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TECHNICAL CONDITIONS

EVAPORATIVE COOLERS

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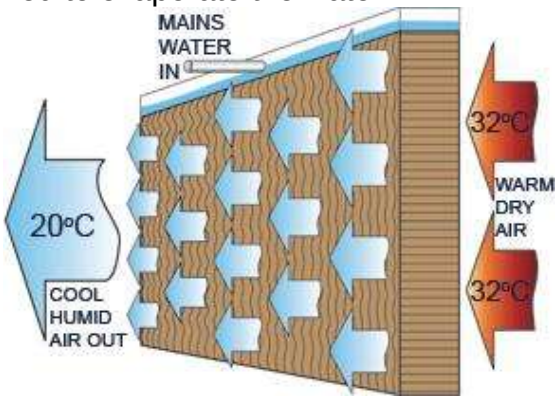
Contents

1. PRINCIPLE: How Evaporative cooler works

Evaporation cooling is to cool and humidify air by water evaporation to absorb heat. Do you ever wonder why you feel cooler by the ocean? It is because hot air is blown over water causing some of the water to evaporate and absorb heat. Evaporative air cooler working this evaporation principle. You can never expect evaporative cooler as cool as air con, because there is no compressor inside.

In an evaporative cooler a circulation pump keeps the cellulose filter pads fully soaked. As warm air passes over wet filter pads water naturally evaporates into the air. The air is cooled as it gives up the heat required to evaporate the water.



2. Specifications

EVAPO EV18KD General specifications	
Airflow (max)	18000 m^3/h
Pressure (max)	180 Pa
Optimal working conditions	12000 m^3/h – 120 Pa
Cooling capacity to: Text 35 °C / RH 35% Airflow 10000 m^3/h	25 kW
Outlet air temperature in working conditions mentionated at point no.4	23 °C ± 0.5°C
Water consumption	15 – 20 l/h
Cooling area	150 – 200 m^2
Power	1.1 kW
Electrical supply	1x230 V
Water tank	30 l
Speed	16
Speed drive	TRIAC
Wall controller Operating function	- LCD + remote control
Auto water drain	Yes
Overload protection	Yes
Pump protection	Yes
Net weight	65 kg
Gross weight	70 kg
Operating weight	95 kg
Dimension	1050 x 1050 x 870 mm
Vent size	680 x 680 mm
Inlet outlet connection	1/2 ”
Outlet drain connection	Φ 32

3. Main components

Motor:

- To drive the fan

Fan blade:

- To deliver air volume
- Made up of 6 pieces of high-rigid and fibrous plastic
- All pieces can be adjusted the prefer angle

Water pump:

- Lift the water to the top of pad, to wet pad and perform cooling
- Professionally manufactured, good heat-radiating performance
- Permanent magnetic synchro motor inside

Water level probe:

- Water level sensor
- To protect pump damage from idle running
- To keep water level in the sump (if with solenoid)

LCD Controller and remote control:

- To control power supply and components, and implement instructions from the MCU
- Relative humidity and temperature display and control (option function)
- Auto timing on/off
- Switch between VENT and COOL mode
- A large LCD screen display simplifies operations
- Multi function MCU control system includes a programmed on/off function

Drain valve:

- Automatically drain water out
- Prevents algae growth
- Maintains clean unit

Inlet valve:

- Float valve. To maintain the water level in the sump
- Small buoy

4. Check up and adjustment before operation:

1. Is the cooler installed horizontally?
2. Is drain pipe connected to the machine?
3. Is the water supply leaking?
4. Adjust water level in the sump?
5. Is the power supply connected correctly (particularly for three phase machine)?
6. Is the power line for the control panel correctly connected?
7. Is the operation current within the rated range?
8. Is there unwanted object in the vent?
9. Is the voltage correct?
10. Does cooler vibrates noticeably while operating?
11. Is there any foreign objects in the sump?

5. Important notes

1. The best effect is achieved when the unit is used in a well ventilated and dry place, where the unit takes in 100% fresh air from outside and no re-circulation occurs.
2. Avoid discharging cool air into an closed space. There must be enough space for discharged air, even use exhaust fans
3. For a place without powered exhaust, 0.8m² of exhaust area is needed for every 3600m³/h air discharge. When using a powered exhaust, the designed exhaust volume shall not be less than 85% of air intake.
4. Keep the unit away from welding sparks or any source of fire during the installation and when the unit is running.

5. The unit must be tested and adjusted. E.g.: adjusting water level floats before operation. Ensure that the unit is operating within the rated electrical currency.
6. Ensure correct wiring of the power and controller. The section in the power socket shall not be less than 1.5mm². the units shall use a dedicated power line instead of sharing a power line with other equipments.
7. Voltage of power supply shall be within 10% vibration from the rated voltage. Lower voltage may cause motor start failure or undue frequent starts and stops. Long-term low voltage or high voltage will cause damage to the motor.
8. The controller and its wire shall be kept away form strong electronic and magnetic interference, such as frequency converter, silicon speed and temperature controller, high frequency heater circuit or high power motor. Avoid wiring the power supply lines parallel to these sources. In the case of unavoidability, the power line must maintain a distance of more than 30cm from parallel interference source.

6. Inspection and preparation before installation

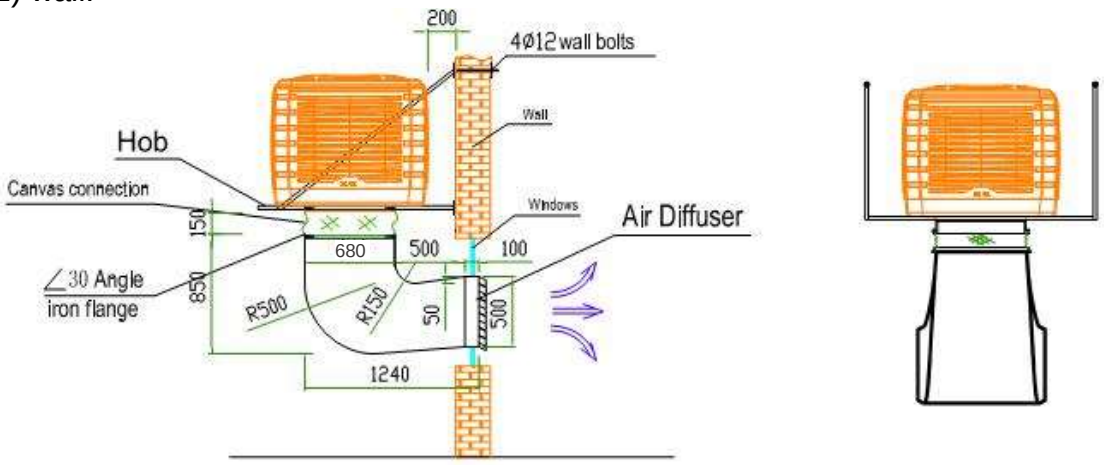
(1) Check the components and documentation (e.g.: instruction, certificate and maintenance card) against the packing list. If there in anything missing or damaged, keep it as it was and report to the factory or local distributor.

(2)Check the power supply for correct voltage.

