protection exist at the same time, the unit will shut down, but the system is priority to showing malfunction code.

Failure display

LED	running lamp(flicker times)	timer lamp(flicker times)	Fault content	The reason of fault and solution
F1	1	light	communication fault	1、 Check whether the connection of the outdoor unit and indoor unit is one to one, otherwise connect the L, N and communication line of the indoor unit and outdoor unit one to one. 2、 Measure whether the voltage between the zero line and the communication line is 18V-30AC half-wave signal, check whether the communication circuit on the indoor and outdoor electric control board has been damaged, otherwise replace it. 3、 Check whether the LED on the outdoor power board has been on, otherwise replace the electric control board. 4、 Check whether the unit is abnormal caused by the external interference, if it is, then find the interfering source, and removes it.
F2	2	light	The indoor ambient temp. sensor fault	1、 Check whether the resistance of sensor is normal, otherwise replace it. 2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above. 3、 When the 1 and 2 are both normal, then the components or integrated circuit is

				damaged, the electric control board should be replaced.
F3	3	light	The coil pipe temp. sensor of indoor unit fault(include : inlet, middle, outlet)	<ol style="list-style-type: none"> 1、 Check whether the resistance of sensor is normal, otherwise replace it. 2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above. 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.
F4	4	light	indoor fan fault	<ol style="list-style-type: none"> 1、 Check whether the contact of the plug of the motor wire and socket is well, making sure well contact. 2、 Check whether the indoor motor has damaged, the motor should be replaced when it is damaged. 3、 Check whether the controllable silicon and other components on the electric control board have damaged, replace the controllable silicon or electric control board when they are damaged.
F5	5	light	module of outdoor unit fault	<ol style="list-style-type: none"> 1、 Check whether the connection of the compressor is reliable, otherwise connect firmly again. 2、 Check whether the fixation between the IPM module and the radiator is firm. 3、 Check whether the compressor is well, otherwise replace it. 4、 Check whether the IPM module is abnormal, otherwise replace it.
F6	6	light	The outdoor ambient temp. sensor fault	<ol style="list-style-type: none"> 1、 Check whether the resistance of sensor is normal, otherwise replace it. 2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above. 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.
F7	7	light	The outdoor unit coil	<ol style="list-style-type: none"> 1、 Check whether the resistance of sensor is

			pipe temp. sensor fault	<p>normal, otherwise replace it.</p> <p>2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.</p> <p>3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.</p>
F8	8	light	The compressor suction temp. sensor fault	<p>1、 Check whether the resistance of sensor is normal, otherwise replace it.</p> <p>2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.</p> <p>3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.</p>
F9	9	light	The compressor discharge temp. sensor fault	<p>1、 Check whether the resistance of sensor is normal, otherwise replace it.</p> <p>2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.</p> <p>3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.</p>
FA	10	light	inductor of current or voltage fault	<p>1、 Check whether inductor of current or voltage have been damaged, they should be replaced if they are fault.</p>
FC	11	light	compressor drive fault	<p>1、 Power on again, and check the operation of the compressor is normal.</p> <p>2、 Check whether the connection of the compressor is reliable, otherwise repair.</p> <p>3、 Check whether the components on the electric control board have been damaged, if they are damaged, the components or the electric control board should be replaced.</p>
FE	13	light	gas return sensor	<p>1、 Check whether the resistance of sensor is</p>

			fault(include : A, B, C, D pipe road)	normal, otherwise replace it. 2、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above. 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.
FF	14	light	other fault	1 check whether the system pressure is normal, whether to have the broken tube result in the leakage of refrigerant. 2 check whether the indoor coil temperature sensor is installed in place. 3 check whether the four-way valve runs abnormally.
P1	light	1	The evaporator temp. protection	1、 Check whether the filter of indoor unit is too dirty, and it should be cleaned when it is too dirty. 2、 Check whether it has barrier around indoor unit, it should be remove if it has. 3、 Check whether the indoor motor is damaged, it should be replaced motor or electrical control board when it is damaged.
P2	light	2	overheat, over current protection of inverter module	1、 Check whether the fixation between the IPM module and the radiator is firm. 2、 Check whether the compressor is well, otherwise replace it. 3、 Check whether the IPM module is abnormal, otherwise replace it.
P3	light	3	AC input current over large protection	1、 Check whether the ambient temperature exceeds the operation range for the air conditioner 2、 Check whether the current detection circuit is abnormal, the electric control should be replaced when it is abnormal.
P4	light	4	The discharge temp. of compressor protection	1、 Check whether the air condition system and pressure are normal. 2、 Check whether the sensor, connecting wire of the sensor and the detection circuit are

