ICEqube™

Cooling Solutions

Heat Exchangers

OPERATION AND INSTALLATION MANUAL

MSCCT - Multi Surface Cold Core Technology

*** IMPORTANT ***

PLEASE READ this manual and follow the instructions for safe and satisfactory installation and operation of this system. Keep this manual for future reference. Some information may not apply to all systems.

RELATED DRAWING; DO NOT CHANGE WITHOUT AUTHORIZED PERSON APPROVAL

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Introduction

Ice Qube computer and electronics enclosure cooling systems have been designed to provide a safe environment for your equipment. Our cooling systems provide this environment by cooling the enclosure that houses your equipment while providing an efficient, modern, and aesthetically pleasing package requiring minimal maintenance. Our closed-loop circulation design also protects your equipment from air-borne dust and contaminants which may hinder your equipment operations and cause unnecessary downtime. Our systems will maintain at least 5° temperature difference above ambient. Models range from 5.5 to 83 watts/°F cooling capacity.

Basic Unit Operation

The Ice Qube Thermal Management System (TMS) is a combination of several systems that function simultaneously to maintain environmentally friendly conditions for your equipment within the enclosure. The three main thermal related systems that we employ are the closed-loop cold air supply stream, the heat rejection air stream, and our MSCCT, Multi Surface Cold Core Technology heat exchanger.

Within this system are only two moving parts. They are maintenance-free fans/blowers, which are used to move air over the heat exchanger (MSCCT). The enclosure fan moves hot air from the top of the 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.

