



# **30000BTU and 36000BTU Units**

## **WORKING PROGRAM MANUAL**

- **SUMMARIZE**
- **FUNCTIONS & OPERATION MODES**
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automatically and selects an operation mode ---- cooling, heating or dehumidifying according to the following:

Heating	Dehumidifying	Cooling
$Tr < 21^{\circ}\text{C}$	$21^{\circ}\text{C} \leq Tr < 27^{\circ}\text{C}$	$Tr \geq 27^{\circ}\text{C}$
Indoor temperature (Tr)		

Fig. A

- B. The above standard temperatures can be set with the **Temp. Setting** buttons on the remote controller. Pressing the buttons each time increase or decrease the temperature setting by  $1^{\circ}\text{C}$ .
- C. When the unit is turned on or operation mode is changed into Auto mode, the indoor fan runs at low speed for 20 seconds and the Power On light blinks (The cycle is 0.5 seconds. And if there is a unit failure, Power On light will not blink), then selects an operation according to indoor temperature (See Fig. A). Once an operation mode is selected, Power On light is ON and the selected operation mode remains work within the 2 hours after the unit is turned off. 2 hours later, mode will be chosen again.
- D. If the room temperature sensor is wrong, indoor unit fan only runs at low speed, compressor and outdoor fan will not start.
- E. Indoor fan speed and louvers are all in Auto mode. (Note: Cooling only unit does not have Heating mode.)

## 2. Cooling Operation

- A. Temperature setting range is  $16 \sim 31^{\circ}\text{C}$  and initial temperature setting is  $21^{\circ}\text{C}$ .
- B. When  $Tr \leq Ts - 1^{\circ}\text{C}$ , and compressor ON time is  $\geq 3$  minutes, outdoor fan and compressor stop working at the same time, and indoor fan runs at set speed ( it runs at low speed if it was set at Auto speed). Airflow direction works at the original setting.
- C. When  $Ts - 1^{\circ}\text{C} < Tr < Ts + 1^{\circ}\text{C}$ , the operations of outdoor fan and compressor remain unchanged. And indoor fan runs at the original setting. Airflow direction is at original setting.
- D. When  $Tr \geq Ts + 1^{\circ}\text{C}$  and the compressor OFF time is  $\geq 3$  minutes, the outdoor fan and compressor start to run. Indoor fan can be set to run at AUTO, LOW, MEDIUM or HIGH.

- F. When indoor temperature sensor is wrong, outdoor fan and compressor run for 40 minutes and become OFF for 8 minutes. Indoor fan runs at medium speed (fan speed can be changed with remote controller. Power On light blinks twice every 8 seconds. Auto is Medium speed.).
- G. Louver operation can be set at Swing, Auto or fixed angle.
- H. Anti-frosting operation (If coil temperature sensor is wrong, this function is disabled):
  - a. If  $T_p \leq -2^\circ\text{C}$  and lasts for 4 minutes, compressor and outdoor fan stop running, and indoor fan runs at MEDIUM speed; Power ON Light blinks 6 times every 8 seconds.
  - b. When in Anti-defrosting operation,  $T_p \geq 6^\circ\text{C}$ , Power ON Light shines normally. When the compressor OFF time is  $\geq 3$  minutes, compressor and outdoor fan re-start running. During this period, indoor fan runs at Medium speed.
- I. When the unit is turned on and the compressor starts running, the compressor running won't stop within the initial 3minutes. When the unit is turned on again immediately after it is turned off, the compressor won't start running for 3 minutes (3 minutes protection of the compressor). The outdoor fan starts working simultaneously with the compressor.