				abnormal.
P6	light	6	The suction temp. of compressor protection	<ol style="list-style-type: none"> 1、 Check whether the air condition system and pressure are normal. 2、 Check whether the sensor, connecting wire of the sensor and the detection circuit are abnormal.
P7	light	7	low or high voltage protection	<ol style="list-style-type: none"> 1、 Check whether the supply voltage is out of rang from 150 to 270V 2、 Check the voltage detection circuit of the IPM base board is abnormal, if it is abnormal, the IPM base board or the electric control board should be replaced.
P8	light	8	low presser of gas return protection	<ol style="list-style-type: none"> 1、 Check whether the pressure is normal when the unit is running, if it is abnormal, should detect the leakage and welding、 add refrigerant.
P9	light	9	high pressure of discharge protection	<ol style="list-style-type: none"> 1、 Check whether the pressure is normal when the unit is running, if it is abnormal, should detect the leakage and welding、 add refrigerant.
PA	light	10	The evaporator coil high temp. protection	<ol style="list-style-type: none"> 1、 Check whether the condenser of outdoor unit is too dirty, and it should be cleaned when it is too dirty. 2、 Check whether it is running at bad condition long time. 3、 Check whether sensor and wire are normal.
PC	light	11	The outdoor ambient high temp. protection	<ol style="list-style-type: none"> 1、 Check the outdoor ambient temperature is too high or there is heat source around the outdoor unit. 2、 Check whether the sensor and sensor wire are normal.
PH	light	12	Lack the refrigerant or reversal valve protection	<ol style="list-style-type: none"> 1、 check whether the system pressure is normal, whether to have the broken tube result in the leakage of refrigerant. 2、 check whether the reversal valve runs abnormally.

Explanations for each error are introduced as below:

A、 F1: The communication fault



1. Descriptions for preconditions, actions, and elimination conditions:

(1) Protection Preconditions: For a constant 3mins, no data's got from the indoor unit or no communicational data's got from the outdoor unit.

(2) Protection Actions: The compressor shuts down, the indoor digital tube shows F1, and the outdoor LED flickers 15 times at 1 HZ.

(3) Elimination conditions: The communication data becomes normal, and after the error disappeared for 1min, the model can restart automatically.

2. How to make a quick judgement, whether it's indoor PCB or outdoor PCB problem that cause the communication fault? The methods are showed as below:

If the A/C shows F1, pls connect the outdoor commercial detection box with the outdoor PCB (make sure the wiring is correct), then start the commercial detection box. If the compressor can start normally, the outdoor PCB is OK. Then check the indoor PCB. However, if the compressor cannot start, the outdoor PCB should be damaged.

Main causes:

- (1) The wires between the indoor and outdoor units are misconnected,
- (2) The communication line is loose, or the voltage regulator is broken.
- (3) If all above reasons are OK, please directly replace the outdoor PCB.

Checking methods:

- (1) Check whether the connection of the indoor and outdoor units is correct. If not, please adjust and confirm again.
- (2) Check whether the inserter part of the PCB is loose, if it is, please fix and confirm again.
- (3) Check whether the alternating current(voltage) of the outdoor PCB is normal, or whether the fuse is loosened or blew out.