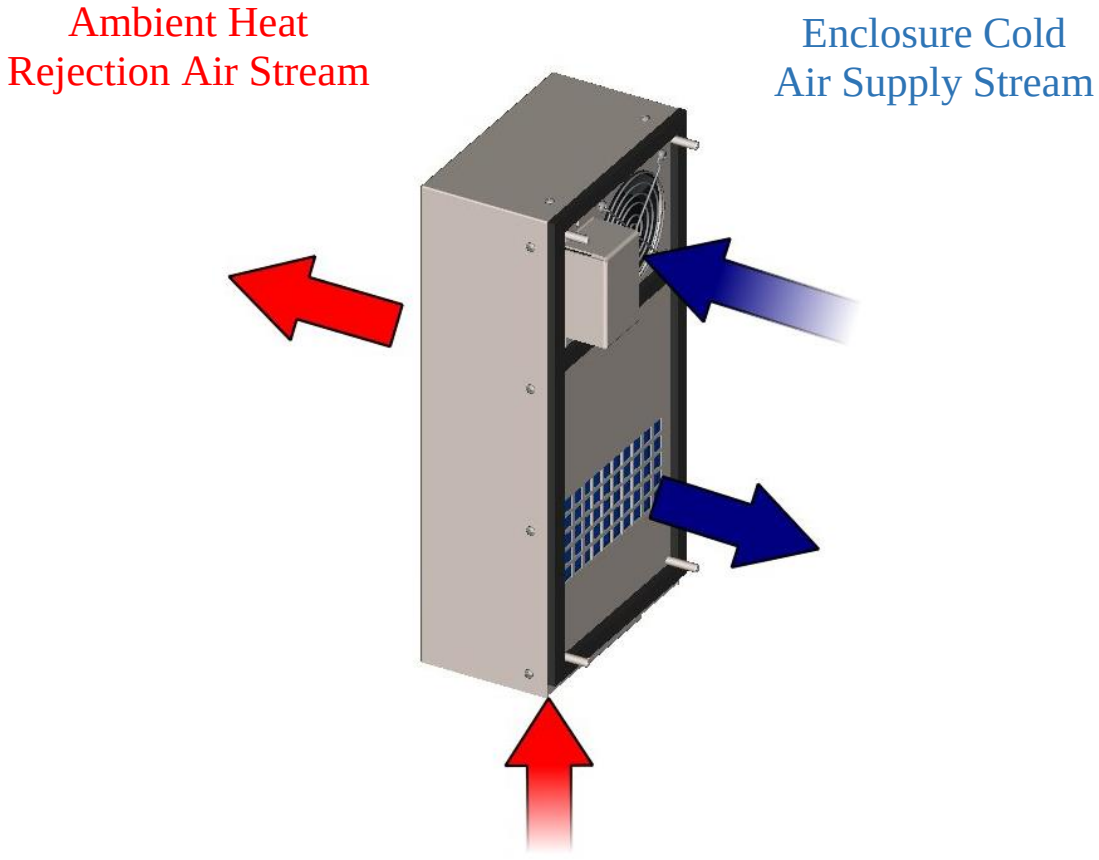

Figure 1: Air Flow

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Preservation Instructions

Unpacking Inspection

Caution: It is recommended using gloves and protective eyewear when unpacking

Verify product is as identified on the packing list. Any evidence of damage should be noted on the freight bill. The freight carriers claim procedure should be followed. **Ice Qube cannot accept responsibility for damages that occur during shipping.** If the shipping container was damaged or marred in any way, check for scratches, dents, loose hardware, presence of oil or any other irregularities with the Ice Qube TMS.

Package Contents

Included in the shipment with the Heat Exchanger will be:

1. Operation manual
2. Mounting hardware
3. Standard master warranty
4. Enclosure gasket
5. Cutout Template (Optional)

Storage

The storage space temperature should be in the range of -40 to 85°C (-40 to 185°F) in a non-condensing environment.

CONDITIONS OF ACCEPTABILITY: When installed in the end use equipment, the following considerations are to be examined:

1. The subject devices must be used within their Recognized "Ratings" and conditions of acceptability as referenced in the User's Manual.

2. Consideration is to be given to the Conditions of Acceptability specified in the individual recognitions when these components are employed in the end-use equipment

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Pre-Installation Test

Before installing the Ice Qube system on your enclosure, Ice Qube recommends that the unit operates for 5-10 minutes to ensure it is functioning properly. Although the Ice Qube TMS has been tested at the factory, internal 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. Ensure that the weight of the unit will be supported. Be sure to allow adequate space for airflow. The cold air supply stream and the heat rejection air stream must not be restricted.

2. Check the data tag for proper electrical requirements. The data tag lists the design voltage and amperage requirements of the system. Verify that the electrical supply where the system will be connected has the proper capacity. After noting the above, connect power from a properly grounded electrical connection. The use of an extension cord is not recommended. ***See* Electrical Installation Instruction *for wiring details.***

   Note: If any unusual noise or vibration is present during the testing procedure, immediately disconnect the power and inspect the exterior of the unit for the cause of noise or vibration. If necessary, Contact Ice Qube immediately to determine cause of the noise/vibration.

3. As soon as power is supplied to the system, both fans will begin to operate.

   Note: If the fan speed controller option is selected, one or both fans might not start if the temperature is below the set point. (Factory set points- Enclosure: 70°F, Ambient: 90°F)

4. After completing the above check point, the Ice Qube TMS is ready to be mounted to your enclosure.

Preparing the Enclosure

Please read entire section before beginning installation. The Ice Qube TMS has been designed to be light in weight for easy installation. These units have been designed with a simple stud alignment feature or hanging tabs to make initial fastening to the enclosure quick and easy. A few modifications must be made to your enclosure to provide proper air flow, maintain enclosure integrity, and assure secure installation. Required modifications will vary with Ice Qube TMS model.

1. Ensure the mounting surface and enclosure will support the weight of the Ice Qube TMS and will not become unstable causing bodily harm or equipment damage. For units mounted on enclosure doors, confirm hinges will support the weight of the Ice Qube TMS. Refer to specification drawings for model weights, which are available at https://www.iceqube.com/.

2. Using the specification drawing, determine the ideal location to install the Ice Qube TMS on your enclosure.

3. Upon deciding the installation location of the Ice Qube TMS on your enclosure, use the cutout drawing to determine the necessary modifications to your enclosure surface needed to accommodate mounting of the Ice Qube TMS. An Electronic copy is available at https://www.iceqube.com/.