### 3. Dehumidifying operation

- A. In dehumidifying operation, temperature setting and fan speed setting do not function. Fan speed is Low. Airflow direction (louvers) function. Outdoor fan and compressor work together, and humidifying works according to the indoor temperature and in a 12-minutes regular pattern:
  - (a) When  $T_r < 16^\circ\text{C}$ , Dehumidifying operation do not function.
  - (b) When  $17^\circ\text{C} \leq T_r \leq 21^\circ\text{C}$ , it ON for 3 minutes and OFF for 9 minutes
  - (c) When  $21^\circ\text{C} \leq T_r \leq 24^\circ\text{C}$ , it ON for 4 minutes and OFF for 8 minutes
  - (d) When  $24^\circ\text{C} \leq T_r \leq 28^\circ\text{C}$ , it ON for 6 minutes and OFF for 6 minutes
  - (e) When  $28^\circ\text{C} \leq T_r \leq 31^\circ\text{C}$ , it ON for 7 minutes and OFF for 5 minutes
  - (f) When  $T_r > 31^\circ\text{C}$ , it ON for 8 minutes and OFF for 4 minutes
- B. Dehumidifying still can functions when indoor temperature sensor is wrong. It operates like (d), ON for 6 minutes and OFF for 6 minutes.
- C. In this operation, Timer functions but Sleep mode does not function.
- D. When  $T_r < 16^\circ\text{C}$ , dehumidifying operation does not function. Compressor and outdoor fan are OFF. When the indoor temperature gets back over  $17^\circ\text{C}$ , this operation resumes.

#### 4. Heating Operation

- A. The temperature setting range is  $16^{\circ}\text{C} \sim 31^{\circ}\text{C}$ . The initial temperature setting is  $27^{\circ}\text{C}$ . The temperature shown by the Temperature Indication Light is  $2^{\circ}\text{C}$  lower than the actual temperature.
- B. After compressor starts running, when  $T_r \geq T_s + 1^{\circ}\text{C}$ , outdoor fan and compressor stop running at the same time. Indoor fan works as anti-cold air program, (if indoor temperature sensor is wrong, indoor fan stops working after 30 second), and air flow direction runs at original setting. (Reversing valve is powered on)
- C. When  $T_s - 1^{\circ}\text{C} < T_r < T_s + 1^{\circ}\text{C}$ , operation of outdoor fan and compressor remain unchanged. Louvers works as the original setting. (Reversing valve is powered on)
- D. When  $T_r \leq T_s - 1^{\circ}\text{C}$  and compressor is OFF for over 3 minutes, outdoor fan and compressor starts working together. Indoor fan selects Auto, Low, Medium, High or OFF mode according to Anti-cold air program.
- E. When the unit is turned on and the compressor starts running, the compressor running won't stop within the initial 3minutes. When the unit is turned on again immediately after it is turned off, the compressor won't start running for 3 minutes (3 minutes protection of the compressor). The outdoor fan starts working simultaneously with the compressor (except for over-heat protection).
- F. Reversing valve is powered during the heating operation and switches off when in defrosting mode.
- G. If the indoor temperature sensor is wrong, the outdoor fan, compressor and reversing valve will run for 40minutes and become OFF for 8 minutes. (Anti-cold air function has 30 seconds delay. Pressing the buttons on remote controller can change Fan speed. In auto mode fan speed is high.
- H. Overheating Protection: Overheating protection setting is at  $54^{\circ}\text{C}$ . If the indoor coil temperature is over  $54^{\circ}\text{C}$ , outdoor fan stops running(when indoor coil  $T_p \leq 45^{\circ}\text{C}$ , outdoor fan re-starts); If the indoor coil temperature is over  $65^{\circ}\text{C}$  for over another 10 seconds, Power ON Light blinks 6 times every 8 seconds and compressor stops running. When  $T_p \leq 40^{\circ}\text{C}$  and compressor is OFF for 3 minutes, compressor and outdoor fan will re-start operation, Power ON light will resume. The operation will run as anti-cold air program.

I. Auto defrosting operation:

a. Operation starts: after compressor starts running and heating operation is ON continuously for over 40 minutes, compressor and outdoor fan have been working together for over 40 minutes, and outdoor coil temperature is lower than  $-5^{\circ}\text{C}$ , defrosting operation starts, i.e. Outdoor fan, Indoor fan and compressor stop, after 55 seconds, reversing valve shuts off, 5 seconds later compressor starts to defrost.

b. Operation ends: when the outdoor coil temperature is over  $13^{\circ}\text{C}$  or the defrosting time is more than 10 minutes (if the outdoor temperature sensor is wrong), the defrosting operation ends. The original heating operation resumes, i.e. compressor stops, 55 seconds later reversing valve is ON. 5 seconds later compressor and outdoor fan start running; indoor fan resumes the original operation mode before the defrosting cycle as anti-cold air program.