The brown and the blue line voltage is AC220V
(Voltage between terminals 1 and 2)



(the input voltage of the outdoor terminal)



The fuse

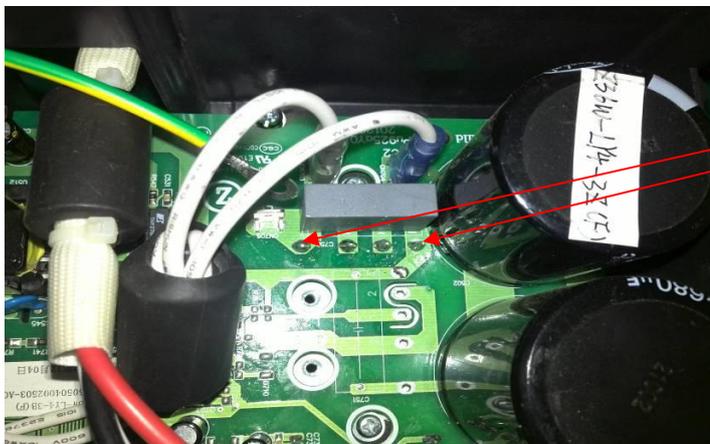
(the fuse can be gotten through under the normal situation. Change the fuse if it is open circuit.)

(4): With the DC pattern of the multimeter, please measure whether the voltage between the terminals S and N is 3-16V, if it's out of the range, please cut off the diode (30V) and test again. If the voltage keeps abnormal, replace the outdoor PCB



Normally, the voltage ranges from 3V to 15VDC.
(Voltage between terminals 2 and 3)

(5). check whether the voltage of the DC PN is normal. The normal voltage should be around 310V.

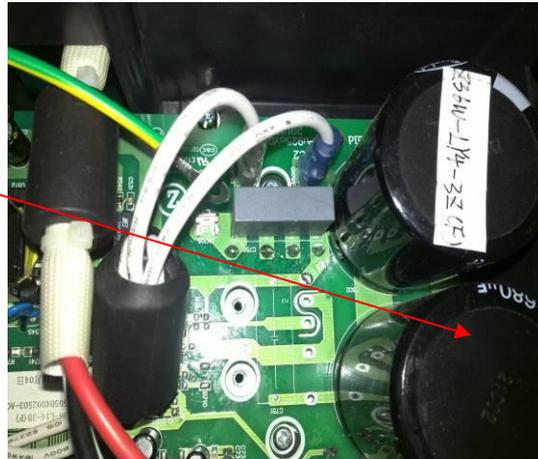


The two point voltage is DC310V

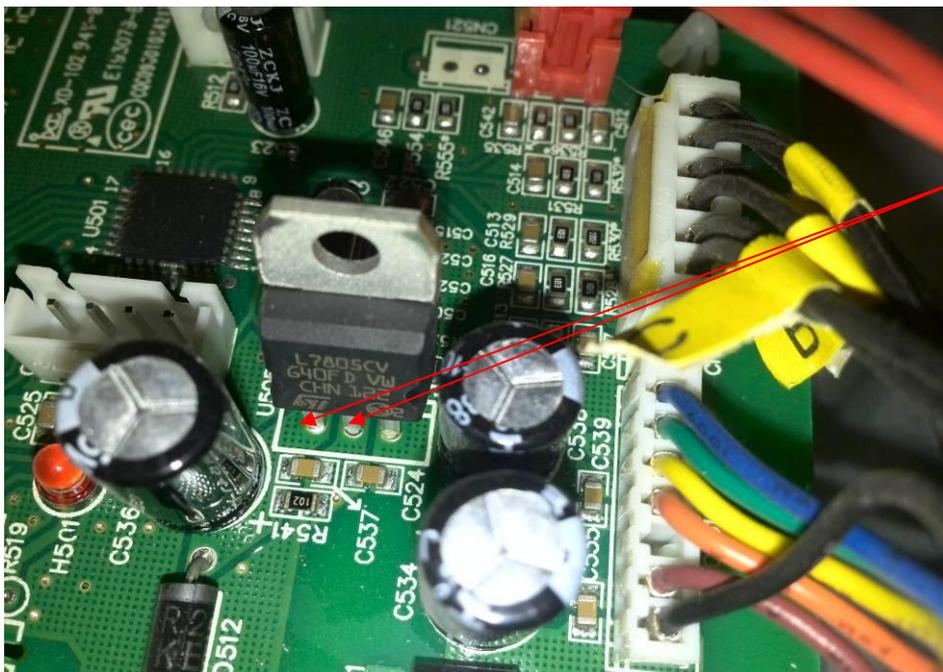
(the output voltage of the Bridge rectifier)

(6). check whether the electrolytic capacitor is convex or burned out.

Cracking and
Convex?