4. Ensure the Ice Qube TMS will be mounted level.

5. Ensure the inlet and outlet of the cold air stream will not be restricted by equipment or shelving within your enclosure.

6. Check that the air flow of the warm air stream will not be affected or restricted.

7. Confirm the gasket is properly installed to the Ice Qube TMS. This gasket is required to create a seal against your enclosure and will maintain enclosure integrity.

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Mechanical Installation Instruction

Caution: Protective safety clothing such as helmet, gloves, and steel toe shoes are recommended.

1. Position the Ice Qube TMS so that the two mounting studs are in alignment with the top two 3/8” (9.5mm) holes or the hanging tabs align properly with the cutout, depending on model, in your enclosure surface.

2. Slide the Ice Qube TMS mounting studs through the 3/8” (9.5mm) or 1/2" (12.7mm) depending on model, holes in your enclosure and check to see that all openings are aligned.

3. After checking that all openings and bolt holes are in alignment, assemble and tighten the (2 or 4) ¼”-20 nuts and (2, 4, 6 or 8 depending on model) ¼”-20 x 1” bolts supplied with you Ice Qube TMS by hand. Check to ensure gasket will properly seal the Ice Qube TMS to your enclosure.

4. Using a wrench, tighten the nuts and bolts until the gasket between the heat exchanger and the enclosure is compressed to half the thickness of the gasket. Check the entire perimeter of the gasket/enclosure interface for compression and seal.