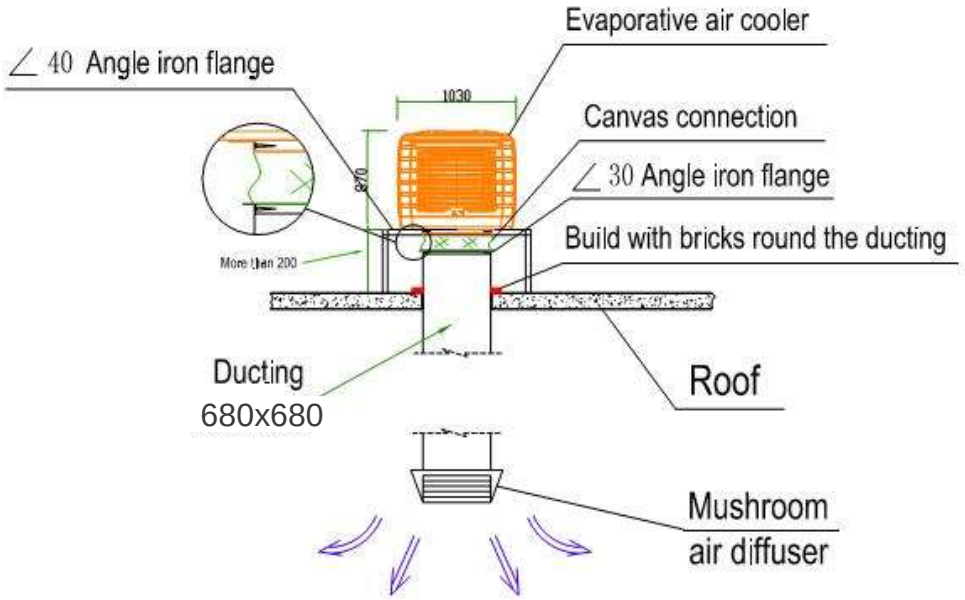
7. Ways of installation

(1) Cooler can be installed on the outer wall, with a side diffuser (an electromotive swing air diffuser can be used to cover larger area);
(2) Cooler can be installed on the roof, with a multi-side air diffuser penetrate through the roof and into the room;
(3) One or more coolers can be installed on the roof or outer wall, each connected to a duct to deliver the cooled air evenly to the room or to the desired spot;
(4) A number of coolers can be installed on the roof or on the outer wall, connected to a single duct, and with a powered blower in case of necessity.

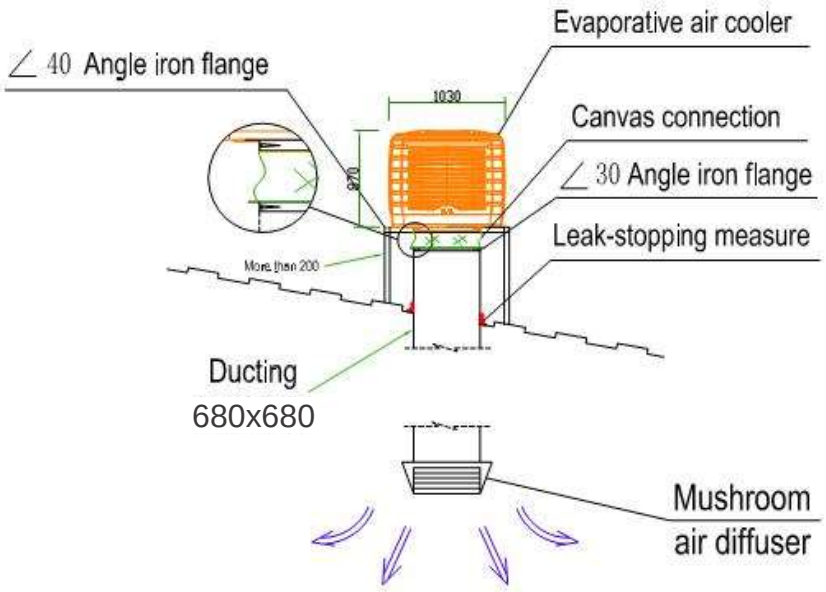
(1) wall:



(2) roof:

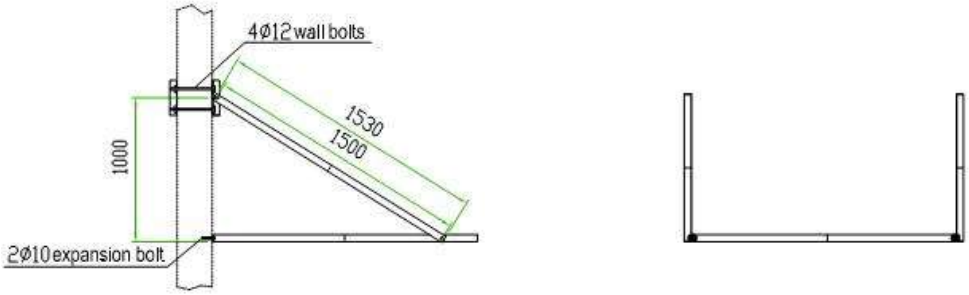


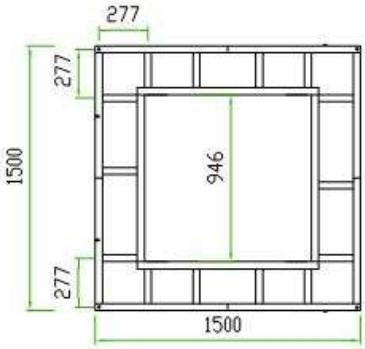
The sketch map of air cooler install in cement roof

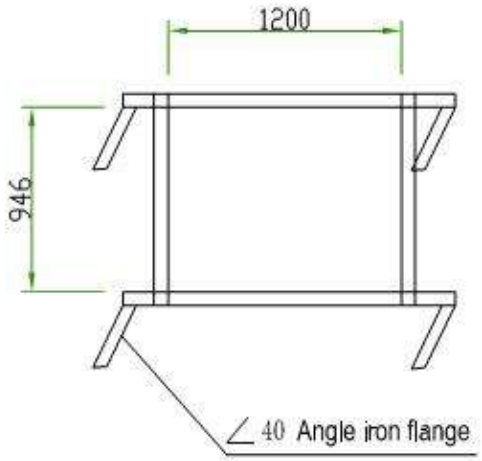


Rooftop installation diagram
(steel structure, glass tile structure)