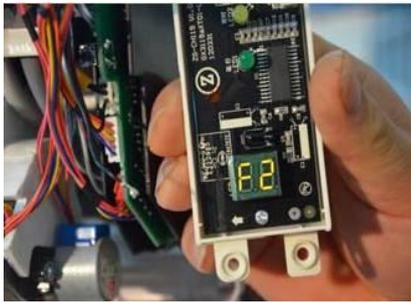
(7). Check whether the 7805 is damaged



The two point voltage
is DC5V

- (8). Check whether the relative electronic components are burned out or loose weld by eyeballing.
- (9). If the problem can't be solved by above procedures, please change the outdoor PCB.

B、 F2: Indoor ambient temp. sensor fault

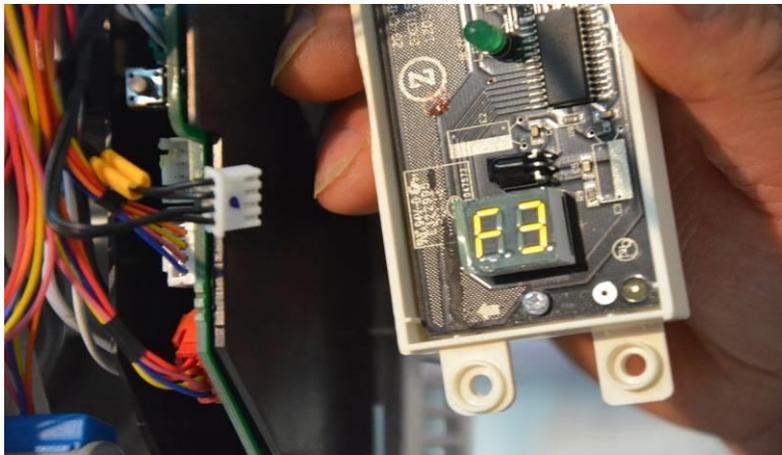


1. Main causes: The sensor wire is loose or bad contacted, or the temp sensor is damaged. When make sure the sensor is OK, please check whether the corresponding integrity circuit has any components missing or damaged.

2. Checking methods:

- (1) Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.
- (2) Check whether the sensor component on the indoor PCB is welding off or rosin joint, if there's any, it should be repaired.
- (3) When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced

C. F3: Indoor coil temp. sensor fault:

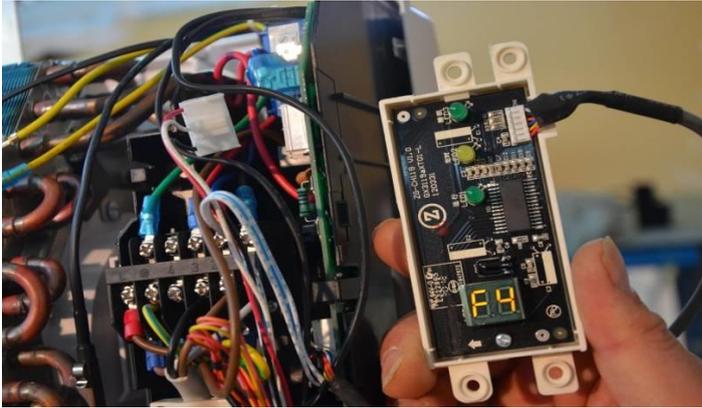


1.Main causes: The sensor wire is loose or bad contacted, or the temp sensor is broken. When make sure the sensor is ok, please check whether the corresponding integrity circuit has any components missing or damaged.

2. Checking methods:

- (1) Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.
- (2) Check whether the sensor component on the indoor PCB is welding off or rosin joint, if there's any, it should be repaired.
- (3) When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.

D. F4: Indoor fan fault:



1. Main causes: No feedback pulse signal's come from the indoor fan. After 30s, the indoor displayer shows F4 and the indoor fan stops.

2. Checking methods:

- (1)、 Check whether the contact of the plug of the motor wire and socket is well, making sure well contact.
- (2)、 Check whether the indoor motor has damaged, the motor should be replaced when it is damaged.
- (3)、 Check whether the connections between the indoor motor bearings and the axial flow fan are reliable, or the empty running speed of the motor would be lower than 200r/min. If there's any problem about the connection, pls mend it.
- (4)、 Check whether the indoor fan is half-jammed or half-blocked. If so, mend it.
- (5)、 Check whether the indoor PCB has any electrical component broken, if so, replace the indoor PCB.