5. Mechanical installation is now complete. Continue with the electrical installation of the Ice Qube TMS.

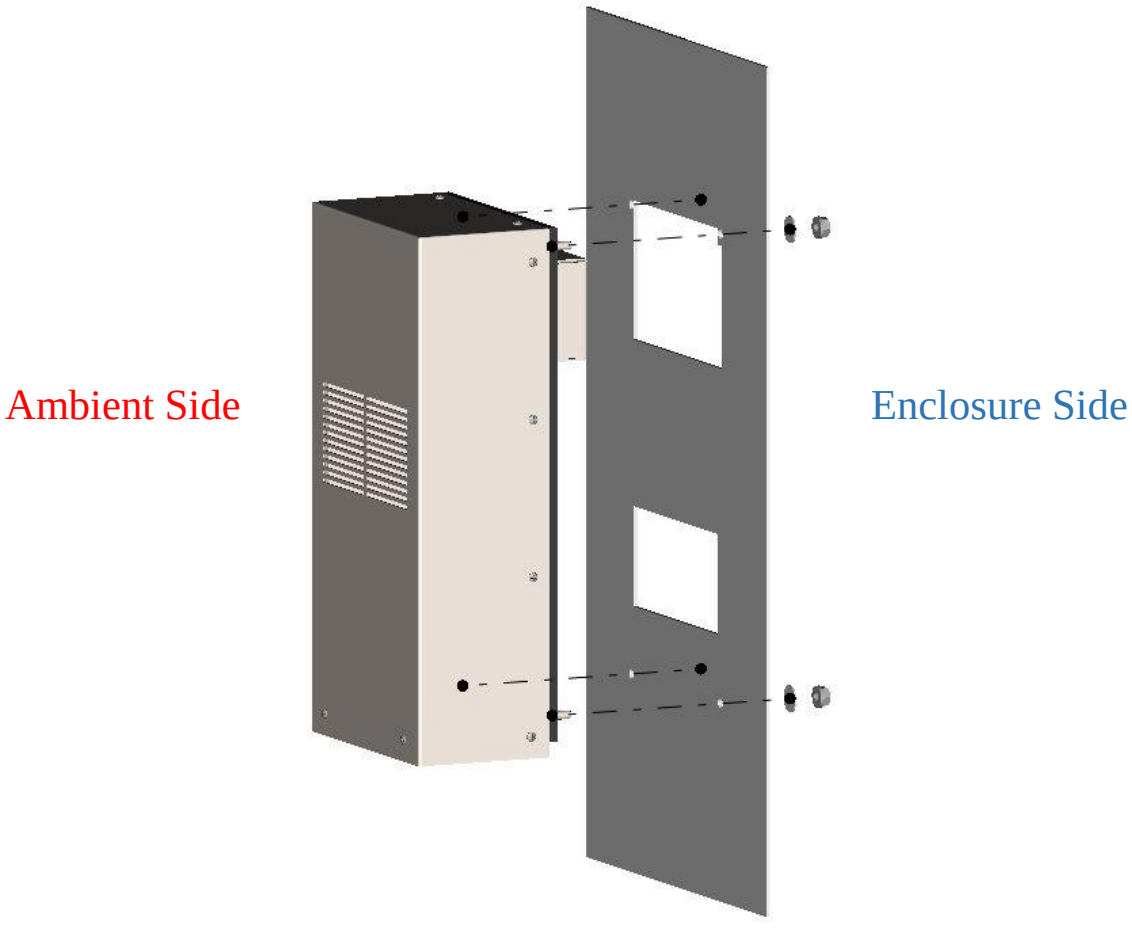

Figure 2: TMS Mounted

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Electrical Installation Instruction

Please read the entire section before beginning the electrical installation of the Ice Qube TMS. Ice Qube heat exchangers have been designed for easy electrical power connection at one specific location on the enclosure side of the Ice Qube TMS. Each Ice Qube TMS been designed to operate at a range of voltages and frequencies. See unit label(s) for correct voltage and frequency for your model(s).

••WARNING: ELECTRICAL SHOCK AND EXPLOSION HAZARD••

Electrical connections should only be completed by a qualified technician. Compliance with all safety and electrical codes are required. Contact local authority having jurisdiction as required. Do not connect while the circuit is energized. Turn off circuit breaker and install lock out.

Pre-Installation Checks

1. Check the heat exchanger model label or specification for power requirements.
2. Check the designated heat exchanger power supply for adequate and proper electrical power requirements.
3. Check that wire routing to the terminal box will not interfere with or become damaged by other components.

Electrical Installation

1. Check that the heat exchanger designated power supply is de-energized and locked out.
2. Locate terminal box on enclosure side of heat exchanger.
3. Remove the (2) terminal box cover screws and remove the cover. (See *Figure 3: Terminal Cover*). The terminal block will be used for power. (*See Figure 4: Terminal Block)*
4. Remove Dome Plug and route power cable through the 0.875”(22.23mm) hole. (See *Figure 3: Terminal*) Use an approved strain relief to secure wires.
5. Connect from top to bottom or left to right, Line 1, Line 2 and Ground. (See *Figure 5: Power Terminal Block*)
6. Once power is securely connected, install terminal box cover, using the (2) screws.