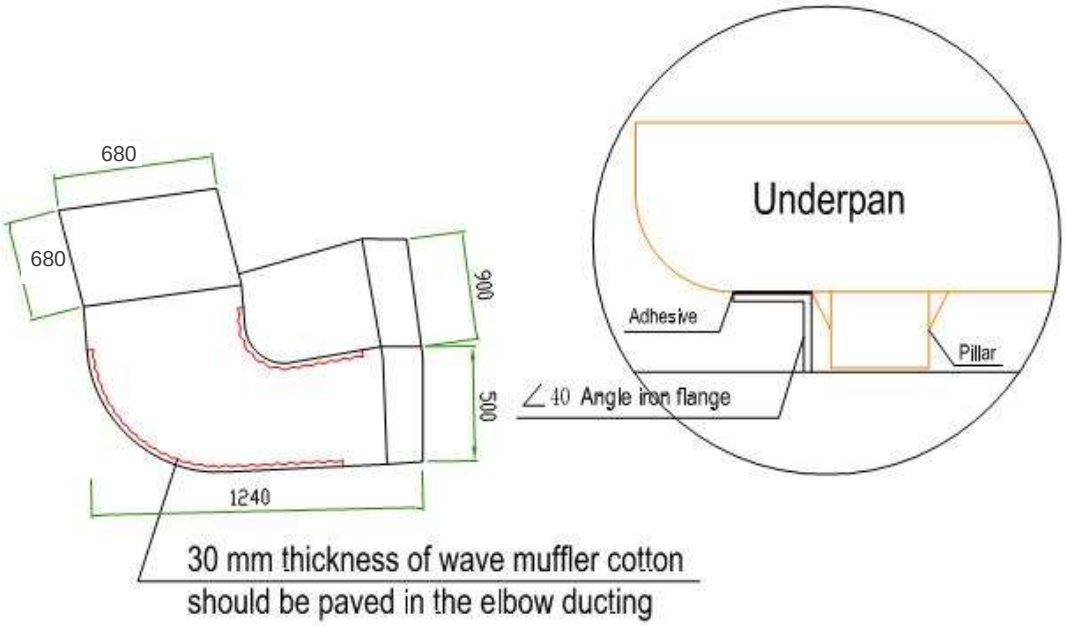
(3) diagram of bracket:







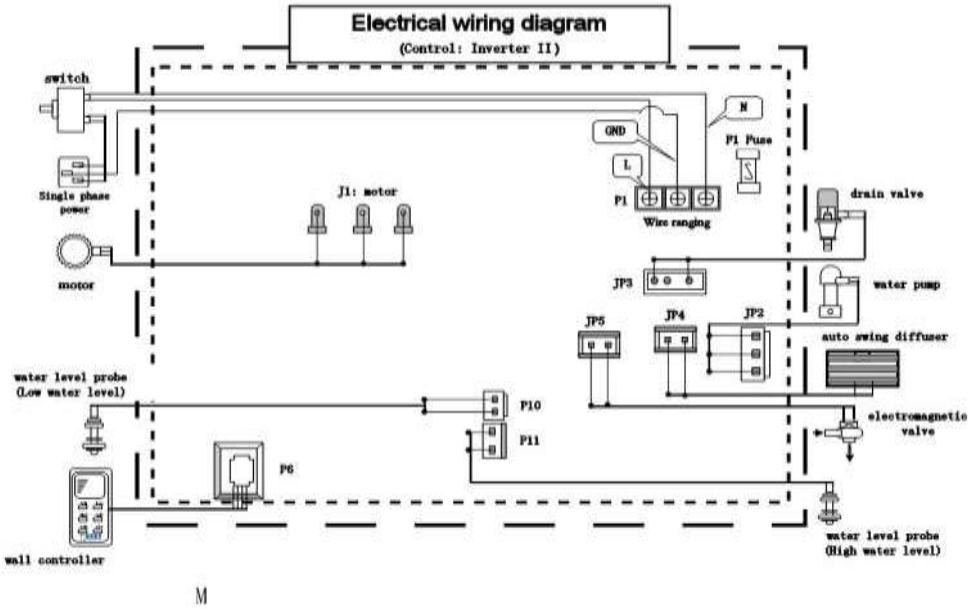
(4) diagram for duct adaptor



Notes:
As shown above the four installation holes at the bottom of the cooler are fixed on the four steel tubes welded on the bracket to the cooler from moving out of place.

8. Circuit diagram of control box of EV18

（other model's circuit diagram please open the control box. You will find it behind the cover.



9. Tips for better duct work

(1).The duct uses zinc coated steel, glass steel and plastic duct also can be used.
(2).The air diffuser should be installed in the places where the temperature actual need to be cooled. It depends on volume and velocity to select the specification of the air diffuser. The air diffuser is made of aluminum, alloy or wood and the type can be selected according to the actual situation. We recommend both single and double deflection grille. The average velocity in the duct is supposed to be at 3-6m/s. The air draft can be controlled by a regulating valve.

(3).The specification of duct depends on flow velocity, the wind velocity in the main duct is kept at 6-8m/s while in the branch is 4-5m/s and 3-4m/s in the end.

(4).The duct system is required to be economical and to be kept smooth as well as quiet, which makes the perfect air draft. To reduce flow resistance, the elbow's radius of curvature is not less than 1.5 times the width of duct.

(5).The air duct should not be too long, the maximal length is 20m.

(6).Keep the duct in a straight line is much better. To reduce the pressure drop, some unnecessary elbow and branch should be refrained.

(7).Try to use motor driven diffuser in the plane layout. The air duct should be designed as short as possible in some places where air duct must be applied.

(8).According to the volume air, different specification of the duct is used in different section.

(9).The air duct and cooler should be connected with hose.

(10).If there are branches in design, a valve and verge board can be used to control the air volume which reach the design requirement.

10. Thermostat Wall Controller User Manual

Functions / Cooler types	Exhaust	RTC functions	Pre-cooling	Intelligent cleaning	Shutdown cleaning	Auto-cleaning
1 Phase/2 Speeds	○	(RTC functions: Relative Humidity and Temperature control functions.) If the wall controller with thermostat, that the wall controller with RTC functions.	◎	○	◎	√
1 Phase/3 Speeds	○		◎	○	◎	√
3 Phase/1 Speed	○		◎	○	◎	√
3 Phase/2 Speeds	○		◎	○	◎	√
1 Phase/16 Speeds	○		◎	○	◎	√
1 Phase/Inverter	√		◎	◎	◎	√

○ means: without the function
◎ means: with the function, but the default is off.
√ means: with the function, and the default is on.

10.1 TURN ON/ TURN OFF

1) Press  , turn on or off the evaporative air cooler manually .

2) Hold  button down for 5 seconds, the wall controller will get back to the ex-factory setting, restart.

10.2 SETTING THE CLOCK

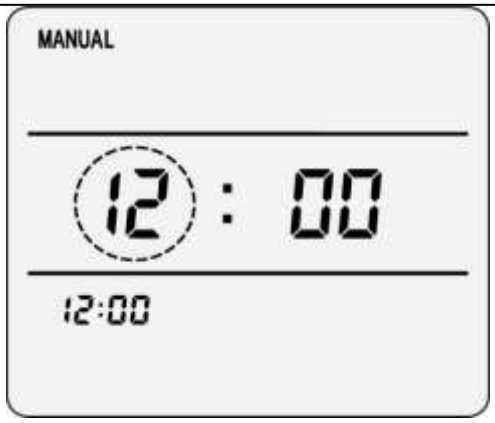
Set the clock on the wall controller before proceeding with any other programs. Picture of 2-1 shows the current time is 12:00. The setting as follows:

1) Press the  button, the hour will flash. Use  to change hours.

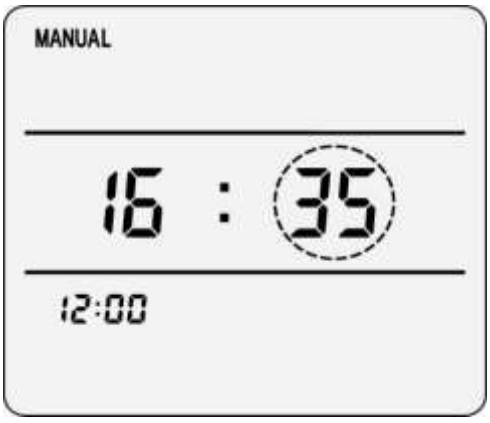
2) Press the  button again, the minute will flash. Use  to change minutes.