E、 F5: Outdoor module fault:

1. Main causes: The key point is to check the outdoor PCB and the drive circuit.

2. Checking methods:

- (1)、 Check whether the connections of the compressor are correct and reliable, otherwise it should be changed and reconnected firmly.
- (2)、 Check whether the fixation between the IPM module and the radiator is firm.
- (3)、 Check whether the compressor is OK. (Normally, the resistance of each couple windings between U,V,W should be around 1 to 2 Ω), or the compressor must be changed.



(4)、 Check whether the outdoor PCB is normally, if there's any abnormal, the outdoor PCB must be replaced.

F、 F6: Outdoor ambient temp. sensor fault



Checking methods:

- 1、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.
- 2、 Check whether the sensor component on the outdoor PCB is welding off or rosin joint, if there's any, mend it.
- 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.

G、 F7: Outdoor coil temp. sensor fault



Checking methods:

- 1、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.
- 2、 Check whether the sensor component on the outdoor PCB is welding off or rosin joint, if there's any, mend it.
- 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.

H. F9: Compressor discharge temp. sensor fault



Checking methods:

- 1、 Check whether the sensor wire is short circuit or open circuit, and whether the plug is well contacted, whether there is welding off or rosin joint on the electric control board, repair it if there is any above.
- 2、 Check whether the sensor components on the outdoor PCB is welding off or rosin joint, if there's any, mend it.
- 3、 When the 1 and 2 are both normal, then the components or integrated circuit is damaged, the electric control board should be replaced.

I. FC: Compressor drive abnormal fault:



Checking methods:

- 1、 Check whether the connections of the compressor are correct and reliable, otherwise correct and connect them firmly.
- 2、 Check whether the compressor is OK. (Normally, the resistance of each couple of windings between U,V,W should be around 1~2Ω), if it's abnormal, the compressor should be replaced.
- 3、 If step 1 and 2 both are OK, then the outdoor PCB should be replaced.

If no connection between the compressor and the PCB, it will show FC.



J、FF: Others fault



Checking methods:

1、DC motor fault

(1)、 Check whether the outdoor DC motor is self-damaged, normally, the windings P and N shouldn't be short circuit. If so, the outdoor motor should be replaced.

(2)、 Check whether the outdoor PCB is damaged, if so, the outdoor PCB should be replaced.

2、NO refrigerant

(1)、 Check whether the refrigerant is sufficient.(Test the pressure can judge it), if needed, pls charge enough refrigerant.

(2)、 Check whether the resistance of the indoor coil temp sensor drifted or has big bias, if so, the sensor should be replaced.

(3)、 Check whether the gas current branches are averagely divided or any bias exists there, if there's any big bias, the indoor evaporator should be replaced.

(4)、 Check whether the indoor electric detection circuit is OK, if there's any abnormal, the indoor PCB should be replaced.

3、 Other fault

Descriptions for the protection code are as below:

A、 P1: Evaporator temp. protection



Checking methods:

1、 Check whether the filter of indoor unit is too dirty, and it should be cleaned when it is too dirty.

2、 Check whether it has barrier around indoor unit, it should be remove if it has.

3、 Check whether the indoor motor is damaged, if damaged, it should be replaced.

4、 Check whether the indoor fan is blocked or jammed.

5、 Check whether the indoor PCB is damaged, if so, the indoor PCB should be replaced.

B、 P2:overheat, over current protection of inverter module

Protection preconditions: When the current is larger than 10A and the module temp is overheat. The outdoor LED flickers 10 times at 1HZ and the indoor digital tube shows P2.

Checking methods:

- 1、 Check whether the fixation between the IPM module and the radiator is firm.
- 2、 Check whether the compressor is well, otherwise replace it.
- 3、 Check whether the IPM module is abnormal, otherwise replace it.