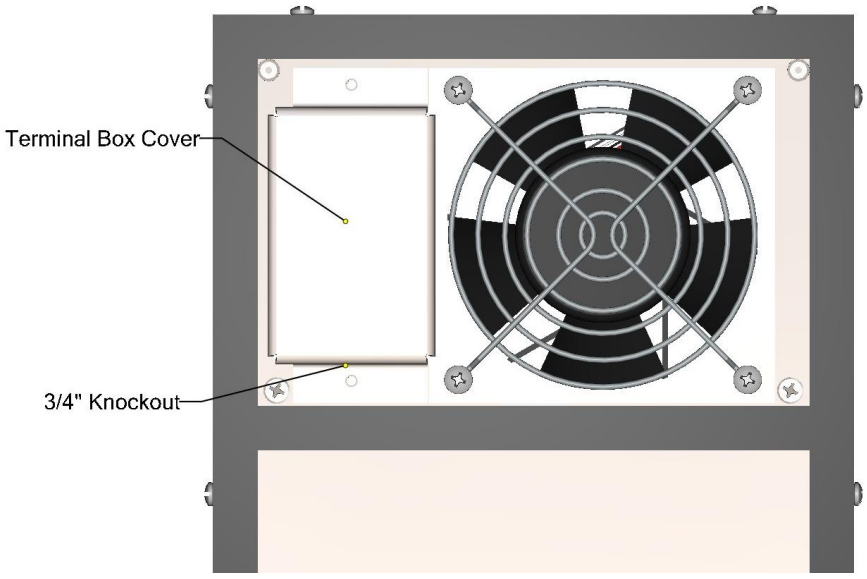

Figure 3: Terminal Cover

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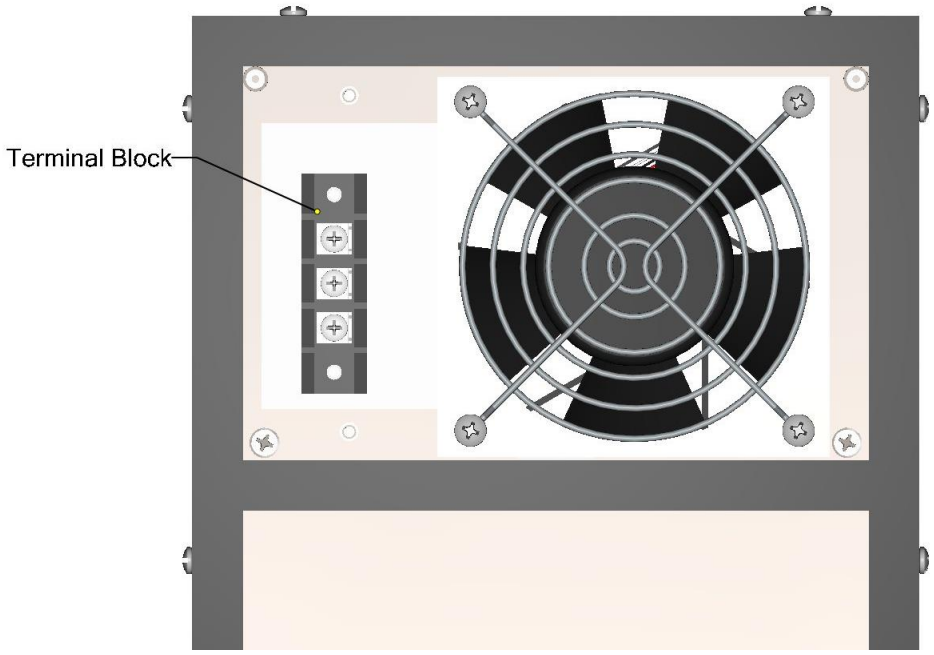
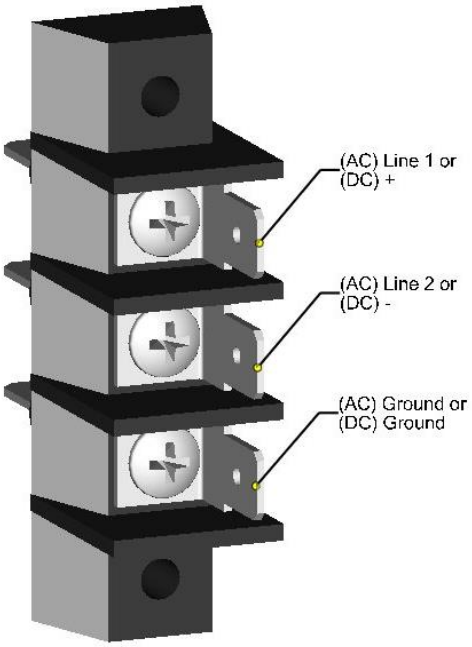


Figure 4: Terminal Block



Verify voltage with model

Figure 5: Power Terminal Block

Operating Your System

Once the Ice Qube TMS has been installed onto the enclosure and the power cable has been attached to a properly grounded electrical connection with adequate voltage and current supply, the unit is ready for operation. As soon as electrical power is supplied to the Ice Qube TMS, both fans will begin to move air through the MSCCT heat exchanger.