3) Press the  button one more time, time setting been finished.

Picture 2-1show the current time



picture 2-2 change hours



Picture 2-3 change minutes

10.3 FAN

The 

button is used to select VENT (fresh air been delivered into rooms, but the air doesn't been cooled).

Press 

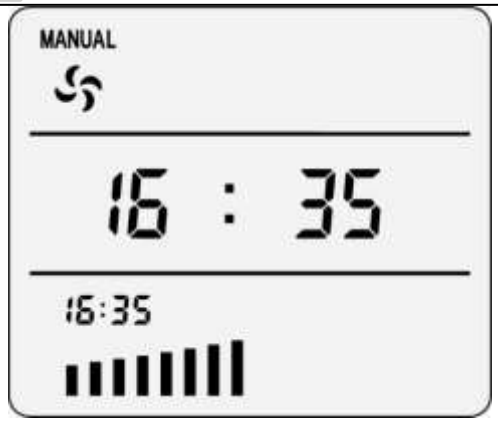
button can turn on and turn off VENT function.

Press 

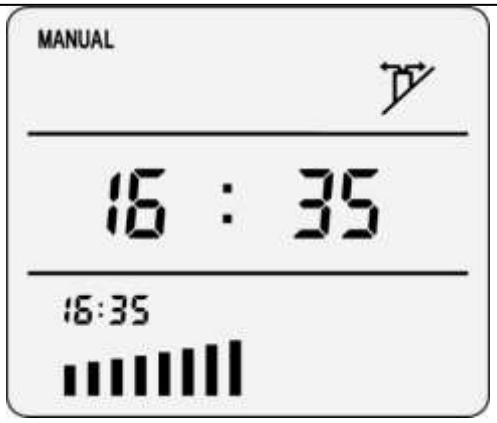
button can turn on or off EXHAUST function. (only inverter model has exhaust function.)

To increase or decrease the fan speed required, press the 
buttons.

Note: in order to protect motor, when the VENT function been switched to EXHAUST, or the EXHAUST function been switched to VENT, the motor will pause for 25 seconds.



Picture 3-1 turn on VENT



picture 3-2 turn on EXHAUST

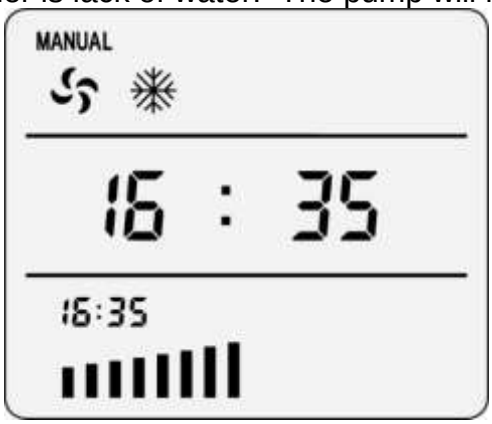
10.4 COOL

Press 

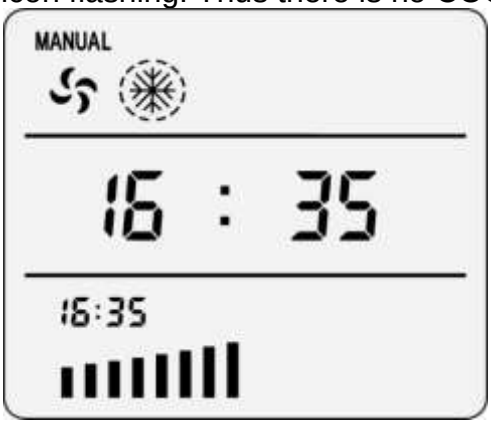
to control the water pump. COOL function is by pump water and wet the pad.

When you press 

button, if the water level is too low, the snow icon will flash to tell you the cooler is lack of water. The pump will not run while snow icon flashing. Thus there is no COOL..



Picture 4-1 turn on VENT and COOL

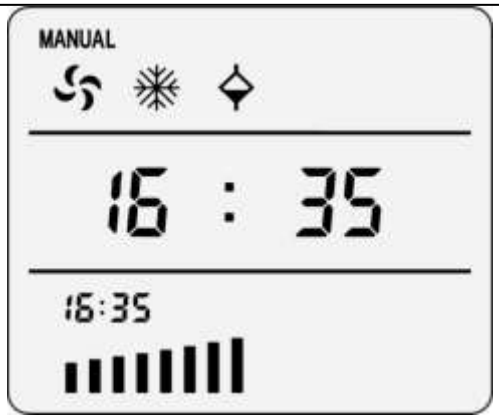


Picture 4-2 pump stop running (water shortage)

10.5 CLEAN

Press 

button can turn on and turn off CLEAN unction.
Drain function runs 5 minutes, and then off.
When draining, the water level will decline rapidly, so if the COOL function is still keep on, the pump will pause automatically to protect pump, and running again when DRAIN stop and water filled enough.
Note: if the unit has exhaust function, while CLEAN function on, the fan will run reversely to clean the pad. Thus, the user will not need to take pad out and clean manually.



Picture 5-1 turn on VENT, COOL and CLEAN

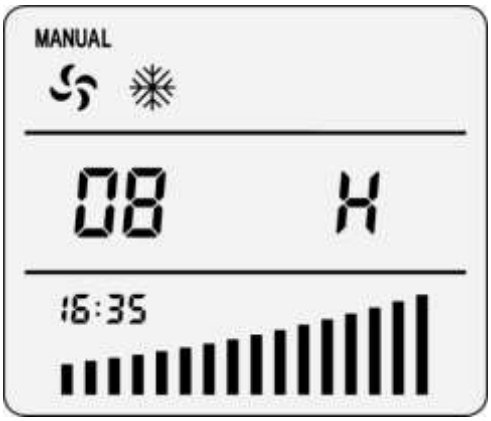
10.6 AUTO-CLEANING

When FAN and COOL functions work together for N hours(N can be set), air cooler will open CLEAN function, drain out the dirty water in tank, and change with clean water automatically. The default of Auto- cleaning cycle is 08-hour.

Press CLEAN button to set up Auto-cleaning cycle , press CLEAN for 3 seconds, the Auto-cleaning cycle will be 00 → 04 → 08 → 16 → 32 → 48 → 00 (in hours). If the Auto-cleaning cycle is 00H, the Auto-cleaning function been cancelled.

When set Auto-cleaning cycle, the screen will show the cycle of Auto-cleaning(as shown in picture 6-1), Auto-cleaning cycle is 08-hour. The time will disappear when setting finish.

Note: Auto-cleaning function turns on under FAN and COOL functions work together.



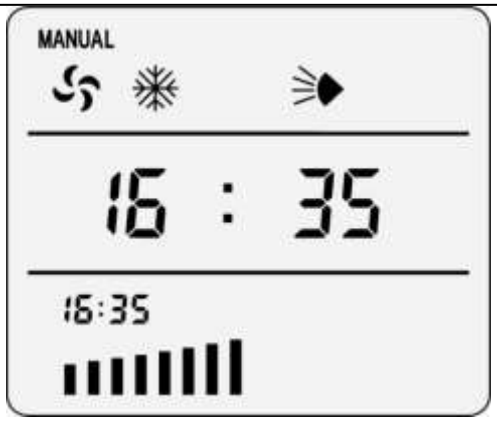
Picture 6-1 Auto-cleaning cycle is 08-hour

10.7 SWING

Note: if there is no electronic swing air diffuser connected to the control box, this function will not available.