c. In defrosting operation, the power ON light and Timer indication light blinks every second (at same frequency; it will not show the failure codes when there is a failure). During and after defrosting operation, 1 minute after compressor and indoor fan start running, the unit starts to check the indoor temperature and indoor coil temperature. (In the initial 1 minute, indoor temperature remains same as the temperature before defrosting, and compressor and indoor fan become on. The unit will check the temperature 1m later; Indoor fan speed is as anti-cold air program.)

d. Defrosting Cycles are as follows:

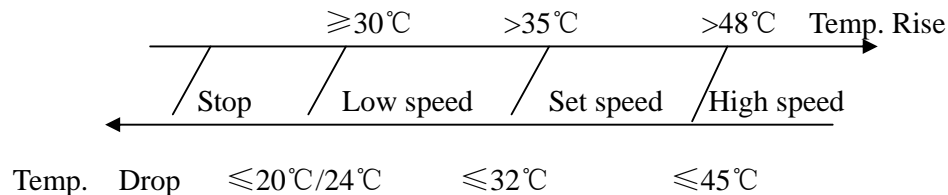
The time that the last defrosting cycle takes Max: 10 minutes      Min: 3 minutes	Intervals between defrosting cycles Max: 50 minutes      Min: 15 minutes
Within 4 minutes	Previous interval + 10 minutes
Between 4 and 6 minutes	Same as previous interval
Between 6 and 8 minutes	Previous interval - 10 minutes
Over 8 minutes	Previous interval - 15 minutes

e. Outdoor temperature sensors fail: if the two sensors are good, the unit runs defrosting operation according to the difference between the coil temperature and indoor temperature. If the difference is below  $16^{\circ}\text{C}$ , heating operation runs for 40 min and defrosting time is 10 min. Otherwise the unit runs fixed defrosting cycle. Heating operation runs for 40 min and defrosting time is 10 min.

f. The minimum Defrosting time is 3 minutes. .

J. Anti- cold air from indoor unit:

Below is the relation of indoor coil temperature VS indoor fan speed. As the temperature drops, if the compressor is ON, indoor fan stops at 20°C; if the compressor is OFF, the indoor fan stops at 24°C.



● **TIMER, SLEEP MODE, FAN SPEED**

1. Timer Function (Timer ON only, or Timer OFF only is just valid for the day)

- A. Both OFF Timer and ON Timer can be set at the same time, which will work in sequence.
- B. When unit ON Timer is set, timing starts and unit turns off immediately. If it is in Heating operation, reversing valve and compressor are powered at same time. When the set time is up, unit turns on and ON Timer is cleared.
- C. When unit OFF Timer is set, before the set time is up, the unit keeps on working normally. When the set time is up, unit stops working immediately regardless of the ambient temperature. If in heating operation, the reversing valve will be OFF 55 seconds after the compressor stops.
- D. In TIMER ON mode, the timer indication light is ON while Power On light is OFF.
- E. IN TIMER OFF mode, the Power On light and Timer Indication Lights are ON. If the unit has failures, only the power On Light blinks.

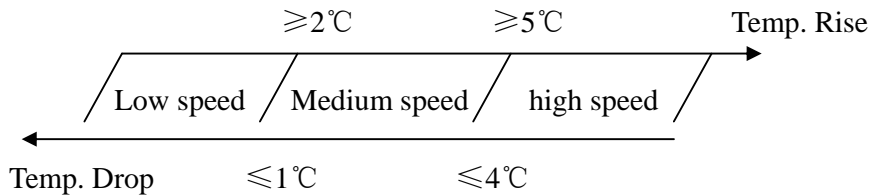
2. Sleep Mode

- A. When the unit is ON, press the Sleep Mode button on the remote controller.
- B. If in cooling operation, after 1 hour, the set temperature will rise by 1°C; another 1 hour later, the set temperature will rise by 1°C more. Indoor fan runs at low speed.
- C. If in heating operation, after 1 hour, the set temperature will decrease by 2°C; another 1 hr later, the set temperature will decrease by 2°C more. Indoor fan runs at low speed.

3. Auto Fan Speed: If the indoor fan speed is set at Auto, the unit chooses fan speed between H, M, L according to the difference between indoor ambient temperature and set temperature.