Fan Speed Controller (Optional)

Version 1.4

Ice Qube offers an optional fan speed controller that 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 either AC or DC voltages, (+) is positive or "hot" and (-) is negative or "neutral", the power connection is polarity sensitive. 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.

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 s 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°F to 110°F. 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% 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 switches 1 and 2 control the enclosure fan (FAN 1), and dip switches 3 and 4 control the ambient fan (FAN 2). The differential for both fans is set at 10°F from the factory.

Differential	1	2	3	5
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 on the dip switch settings.

Fan off temperature will be approximately 5°F (3°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.

Optional High Temperature Alarm:
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: Fan 2 Temperature + Dip Switch Setting + 10°F

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

Maintenance

Cooling System Cabinet:

The heat exchanger cabinet may also need to be cleaned occasionally. To clean the heat exchanger cabinet, simply wipe it with a damp, lint free cloth. A mild soap solution may be used if necessary.

Trouble Shooting

Contact Ice Qube if the heat exchanger should fail to operate satisfactorily during the first year of operation. DO NOT remove the cover without first notifying customer service. **Removal of the cover will immediately void the warranty.**

If an operating problem should occur, please review the items outlined on the following page "Trouble Shooting Check List." If the problem persists, obtain model and serial number before contacting Ice Qube for technical assistance.

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Trouble Shooting Checklist

Model No:		**Serial Number:**	
Voltage Rating:	**Amps:**	**Phase:**	**Frequency:**
Options:			
Is proper electrical power available at the power supply?		Yes ☐	No ☐
Is your power cord connected to the power supply and IQ terminal block?		Yes ☐	No ☐
Is the enclosure (cold air stream) blower operating?		Yes ☐	No ☐
Is the ambient (warm air stream) blower operating?		Yes ☐	No ☐
Is the enclosure door closed tightly?		Yes ☐	No ☐
Are all of the gaskets in place?		Yes ☐	No ☐
Is the system mounted level on the enclosure?		Yes ☐	No ☐
Is there adequate space within the enclosure for airflow?		Yes ☐	No ☐
Is there adequate space around the heat exchanger for airflow?		Yes ☐	No ☐
Has the enclosure population remained the same?		Yes ☐	No ☐
Notes:			

For additional support call:

Ice Qube at 1-888-867-8234

Please have above checklist completed before you call.