Swing function means change wind direction circularly.

Press SWING button can turn on and turn off SWING unction.



Picture 7-1turn on VENT, COOL, and SWING

10.8 TIMER

TIMER can turn on/turn off the timing function, the wall controller will work according to the last setting before shutdown.
TIMER function can work on any working modes, the setting methods are same in any working modes, take an example of manual mode (MANUAL).

10.8.1TIMING TURN ON

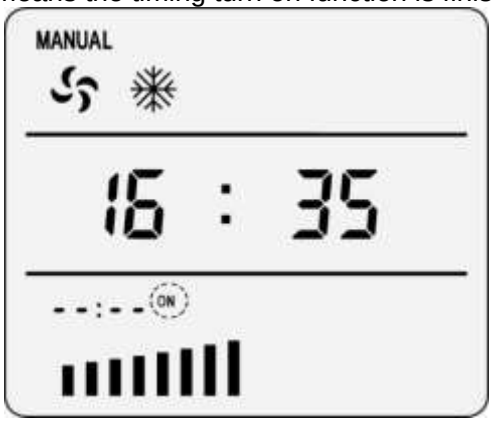
The processes are as follows:

1) Press the TIMER button, the screen will show "--:--", "ON" is flashing, means timing turn on function doesn't be set, like the picture of 8-1.

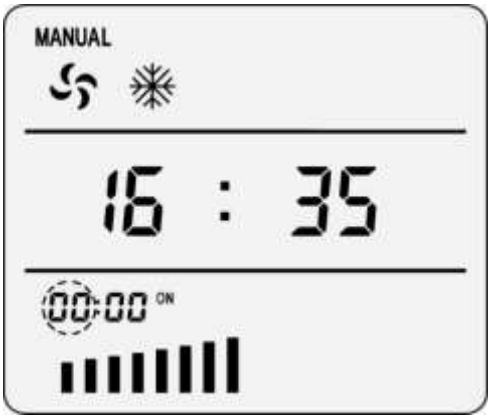
2) Press PROG button, --:-- changes to 00:00, and the hour is flashing, use  button to changes hour, like the picture of 8-2.

3) Then Press PROG button, the hour stop blinking, the minute is flashing, use  button to changes minutes, like the picture of 8-3.

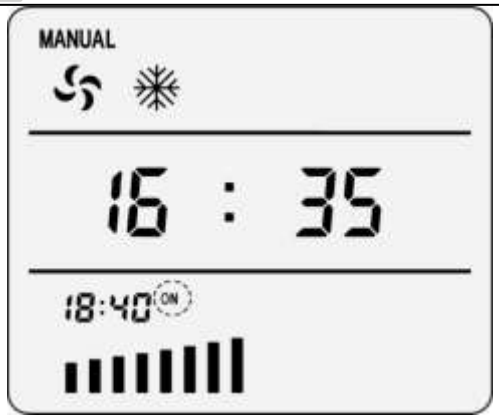
4) Press PROG button once again, finish the setting, the screen shows the current time 16:35 and "ON", means the timing turn on function is finished, like the picture of 8-4.



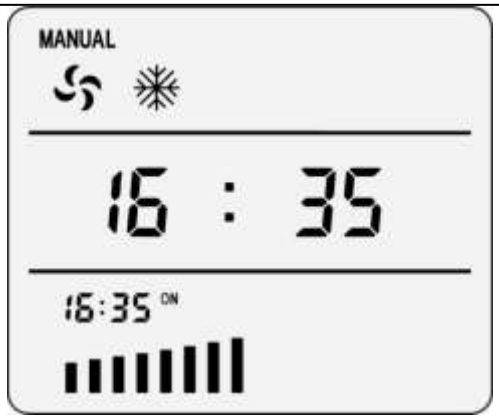
Picture 8-1timing turn on



Picture 8-2 setting hours



Picture 8-3 setting minutes



Picture 8-4finish the setting

10.8.2 TIMING TURN OFF

The processes are as follows:

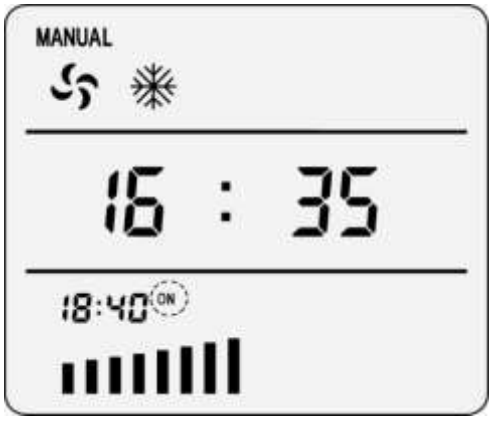
1)Press the TIMER button, and the screen will show “18:40”, “ON” is flashing, means the machine will be turned on at 18:40; see the picture of 8-5.

2) Press PROG button, and the screen will show “--:--“, “OFF” is flashing, means timing turn off function doesn’t be set; see the picture of 8-6.

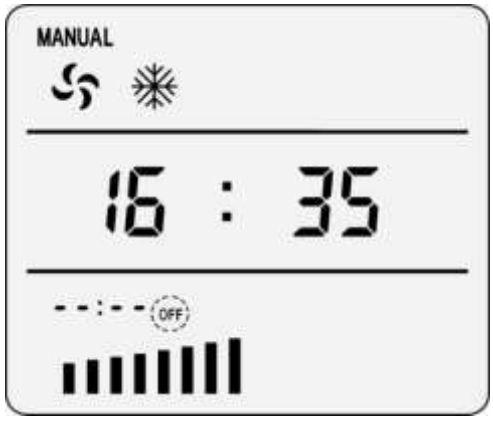
3) Then Press PROG button, “--:--” change to 00:00, the hour is blinking, press  button to change hours; like the picture of 8-7.

4) Press PROG button, the hour stop blinking, the minute is flashing, press  button to change minutes; like the picture of 8-8.

5) Press PROG button once again, finish the setting, the screen shows the current time “16:35”, “ON” and “OFF”, means the timing turn on and turn off functions have been finished, like the picture of 8-9.