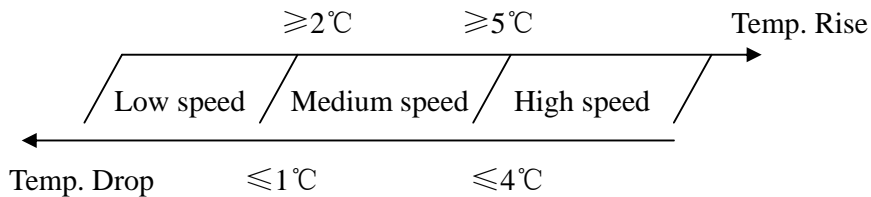
A) In heating operation:

The temperatures below are the temperature differences of  $T_s - T_r$



B) In cooling operation::

The temperatures below are the temperature differences of  $T_r - T_s$ .



#### 4. Air Flow Direction Function

Note: when closed, vane direction is at angle 0°

A) When the unit starts to run, vane automatically opens to the maximum position, i.e. 120° .

B) Auto-swing patterns:

Vane Positions at fixes angles

- Position 1: vane swings to about 30°
- Position 2: vane swings to about 45°
- Position 3: vane swings to about 60°
- Position 4: vane swings to about 75°
- Position 5: vane swings to about 90°

Note: In cooling or dehumidifying operation, after the unit blows air at vane (4) and (5) positions for one hour, to avoid condensate water dripping, vane would be automatically changed to horizontal angle, i.e. position 1.

C) Auto mode of Vane Positions at fixes angles

In cooling or dehumidifying operation: in the initial 10 minutes, vane stays at position 4. And 10 minutes later, it operates according to the difference in temperature.

a. When  $T_r \geq T_s + 4^\circ\text{C}$ , it stays at position 1 for 10 seconds, then swings to position 4 and stays for 20 seconds, and then returns to position 1. This cycle will be repeated.

- b. When  $T_r \geq T_s + 1^\circ\text{C}$ , it stays at position 1 for 20 seconds, then swings to position 4 and stays for 10 seconds, and then returns to position 1. This cycle will be repeated.
- c. When  $T_r < T_s + 1^\circ\text{C}$ , it stays at position 1.
- d. It takes temperature differences between  $T_r$  and  $T_s$  every 30 seconds.
- e. If the indoor temperature sensor fails, it operates as depicted in “b”.
- f. In cooling & dehumidifying operation, it swings from position 1 to position 4.

In heating operation, when the compressor stops, louver stays at position 1. And when the compressor is on, louver operates as below:

- a. When indoor coil temperature is  $< 28^\circ\text{C}$ , louver stays at position 1.
- b. When indoor coil temperature is  $\geq 28^\circ\text{C}$ , louver stays at position 2 for 23 seconds, and then swings to position 5 and stays for 7 seconds.
- c. When indoor coil temperature is  $\geq 32^\circ\text{C}$ , louver stays at position 2 for 15 seconds, and then swings to position 5 and stays for 15 seconds.
- d. When indoor coil temperature is  $\geq 36^\circ\text{C}$ , louver stays at position 2 for 10 seconds, and swings to position 5 and stays for 20 seconds.
- e. Unit takes the indoor coil temperature every 30 seconds
- f. If the indoor coil sensor breaks down, it operates as depicted in “c”.
- g. In heating operation, it swings from position 2 to position 5.

D) Louver works while the unit is operating. When the unit shuts on or off, the louver swings one time every 22 seconds.

E) Louver swings horizontally about  $125^\circ$

## ● **PROTECTION FUNCTIONS**

1. Indoor Coil Overheating Protection: See I. 4. H.
2. Anti-frost Function: See I. 2. G.
3. Compressor Time delay Protection
  - A. In any circumstances the compressor won't re-start in 3 minutes after it is turned off.
  - B. When the unit is turned on the first time, it does not need 3 min delay protection.
  - C. In normal cooling /heating operation, when the compressor starts to run, it won't stop running within 3 min.
4. Reversing Valve On and Off Time
  - A. When the unit is turned on the first time and heat mode is selected, compressor and reversing valve are powered. In heating operation the

reversing valve is always powered.

- B. If the unit changes from cooling to heating operation, the reversing valve gets power after 55 seconds.
- C. In heating operation when the unit is turned off or changes from heating to cooling operation, the rev. valve loses power after compressor has been OFF for 55 seconds.