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Schematic/Wiring Diagram

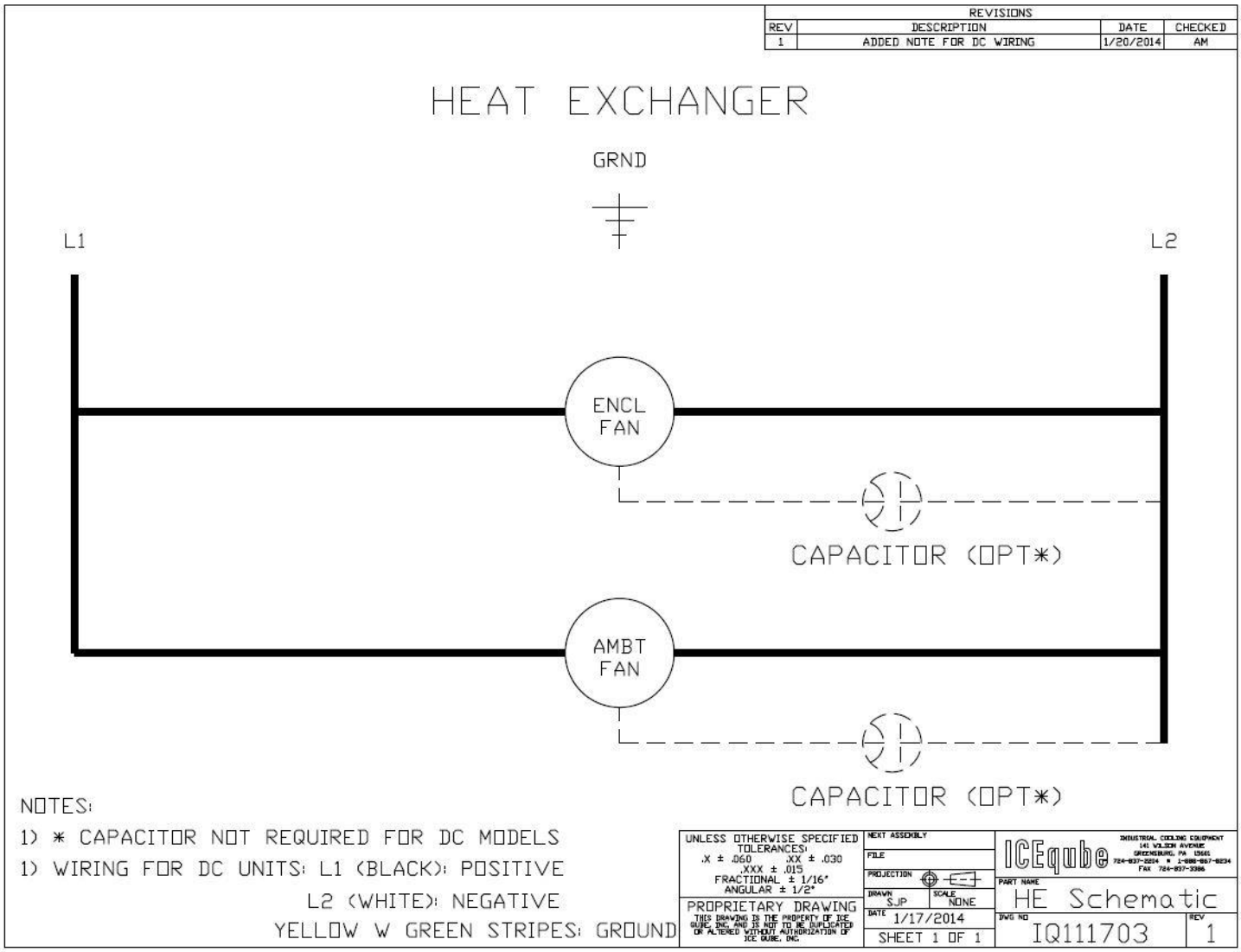

Figure 6

Standard Warranty Policy

Ice Qube, Inc. ("**Ice Qube**") warrants that the products manufactured by Ice Qube (the "**Products**") are free of defects in material and workmanship which impair the operation of the Products, under normal and proper use and service, for a period of one (1) year from the date of shipment FCA from Ice Qube's facility located in Greensburg, Pennsylvania (the "**Standard Warranty**").

In order for this Standard Warranty to apply, the Product(s) must be installed and operated according to and consistent with the following conditions:

- Operation within the rated voltage on the label of the Product;
- Frequency variation no greater than +/- 3 HZ from rated frequency on the label of the Product;
- Ambient temperature must not exceed operating temperature range on the label of the Product;
- Maximum cooling capacity not to exceed rating (BTU/HR) as rated on the label of the Product; and
- The Product must be installed, maintained and operated consistent with the terms and conditions set forth in the operation manual.

THIS STANDARD WARRANTY DOES NOT COVER THE FOLLOWING:

- Ice Qube assumes no liability beyond the repair or replacement of its own Products. In no event shall Ice Qube be liable for any incidental, special, indirect, consequential or similar damages incurred by any purchaser, owner, possessor, assignee or successor in interest or any other third party having any interest in any Product as the result of any breach of this Standard Warranty, including but not limited to loss of profit or revenues, damages for loss of use of the Products, damage to property, both real and personal, claims of third parties, including personal injury or death on account of use of the Products or failure of Ice Qube to warn against or instruct on or adequately warn against or instruct on, the dangers of the Products or the safe and proper use of the Products, whether or not customer has been advised of the potential for such damages.
- Ice Qube's total liability for customer's claims from any cause whatsoever, whether arising under contract, warranty, tort (including negligence), strict liability, products liability or any other theory of liability, will be limited to the lesser of customer's actual damages or the price paid by customer to Ice Qube for the Products (not including applicable taxes, duties and freight charges) that are the subject of customer's claim.

