



Heat Exchanger Operation and Installation

*** IMPORTANT ***

For safe and satisfactory operation, please read the following instructions. Keep these instructions for future reference. Some information may not apply to your system.

Introduction

Ice Qube Heat Exchangers are closed-loop systems that have been designed to provide cooling for computer and electronics enclosures in environments where the enclosure temperature may be maintained at temperatures at least 5 degrees Fahrenheit above ambient. Models range from 5.7 to 83 watts/degree Fahrenheit cooling capacity.

Basic Operation

Ice Qube Heat Exchangers have only two moving parts. They are maintenance-free fans or blowers, which are used to move air over the heat exchanger core. The enclosure fan moves hot air from the top of enclosure, through the heat exchanger core where the heat is dissipated and the cool air returns to the bottom of the enclosure. The ambient fan moves cool air from near the bottom of the heat exchanger through the core where the heat from the enclosure is absorbed and dissipated to the ambient air out of the top of the heat exchanger.

Unpacking Inspection

Look for damage to the shipping container. If the shipping container has been damaged or marred in any way, carefully inspect the heat exchanger for damage which may have occurred during shipping. Check for scratches, dents, or any other irregularities. Listen for noises that could indicate loose components. Any evidence of damage should be recorded on the freight bill. The freight carrier's claim procedure should be followed.

Ice Qube Inc. cannot accept responsibility for damages which occur during shipping.

Pre-installation Test

Before installing the heat exchanger on the enclosure, it is recommended to operate the unit for a few minutes to be sure it is functioning properly. Although the system has been factory tested, damage may have occurred during shipping which may have not been apparent during the unpacking inspection.

1. Place the system on a solid base such as a workbench or table. Be sure there is adequate space for the two air streams.
2. Check the unit name plate for electrical requirements. Connect the power cord to a properly grounded electrical outlet of sufficient capacity. The use of an extension cord is not recommended.
**** If any unusual noise or vibration is present, immediately disconnect the power cord and inspect the unit for the cause.**
3. After power is supplied to the unit, both fans should begin to operate.
**** If the fan speed controller option is selected, one or both of the fans might not start if the temperature is below the set point.
(Enclosure - 70 degrees Fahrenheit, Ambient - 90 degrees Fahrenheit; factory setting)**
4. After making these few simple checks, you are ready to prepare your electrical enclosure for installation of the heat exchanger.

Preparing the Enclosure

1. Determine the location of the heat exchanger on your enclosure.

***** Caution *****

Be sure the weight of the heat exchanger will not cause the enclosure to become unbalanced causing bodily harm or injury. For units mounted on enclosure doors, be sure the hinges will support the weight of the unit. Refer to system specifications for model weights.

2. Use the cutout template, or drawing, as a reference to make an opening in the enclosure surface for intake and exhaust air, along with the holes for the mounting hardware and electrical connection. Be sure that the heat exchanger will be mounted level and air flow will not be restricted by components in the enclosure or the surrounding ambient.
3. Test fit the heat exchanger on the enclosure to ensure that all mounting holes are aligned.
4. Remove the heat exchanger from the enclosure and apply the gasket as shown on the gasket diagram.

***** Caution *****

Be careful not to stretch or tear the gasket material when removing the backing.

5. After the gasket material has been installed, mount the heat exchanger to the enclosure using the nuts and bolts provided with your system. Check to be sure all mounting hardware is tightened securely and the gasket material is in place to maintain enclosure integrity.
6. Connect power to the unit from a properly grounded power supply of sufficient capacity. Check to be sure that both fans or blowers are operating.
** With the fan speed controller option, one or both of the fans might not start if the temperature is below the set point.

Ice Qube Fan Speed Controller Ver. 1.2 (Optional)

The fan speed controller requires an input voltage in the range of 24 through 250 AC or DC. Check the model label for the proper voltage requirements of the heat exchanger. For all DC voltages and for 120 VAC, the power connection is polarity sensitive. The black wire is positive or "hot", the white wire is negative or "neutral", and green is ground. Be careful when handling or adjusting the controller as all components and circuitry are at line voltage except for the alarm outputs which are dry contacts.

Power Up

When power is applied to the heat exchanger, the fan speed controller will automatically sequence through a diagnostic procedure that will check the operation of the fans and the optional alarm relay. Following is the test sequence.

Test Mode

FAN 1 comes ON. If PWM type, FAN 1 starts at minimum speed and ramps up to full speed over a 25 second period with its LED blinking faster during the period. Upon achieving full speed, fan will operate at full speed for 15 seconds. Then FAN 1 goes OFF. LED 1 pulses once per 2 seconds when the fan is off.

If single speed, the fan will operate for forty seconds, LED ON when FAN is ON. Then FAN 1 goes OFF. LED 1 pulses once per 2 seconds. Pause for 3 seconds.

FAN 2 tests just as FAN 1. Pause for 3 seconds.

FAN 1 and 2 test simultaneously as above. Pause for 3 seconds.

ALARM relay activates for 3 seconds. Then system returns to normal operation.

Operation

The Ice Qube fan speed controller has two adjustable set points, one for the ambient fan and one for the enclosure fan. The ambient fan (fan 2) set point has a range of 70° Fahrenheit to 110° Fahrenheit. It is set at 90° F from the factory. The enclosure fan (fan 1) set point has a range of 50° F to 90° F. It is set at 70° F from the factory.

Each fan also has an adjustable top speed differential. The fan will begin to operate at approximately 10% rated speed when the enclosure temperature is at its set point. The fan will ramp up to 100% speed when the temperature is 5°, 10°, 15°, or 20° F above the selected set point. This differential is selected using the four dip switches located on the fan speed controller. Dip switch 1 and 2 control the enclosure fan (fan 1), and dip switch 3 and 4 controls the ambient fan, (fan 2). The differential for both fans is set at 10° F from the factory.

Differential	1	2	3	4
5°	off	off	off	off
10°	off	on	off	on
15°	on	off	on	off
20°	on	on	on	on

Each fan has an LED that will indicate the status of the fans. Normally, with power supplied to the controller and the fans not operating, the LED's will blink at a rate of 1 pulse every 2 seconds. When the fans begin to operate the LED's will blink 1 pulse per second. As the fan speed increases the LED blink speed will increase.

Note: Single speed fans will start and immediately ramp to full speed. However, the LED will blink faster as temperature increases. The rate of pulse increase is dependent upon DIP switch settings.

Fan off temperature will be approximately 5 degrees F (3 degrees C) below fan on setting.

Fan failure alarm

A fan failure is displayed by a continuously lit LED. This alarm is not available for single speed fans and will not activate the alarm relay.

High temperature alarm (Optional)

An alarm relay can provide a high temperature signal through either normally open (NO) or normally closed (NC) dry contacts. The high temperature alarm relay activation will be by default determined by:

$$\text{Fan 2 temperature setting} + \text{DIP switch setting} + 10 \text{ degrees F.}$$

The alarm will automatically reset at when the temperature decreases 10 degrees F.