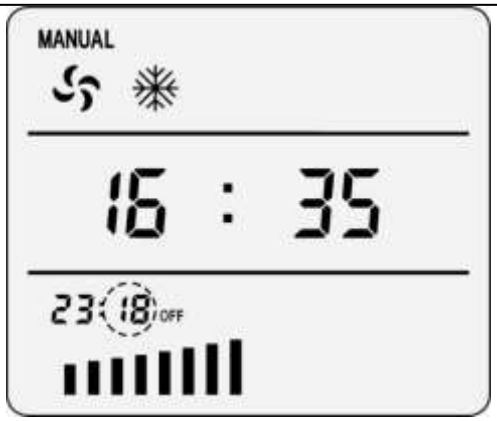


Picture 8-5 setting of timing turn on

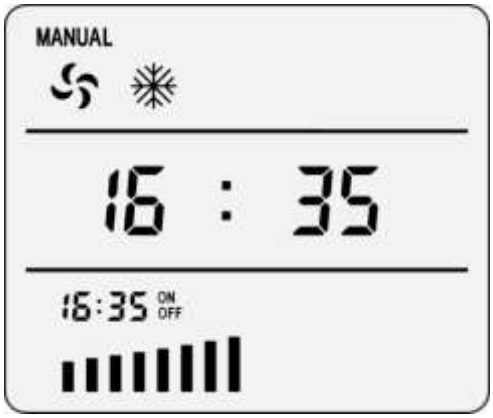


Picture 8-6 setting of timing turn off

Picture 8-7 setting hours



Picture 8-8 setting minutes



Picture 8-9 finish the settings of timing turn on/off

10.8.3 CANCEL TIMING

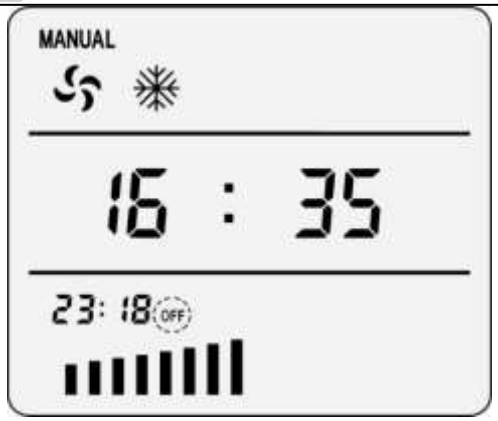
The processes are as follows:

1)Press the TIMER button, the screen shows “18:40”, “ON” is flashing, time of turn on is 18:40, see the picture of 8-5.

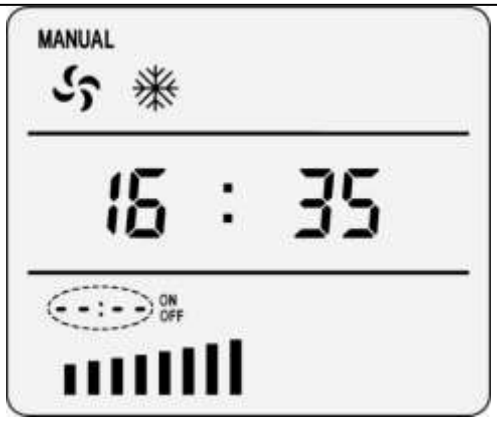
2) Press TIMER button, the screen shows “23:30”, “OFF” is flashing, time of turn off is 23:30; see the picture of 8-10.

3) Then Press TIMER button, the screen shows “ON” and “OFF”, “--:--” is flashing, timing been canceled; see the picture of 8-11.

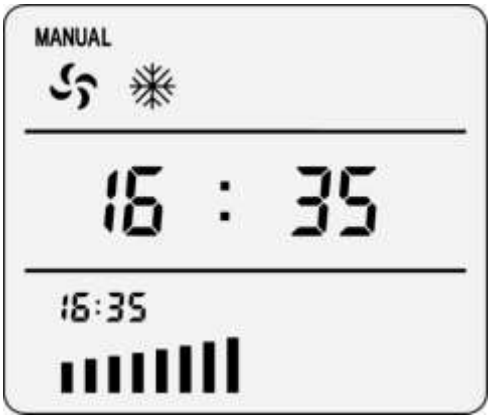
4) Press PROG button, timing function been canceled, the screen just shows current time 18:35, no any timing setting.



Picture 8-10 setting of timing turn off



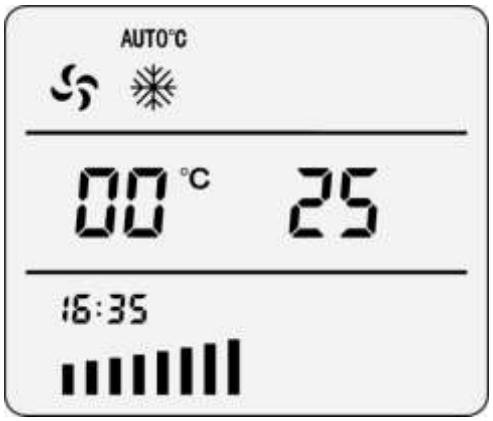
Picture 8-11 cancel the setting



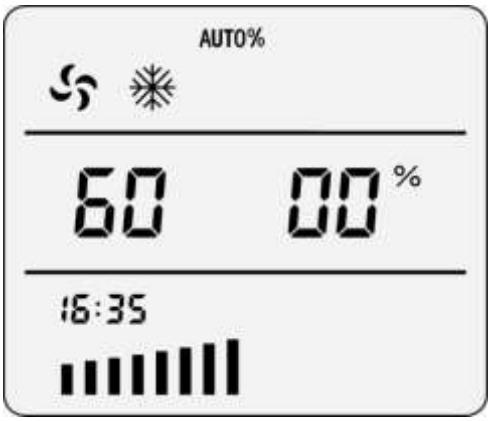
Picture 8-12 timing function been cancel

10.9 MODE

Note: This feature does not apply to all models. If your controller does not support thermo, it will show 00 ℃ and 00% on screen. (like the pictures 9-1 and 9-2)



Picture 9-1 does not support the temperature control



Picture 9-2 does not support the humidity control

press MODE button for 3 seconds, can switch air cooler's working mode between MANUAL, AUTO℃, AUTO%.

10.9.1 MANUAL MODE

Press the MODE button until MANUAL is shown on the top left corner of screen. Current temperature and relative humidity will be shown on the screen. If FAN is selected, the wall controller will show a constant fan speed, indicated on the bar graph on the bottom of screen.

If the water is enough in tank, press COOL button, will turn on or turn off pump.

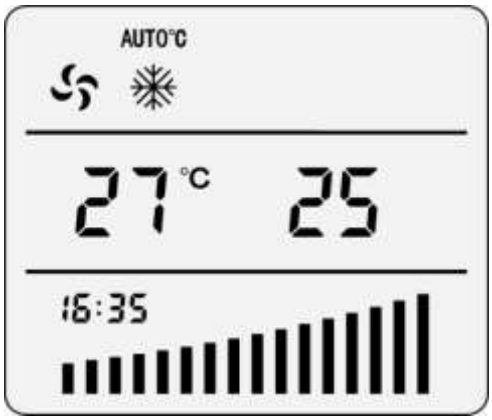
10.9.2 AUTO℃ MODE

Under the mode of AUTO℃, the wall controller will adjust fan speed and pump's work to maintain the preconcerted temperature.
When the mode switch to AUTO℃, the icons of AUTO℃, FAN and COOL will be shown on screen, FAN and COOL functions will be turned on automatically, use △▽ buttons to change fan speed.

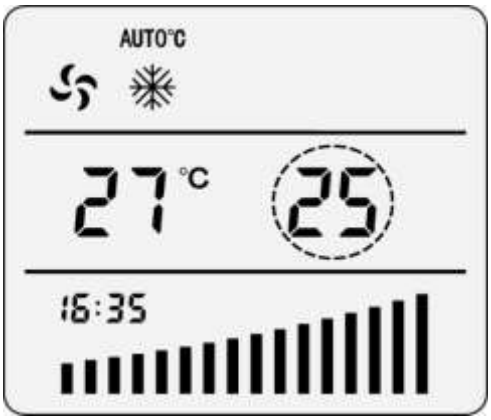
As shown in picture 9-3, current temperature is 27℃, the preconcerted temperature is 25℃, FAN and COOL functions are both on.