THE WARRANTY SET FORTH HEREIN IS STRICTLY LIMITED TO ITS TERMS AND IS IN LIEU OF ALL OTHER WARRANTIES, GUARANTEES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW, COURSE OF DEALING, CUSTOM, USAGE OF TRADE OR OTHERWISE, SPECIFICALLY EXCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE.

1. The warranty and remedies for breach of warranty provided for in this Standard Warranty extend only to the original installation and do not cover, and Ice Qube will neither assume responsibility, nor be liable, for the following:
   - misapplication of its Products or the erroneous selection of an inappropriate Product by a non-authorized Ice Qube representative;
   - use of the Product for other than its designed purpose or operating conditions;
   - operation or storage in harsh, oily, corrosive or other abnormal environments without the proper filtration, sealing, protective coatings and/or weather protection;
   - damage to the hermetic system resulting from continuous operation with dirty or clogged air filters or improper or negligent maintenance;
   - use of refrigerant other than designated on the label of the Product;
   - customer modification or abuse;
   - shipping damage or other accidental damage (It is Ice Qube's standard policy that freight claims are the responsibility of the customer if the Product is not refused at delivery);
   - repair, damage or service of the Product caused by anyone except personnel authorized by Ice Qube;
   - cracked or broken hermetic tubing, brazed joints or other internal damage caused by shipping or mishandling;
   - damage caused by shipping units attached to an enclosure;
   - any and all damage, breakage, malfunction or other like conditions or defects resulting from noncompliance with the standard operation, care, installation, maintenance and use of the Product as set forth in the operation manual for such Product;
   - any cause beyond the control of Ice Qube, including without limitation conditions caused by movement, settlement or structural defects of the environment in which the Products are installed;

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- fire, wind, hail, flood, lightning or other acts of God;
- any damage to the finish of the Products after they leave Ice Qube's facility;
- any discoloration or spotty appearance of the Products;
- return freight and shipping charges, along with applicable duties and other like fees and charges, for the return of the Product to Ice Qube (such amounts are the sole responsibility of the customer);
- failure to process or inaccurate processing of time-sensitive information and/or mechanisms; or
- Exposure to harmful chemicals, pollutants or other foreign matter or energy.

2. All returns must have a RMA number and must be marked with the RMA number on the bill of lading and on the packaging.

3. Upon resale, customer agrees to extend to its customers no greater warranties, and limit its liability and remedies to the same extent, as those set forth herein.

4. All Product literature is for illustrative purposes only and does not contain a warranty of any kind.

5. Ice Qube's advice relating to the technical usage of the Products or the intellectual property rights of others, whether provided orally or in writing or through the provision of test results, is given in accordance with Ice Qube's best knowledge at that time, but shall at all times be deemed to be non-binding. Such advice does not relieve customer from the obligation, and customer accepts full responsibility, to confirm for itself the suitability of the Products for their intended purpose(s).

Remedies

Customer's sole and exclusive remedy, and Ice Qube's only obligation for breach of warranty hereunder shall be, at Ice Qube's option, in its sole discretion, to (i) repair or replace the defective Product which fails within the one (1) year warranty period, free of charge, provided that customer promptly notifies Ice Qube of such failure and, after receipt of prior written authorization and return authorization number from Ice Qube, which will be given or withheld at Ice Qube's sole discretion, returns such Product to Ice Qube, Inc., 141 Wilson Avenue, Greensburg, PA 15601, USA or such other place as requested by Ice Qube, freight prepaid, and thereupon Ice Qube finds such to be defective or (ii) issue a credit equal to the price of the defective Product which fails within the one (1) year warranty period. Customer must pay all related costs of repair or replacement, including removal, installation or reinstallation costs. Ice Qube's personnel must be granted access to inspect the Products claimed to be defective at the site of their installation or use. Products repaired or replaced and designs corrected under this Standard Warranty are warranted only for the remainder of the original warranty period.

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Notes:

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