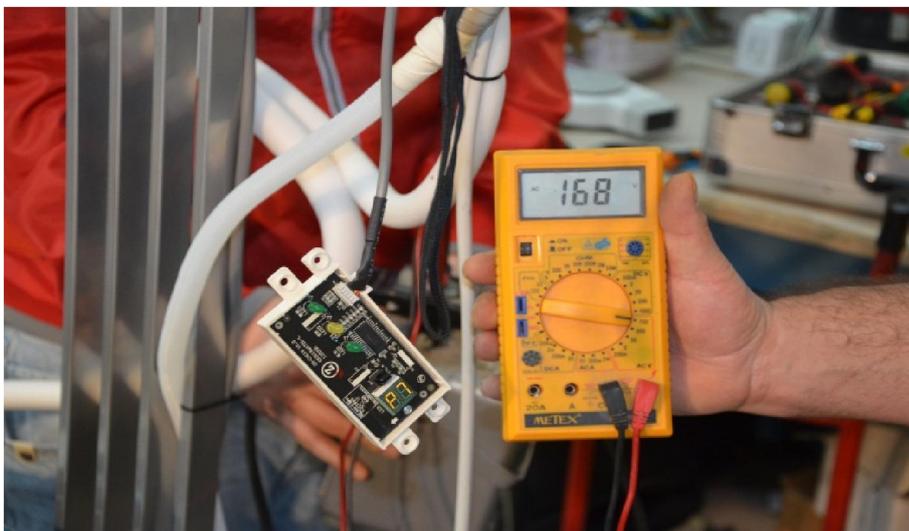
C、 PA: high temp. of condenser protection



Checking methods:

- 1、 Check whether the condenser of outdoor unit is too dirty, and it should be cleaned when it is too dirty.
- 2、 Check whether it is running at bad condition long time.
- 3、 Check whether sensors and wire are normal.
- 4、 Check whether the outdoor motor fails to run due to self-damage, if so, the outdoor motor should be replaced.
- 5、 Check whether the outdoor PCB is damaged, if so, the outdoor PCB should be replaced.

D、 P7: power supply over less / over voltage protection



Checking methods:

- 1、 Check whether the voltage of the power supply is out of the range 170~265V, if so, pls adjust the voltage into the normal range.
- 2、 Check whether the outdoor PCB is damaged, if so, the outdoor PCB should be replaced.

E、 PC: high temp. of outdoor ambient protection



Checking methods:

- 1、 Check whether the outdoor ambient temp is too high or too low.
- 2、 Check whether the sensor and its wirings are OK, if there's any abnormal, the sensor should be replaced.
- 3、 Check whether the outdoor PCB is damaged, if so, the outdoor PCB should be replaced.

F、 88 error code:



Checking methods:

- 1、 Check whether the emergent button on the PCB is being pressed to a deadpoint, if so, open the cover of the electric box and shut down the power, then power on again and restart the unit.
- 2、 Check whether the emergent button on the indoor PCB is damaged, if there's any abnormal, the indoor PCB should be replaced.

G、 P4: Discharge temp of compressor protection



1. Check whether there's gas missing according to the pressure of the system. If so, pls charge enough refrigerant.
2. Check whether the discharging temp is super high because of poor ventilation. Such as the condenser is dirty, the outdoor unit is bad ventilated or the hot sunshine etc. Under this case, pls take necessary steps to guarantee a good ventilation.

Common contrast table for the temperature of the sensor and the value of the resistance(3274)