5. Sensor Failure Protection

- A. When indoor room temperature sensor is broken, indoor room temperature control is cancelled.
- B. When indoor coil sensor fails, over-heating protection, anti-frosting function are disabled. The function of anti-cold air and residual heat clearance in indoor coil works as timed, and time is 30 seconds; system abnormal-protection is disabled.
- C. Outdoor temperature sensor fails: if the indoor two sensors are good, defrosting operation starts when the difference between the indoor coil temperature and indoor room temperature is below 16 °C , and compressor has been working for over 40 minutes. Defrosting time is 10 minutes. Otherwise the unit runs at fixed defrosting operation. Heating operation runs for 40 minutes and defrosting time is 10 minutes.

6. Failure Code

No.	FAILURES	CODE
1	Indoor temperature sensor failure	Power On Light blinks twice every 8 sec.
2	Indoor coil temperature sensor failure	Power On Light blinks 3 times every 8 sec.
3	Outdoor coil temperature sensor failure	Power On Light blinks 4 times every 8 sec
4	Anti-frost in cooling mode & overheating in heating mode failure	Power ON Light blinks 6 times every 8 sec.
5	High/Low pressure protection	Power ON Light blinks 9 times every 8 sec.

If several failures happen at the same time, failure code warning comes in the order of 1 to 7. For example, if the indoor temperature sensor and indoor coil temperature sensor are wrong, the unit gives an alarm in a cycle from E2-E9.

● **EMERGENCY SWITCH**

- 1. When the unit is powered on, press the Emerg. Switch the first time to turn on emergency cooling operation; press it the second time to turn on the emergency heating

operation; and press it third time to shut off the unit. Power On light shines during the cooling or heating operation and black when the unit shut off.

2. If the unit performs cooling or heating operation with emergency switch, temperature setting does not function in the initial 30 min. and indoor fan runs at high speed. After the initial 30min, the operation is like the following:

Operation Mode	Cooling Operation	Heating Operation
Set Temperature	26°C	21°C
Fan Speed	Auto	Auto
Louver	Auto	Auto

3. Emergency switch function does not affect cooling or heating operation.

## ● **TEST GUIDE**

### 1. Controller board function test

a. System self-diagnosis: (It checks buzzer, relays and its driving/interface circuits).

Pressing the emergency switch before the unit is powered on, then the controller can get into self-diagnosis. It operates in the following sequence:

The buzzer beeps a time → temperature indication light and power ON light blinks a time in a turn quickly (blinks a time every second) → reversing valve (1 second) → outdoor fan motor (1 second) → compressor (1 second) → indoor fan High speed (1 second) → indoor fan Medium speed (1 second) → indoor fan Low speed (1 second) → the louver from fully open to fully closed → indoor room temperature → indoor coil temperature → outdoor coil temperature → outdoor ambient temperature → buzzer beeps one more time → shuts off.

b. Manual test:

Test it manually after the unit is powered on. Every press to the emergency button, it responds with emergency cooling (buzzer beeps a time) → heating (buzzer beeps twice) → OFF (buzzer gives off one long beep).

### 2. Remote-controller

a. Power on/off button: (controls the on/off of the unit); OFF timer and ON timer, swing and sleep setting, fan speed of fan motor, mode setting and temperature setting.

b. When the unit shuts off, the LCD just shows clock. When the unit turns on, the LCD resumes the louver, fan speed, mode and temperature setting before shutting off.

c. “Too cold” button: increase the setting temperature. And it does not function in dehumidifying mode.

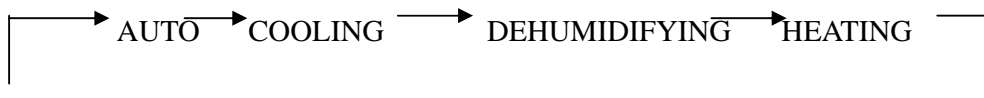
d. "Too hot" button: decrease the setting temperature. And it does not function in dehumidifying mode.

e. Modes button:

Setting the running modes. It sets the running modes in the following sequence:

Mode choosing button: can be chose in auto, cooling, dehumidifying and heating.

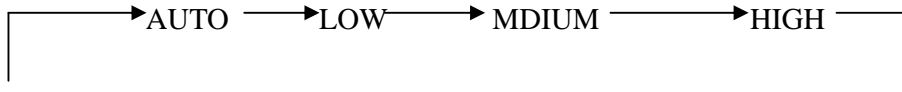
When the unit is turned on, it is in Auto mode and it does not display the set temperature. The set temperature in heating is 27°C, and in cooling is 21°C. It does not display the set temperature in dehumidifying mode. In cooling and heating mode, the LCD displays the correlative temperature. If there has SLEEP and VANE SWING, SLEEP and Vane closed when the modes changes and resume the initial fan speed and Vane setting. LCD displays the correlative signs.