How to change preconcerted temperature?

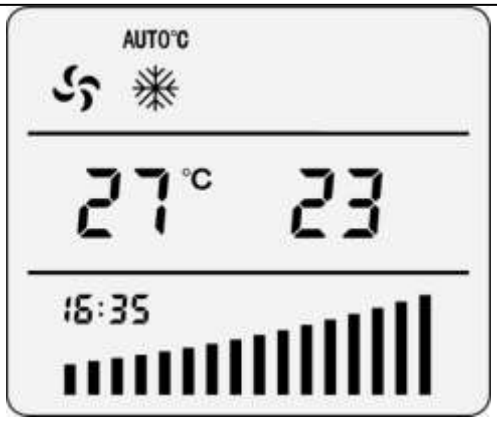
The default temperature on AUTO℃ mode is 25℃, if want to change, press PROG button, the preconcerted temperature will flash (as shown in picture 9-4), △▽ button will change the preconcerted temperature, press PROG button again, the setting is finished. The temperature has been change to 23℃. (as shown in picture 9-5).



Picture 9-3 AUTO℃mode



Picture 9-4 set temperature



Picture 9-5 Finish the setting

10.9.3 AUTO% MODE

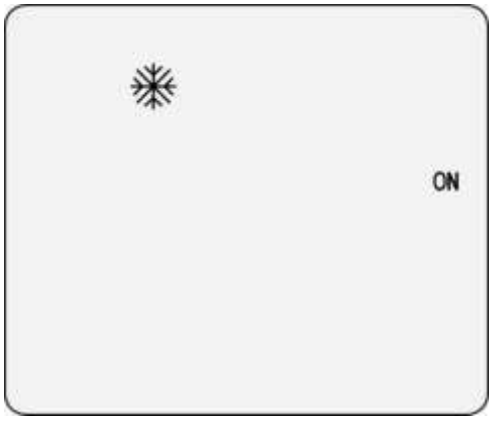
Similar with AUTO℃ mode settings.

10.10 PRE-COOLING MODE

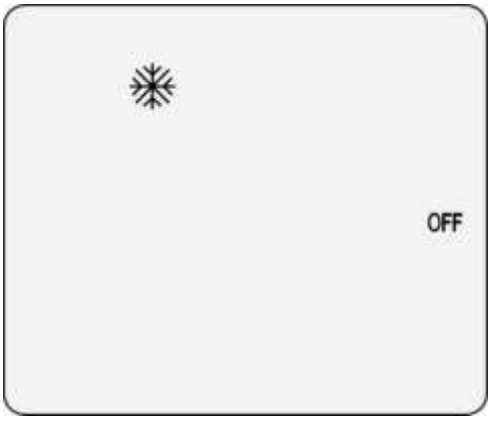
PRE-COOLING means wet the pad before fan run. If without PRE-COOLING, the fan may bring dust into room while pad is dry. The default of pre-cooling function is not on.

While the cooler is off, press the both buttons of FAN and COOL for 5 seconds, can turn on and turn off the cooling mode. (picture 10-1 and 10-2). While PRE-COOLING is functioning, FAN icon flashes on screen. (like the picture of 10-3).

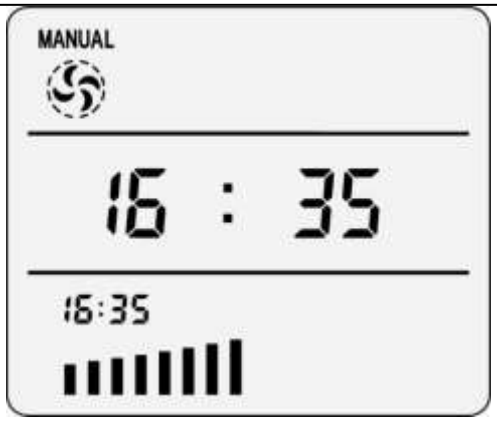
(1) If the water level is low, the water inlet valve will be on automatically.
(2) 2 minutes later, the pump will be turned on and wet pads. If the water tank cannot be added to normal level in 2 minutes, the PRE-COOLING will end automatically.
(3) 1 minute later, after pads have been fully cleaned, fan will be started. The FAN icon will not flash again while PRE-COOLING end.
Note 1: PRE-COOLING will not be activated in case restart the cooler shortly after last turn off.
Note 2: The settings on PRE-COOLING mode will be stored to memory.



Picture 10-1 enable PRE-COOLING



Picture 10-2 disable PRE-COOLING



Picute10-3 PRE-COOLING function is running

10.10 INTELLIGENT CLEAN MODE

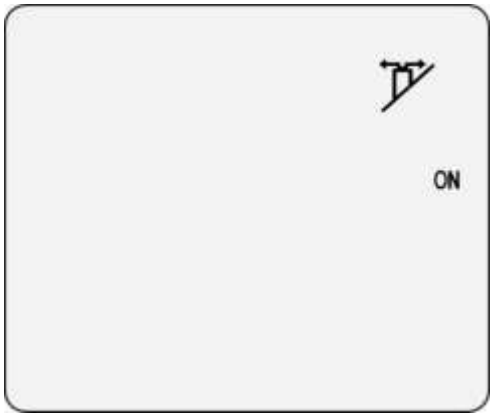
Note: This feature does not apply to all models. Only models with EXHAUST function have INTELLIGENT CLEAN FUNCTION. We suggest you consult to the dealer before you operate this settings.

INTELLIGENT CLEAN means the fan will run reversely to clean the pads. Thus the user will not need to take pads out and clean manually. The default of intelligent cleaning mode is closed.

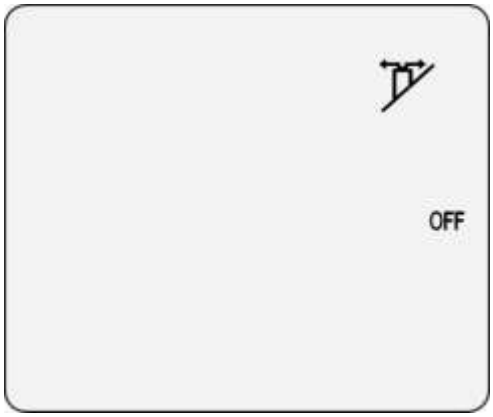
While the cooler is off, press both buttons of FAN and DRAIN for 5 seconds, can enable or disable the intelligent clean function.

If intelligent cleaning mode is enabled, press the DRAIN button, the cooler will operate as follows:
(1) If the cooler is in VENT mode, the fan will run reversely and clean the pad.

(2) If the cooler is in COOL+VENT mode, besides fan run reversely, the drain valve also turn on and let dirty water out.
Note: The settings on Intelligent clean will be stored in memory.