Temperature °c	Resistance Min (K Ω)	Standard (K Ω)	Resistance Max (K Ω)	Value of the voltage 5V、4.3K		Temperature °c	Resistance Min (K Ω)	Standard (K Ω)	Resistance Max (K Ω)	Value of the voltage 5V、4.3K	
				Drop down	Pull up					Drop down	Pull up
-30	51.195	52.840	54.521	0.38	4.62	26	4.771	4.821	4.871	2.36	2.64
-29	48.659	50.232	51.805	0.39	4.61	27	4.599	4.649	4.699	2.40	2.60
-28	46.299	47.772	49.248	0.41	4.59	28	4.434	4.485	4.535	2.45	2.55
-27	44.071	45.452	46.832	0.43	4.57	29	4.277	4.327	4.377	2.49	2.51
-26	41.968	43.261	44.554	0.45	4.55	30	4.126	4.176	4.226	2.54	2.46
-25	39.981	41.193	42.405	0.47	4.53	31	3.981	4.031	4.081	2.58	2.42
-24	38.102	39.238	40.375	0.49	4.51	32	3.842	3.892	3.942	2.62	2.38
-23	36.326	37.391	38.457	0.52	4.48	33	3.709	3.759	3.808	2.67	2.34
-22	34.646	35.645	36.645	0.54	4.46	34	3.581	3.631	3.680	2.71	2.29
-21	33.055	33.993	34.931	0.56	4.44	35	3.495	3.508	3.557	2.77	2.23
-20	31.550	32.430	34.310	0.59	4.41	36	3.340	3.389	3.438	2.80	2.20
-19	30.097	30.923	31.748	0.61	4.39	37	3.226	3.275	3.323	2.84	2.16
-18	28.722	29.497	30.271	0.64	4.36	38	3.117	3.165	3.213	2.88	2.12
-17	27.420	28.147	28.873	0.66	4.34	39	3.012	3.06	3.107	2.92	2.08
-16	26.186	26.868	27.55	0.69	4.31	40	2.912	2.959	3.006	2.96	2.04
-15	25.017	25.657	26.297	0.72	4.28	41	2.815	2.861	2.908	3.00	2.00
-14	23.908	24.509	25.11	0.75	4.25	42	2.722	2.768	2.814	3.04	1.96
13	22.857	23.421	23.98	0.78	4.22	43	2.633	2.678	2.724	3.08	1.92
-12	21.859	22.389	22.918	0.81	4.19	44	2.547	2.529	2.637	3.12	1.88
-11	20.912	21.409	21.907	0.84	4.16	45	2.464	2.509	2.553	3.16	1.84
-10	20.013	20.48	20.917	0.87	4.13	46	2.385	2.429	2.473	3.20	1.80
-9	19.116	19.584	20.023	0.90	4.10	47	2.308	2.352	2.395	3.23	1.77
-8	18.322	18.734	19.146	0.93	4.07	48	2.235	2.278	2.231	3.27	1.73
-7	17.540	17.927	18.314	0.97	4.03	49	2.164	2.207	2.249	3.30	1.70
-6	16.797	17.160	17.524	1.00	4.00	50	2.096	2.138	2.180	3.34	1.66
-5	16.090	16.431	16.733	1.04	3.96	51	2.030	2.071	2.112	3.37	1.63
-4	15.418	15.739	16.060	1.07	3.93	52	1.966	2.006	2.047	3.41	1.59
-3	14.779	15.080	15.382	1.11	3.89	53	1.904	1.944	1.984	3.44	1.54
-2	14.170	14.454	14.737	1.15	3.85	54	1.844	1.884	1.923	3.48	1.52
-1	13.591	13.857	14.124	1.18	3.82	55	1.787	1.826	1.865	3.51	1.49
0	13.040	13.290	13.54	1.22	3.78	56	1.732	1.770	1.809	3.54	1.16
1	12.505	12.739	12.974	1.26	3.74	57	1.679	1.717	1.754	3.57	1.43
2	11.995	12.215	12.436	1.30	3.70	58	1.628	1.665	1.702	3.60	1.40
3	11.509	11.717	11.924	1.34	3.66	59	1.579	1.615	1.652	3.63	1.37
4	11.047	11.241	11.436	1.38	3.62	60	1.531	1.567	1.603	3.66	1.34
5	10.606	10.789	10.971	1.42	3.58	61	1.485	1.521	1.556	3.69	1.31
6	10.186	10.357	10.529	1.47	3.53	62	1.441	1.476	1.511	3.72	1.28
7	9.785	9.945	10.107	1.51	3.49	63	1.399	1.433	1.467	3.75	1.25
8	9.403	9.554	9.705	1.55	3.45	64	1.357	1.391	1.425	3.78	1.22
9	9.038	9.180	9.322	1.59	3.41	65	1.318	1.351	1.384	3.80	1.20
10	8.690	8.823	8.956	1.64	3.36	66	1.279	1.312	1.344	3.83	1.17
11	8.357	8.482	8.607	1.68	3.32	67	1.242	1.274	1.306	3.86	1.14
12	8.040	8.157	8.274	1.73	3.27	68	1.206	1.237	1.269	3.88	1.12