Note: Cooling only unit does not have Heating mode

f. Speed button

Setting the fan speed in the following sequence:

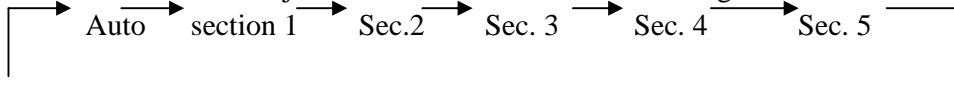


g. Horizontal wind button

Press this button to adjust the horizontal wind and press it again to stop this function.

h. Vertical wind button.

Press this button to adjust the vertical wind and vane swings as follows:



i. Sleep button

When presses this button, the unit come into sleep mode. When pressed it again, sleep mode is cancelled.

j. Clock button

Adjust the hour and minute through the button at the back of remote-controller. This clock is not controlled by ON/OFF.

k. On Timer

When presses this button, unit come to ON condition. Set the turn-on time by time-adjusting button. Press it again to cancel it.

l. OFF Timer

When presses this button, unit come to OFF condition. Set the turn-off time by time-adjusting button. Press it again to cancel it.

m. Combination Timer

When both timer-on and timer-off are set, the controller comes to combination timer condition. The controller determined the sequence of ON and OFF through the set sequence of them. When one of them finished its operation, it is deleted. Then system operates the other setting, till this operation is finished. Controller deletes all setting and comes to a condition of no timer.

- n. When remote controller is powered, it shows all the signs on it for 3 seconds.

● **UNIT INPUT AND OUTPUT**

1. Power Input: 170 ~ 242V, 1Ph. 50Hz

2. Control Signal Input:

A). Remote control infrared signal input;

B). Temperature sensor input (A/D).

a) Indoor temperature sensor: In the indoor unit, temperature testing range 0 ~ 40°C

b) Outdoor coil temperature sensor, temperature testing range -10 ~ 80°C

c) Indoor coil temperature sensor, temperature testing range -10 ~ 80°C

d) At 25°C, the resistance is 5K thermal resistor.

3). Control Signal Testing

A) Compressor Relay (220V AC/30A) X 1pce

B) Outdoor Fan motor relay (22V AC/5A) X 1pce

C) Reversing valve coil power relay (220V AC/5A) X 1pce

D) Indoor Fan motor 3-speed power relays (220V AC/5A) X 3pcs

E) Buzzer X 1pce, pilot light X 1pcs

F) Set temperature and room temperature display circuit, lighting diodes  $\phi$  5 x 10pcs

● **DISPLAY BOARD AND RECEIVER BOARD INTRODUCTION**

1. Display board is used to display the setting temperature and indoor temperature, which totally has 10 pieces green shining diodes. These diodes from left to right stands for the temperature from 21°C to 30°C (i.e. Each diode corresponds with one temperature point). When the unit is running, the display board only lights two shining diodes. The lighting one that does not flash is setting temperature; the other that flashes every second is indoor temperature. With the change of indoor temperature, the flashing shining diodes changes continuously. When the indoor temperature reaches the setting temperature, indicator light keeps lighting.

1) Receiver board is used to present the operation of whole unit. When the unit is running, one of the shining diodes lights. When it comes in defrosting mode, this diode flashes every second with the indoor temperature indicator light and setting temperature light, till the defrosting finished, it returns to normal lighting. When the unit shuts off, this diode distinguishes. It alarms when there is troubleshooting.

● **AUTO RE-START FUNCTIONS**

When there is a power failure during operation, and then the power resumes, the unit will restart automatically operating as per the operation modes, setting temperature, setting fan speed and airflow direction, timer operation, sleep mode before the power failure.

A. Test the re-start function after the unit is powered on. Buzzer beeps twice if the unit does not have this function, otherwise buzzer beeps three times

B. To change this Auto restart function, after the unit is turned on, press the emergency switch on the indoor unit for 5 seconds. The buzzer beeps twice indicating that it is cancelled, while beeping three times indicates that it is setup.

C. When the unit is powered on first time, it has no auto re-start function.

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