Picture 11-1 enable intelligent clean



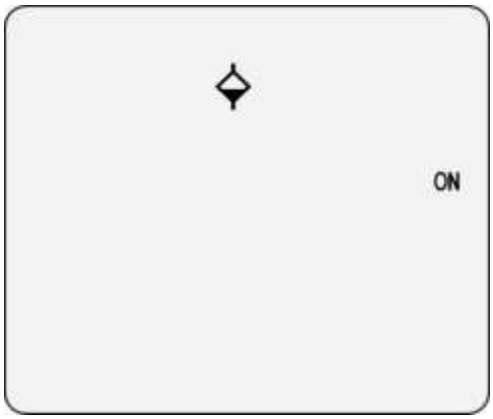
Picture11-2 disable intelligent clean

10.11 SHUTDOWN CLEAN MODE

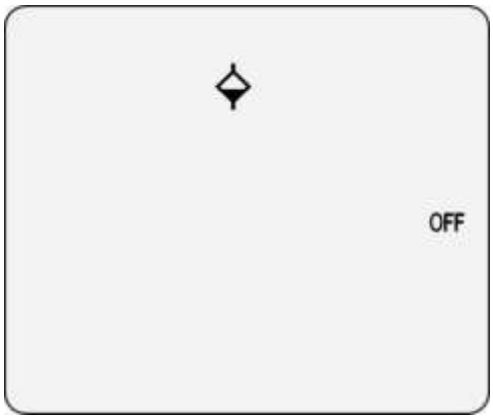
SHUTDOWN CLEAN means after the cooler is shut down, the cooler will blow pads to dry. This will prevent bacteria and alga to grow on pad, and maintain healthy fresh air from the cooler. The default of shutdown cleaning mode is closed.

While cooler is off, press both buttons of COOL and DRAIN for 5 seconds, can enable and disable the shutdown clean cunction.
If shutdown clean is enabled, turn the cooler off, the cooler will operate as follows:
(1) All functions will be closed except the clean function, CLEAN icon shows on wall controller.

(2) 5 minutes later, cleaning function will turn off automatically. The screen shows nothing.
Note: The settings of shutdown clean will be stored in memory.



Picture 12-1 enable Shutdown clean



12-2 disable Shutdown clean

10.12 SUGGESTIONS

SNOW ICON FLASHING

COOL icon flashing (as shown in picture 4-2), indicates the water tank with low water level. It doesn't mean which part has problem.
It is to show that the water level is under rated line for pump working. The cooler will stop pump running until water is up to rated level.

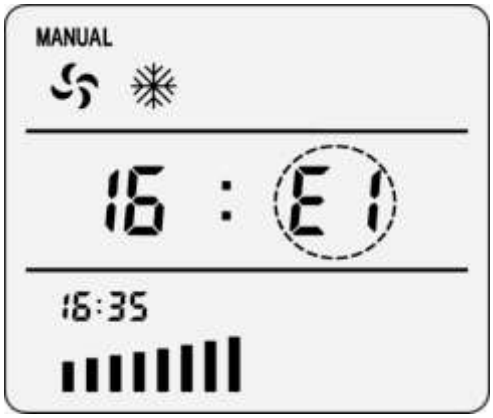
FAN ICON FLASHING

When the FAN icon flashing (as shown in picture 10-3), that means, the air cooler is pre-cooling, pump works for 1 minute, the FAN will be opened automatically. If the water level is too low, will water automatically.

10.13 MALFUNCTIONS

E1

"E1" flashing indicates, (as shown in picture 14-1) the power supply to air cooler is over-current. Please cut off power supply for 1 minute and then restart. If E1 still on, please check the power supply.



Picture 14-1 over-current

E2

”E2” flashing indicates over-voltage (more than 265V). Please cut off power supply, and check the voltage.

E3

”E3” flashing indicates under-voltage or lost-phase. Under-voltage means the input voltage is less than 140V. Please cut off power supply and check it.

E8

"E8" flashing indicates connection failure between wall controller and cooler. Re-plug the signal cable or change crystal head.

E9

“E9” flashing indicates the failure in water supply. After turn COOL on, if water level cannot reach required line for pump working within 15 minutes, the E9 will show on LCD.

If water supply pressure is too low, E9 always show also. In this case, restart the cool function, to let the water in again.

11. Maintenance

(1).It is to be noted to change the water while the cooler is in work to avoid incrustation.
(2).The filter pads should be cleaned more often to keep the cooling efficient. Do not use water above 40℃. Banister brush can be used softly to scrub away the dust on the pads.
(3)The water supply should be shut off to avoid bacteria as well as cold weather. It is also recommended covering to protect the cooler in some dusty and snowy cities.
(4).All the type of this series has the function of auto timing cleaning. (the cooler will operates auto cleaning function after accumulative 8 hours under persistence power supply.)
(5).We recommend to clean the pad every month to keep the cooler under best condition.
to our related standard.

12. Water and power supply

(1).the water must be clean, tap water is often used and water source pressure should more than 1.0kgf/cm.
(2).there should be a stop valves in the hose and obligate a pine joint.
(3).keep the voltage only between 210-250v.
(4).there should be a switch to prevent creepage. It also should avoid short circuit, overload and electric shock.

13. Temperature decrease form of Evaporative air Cooler

Exit ℃ / Intake air ℃	Intake air Relative humidity(%)								
	10	20	30	40	50	60	70	80	90
10	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.6	9.4
15	6.6	7.8	8.8	9.8	10.8	11.7	12.6	13.4	14.3
20	10.1	11.4	12.8	13.9	15.2	16.2	17.2	18.2	19.2
25	13.4	15.0	16.6	18.0	19.4	20.6	21.8	22.9	24.0
30	16.6	18.6	20.4	22.0	23.6	25.0	26.4	27.7	28.9
35	19.8	22.2	24.2	26.2	28.0	29.6	31.0	32.4	33.7
40	23.0	25.6	28.1	30.4	32.3	33.9			
45	25.9	29.2	32.0	34.3					
50	29	32.7	35.8						

14. Troubleshooting

The following troubleshooting guide is intended to address the most common symptoms and is by no means exhaustive. If symptoms persist, call a qualified serviceman. Only a certified electrician should complete electrical work. Turn off all power to the cooler before attempting to troubleshoot any of following symptoms.

Number	Symptom	Problem Cause	Remedy
1	Unit fails to start or deliver air	No electrical power to unit: A. Fuse blown B. Circuit breaker tripped C. GFCI tripped D. Cords unplugged or Damaged	Check power: A. Replace fuse B. Reset breaker C. Reset GFCI D. Plug in cord or replace if damaged
		Motor overheated	Try restart after cool down
		Motor frozen	Replace motor
		Motor able to free spin	Replace capacitor
2	Unit starts but air Delivery inadequate	Insufficient air exhausts	Open windows or doors
		Insufficient water-pad not wet: A. Cooling pads plugged B. Dry streaks on pads C. Large dry spots on pads D. Pump not working E. Loose water connections	Check water distribution system: A. Clean or replace pads B. Check water level C. Make sure cooler is level D. Clean or replace pump E. Check for leaks and correct
3	Musty or unpleasant odor	Stale or stagnant water in sump	Drain, flush and clean sump
		Pads mildewed or clogged	Replace pads
		Pads not completely wet before cooler is turned on	Turn on pump before starting fan
4	Knocking, shaking or rattling sounds	Loose parts	Check and tighten where needed
		Blower wheel loose or rubbing	Inspect and adjust, or replace
5	Water droplets in the discharge air stream	Too much water delivered to the cooling pads	make sure pads are properly positioned in the pad frames and The unit is level. If necessary, reduce the flow of water to the pads by tightening the screw on the hose restrictor clamp found on the pump discharge hose.
		Outdoor humidity level is too high or it is raining	Use cooler as a fan only (turn pump off) or discontinue use of cooler until outdoor humidity level drops.