13	7.736	7.816	7.957	1.77	3.23	69	1.171	1.202	1.233	3.91	1.09
14	7.446	7.550	7.653	1.81	3.19	70	1.137	1.168	1.199	3.93	1.07
15	7.169	7.226	7.363	1.86	3.14	71	1.105	1.135	1.165	3.96	1.04
16	6.900	6.991	7.082	1.90	3.10	72	1.074	1.103	1.133	3.98	1.02
17	6.644	6.729	6.814	1.95	3.05	73	1.043	1.072	1.101	4.00	1.00
18	6.398	6.478	6.558	1.99	3.01	74	1.014	1.043	1.071	4.02	0.98
19	6.163	6.238	6.313	2.04	2.96	75	0.986	1.014	1.042	4.05	0.95
20	5.938	6.008	6.078	2.09	2.91	76	0.959	0.986	1.014	4.07	0.93
21	5.723	5.789	5.854	2.13	2.87	77	0.932	0.959	0.986	4.09	0.91
22	5.517	5.578	5.64	2.18	2.82	78	0.907	0.933	0.960	4.11	0.89
23	5.320	5.377	5.484	2.22	2.78	79	0.882	0.908	0.934	4.13	0.87
24	5.131	5.185	5.238	2.27	2.73	80	0.858	0.884	0.910	4.15	0.85
25	4.950	5	5.05	2.31	2.69	81					

Contrast table for features of resistance and temp (R – T CONVERSION TABLE)----Discharge sensor(3950)

Contrast table for features of resistance and temp (R – T CONVERSION TABLE)----Discharge sensor RB25B=50KΩ±2% BB25/85 B=3950K±2% (T/°C Rcen)

-40	1666.000	1	152.800	42	24.590	83	5.796
-39	1558.000	2	145.300	43	23.630	84	5.612
-38	1458.000	3	138.300	44	22.720	85	5.433
-37	1366.000	4	131.700	45	21.840	86	5.255
-36	1279.000	5	125.400	46	21.010	87	5.082
-35	1199.000	6	119.400	47	20.210	88	4.916
-34	1124.000	7	113.800	48	19.440	89	4.755
-33	1055.000	8	108.400	49	18.710	90	4.600
-32	989.900	9	103.400	50	18.010	91	4.451
-31	929.400	10	98.580	51	17.370	92	4.306
-30	873.000	11	94.040	52	16.750	93	4.167
-29	820.400	12	89.730	53	16.160	94	4.032
-28	771.300	13	85.640	54	15.590	95	3.902
-27	725.500	14	81.760	55	15.040	96	3.776
-26	682.700	15	78.080	56	14.520	97	3.655
-25	642.600	16	74.590	57	14.010	98	3.537
-24	605.200	17	71.270	58	13.520	99	3.424
-23	570.200	18	68.120	59	13.050	100	3.315
-22	537.400	19	65.120	60	12.600	101	3.209
-21	506.700	20	62.280	61	12.170	102	3.107
-20	477.900	21	59.570	62	11.750	103	3.009
-19	450.900	22	57.000	63	11.350	104	2.914

-18	425.600	23	54.550	64	10.960	105	2.822
-17	401.900	24	52.220	65	10.590	106	2.733
-16	379.600	25	50.000	66	10.230	107	2.647
-15	358.700	26	47.860	67	9.884	108	2.565
-14	339.100	27	45.830	68	9.551	109	2.484
-13	320.700	28	43.890	69	9.231	110	2.407
-12	303.500	29	42.040	70	8.922	111	2.332
-11	287.200	30	40.280	71	8.625	112	2.260
-10	271.900	31	38.610	72	8.339	113	2.190
-9	257.600	32	37.010	73	8.063	114	2.122
-8	244.100	33	35.490	74	7.797	115	2.057
-7	231.300	34	34.040	75	7.541	116	1.994
-6	219.400	35	32.660	76	7.294	117	1.933
-5	208.100	36	31.340	77	7.056	118	1.874
-4	197.400	37	30.080	78	6.826	119	1.817
-3	187.400	38	28.880	79	6.605	120	1.761
-2	178.000	39	27.730	80	6.329		
-1	169.100	40	26.630	81	6.186		
0	160.600	41	25.590	82	5.988		