

Warranty

For warranty information visit:

www.manitowocice.com/Service/Warranty

- Warranty Coverage Information
- Warranty Registration
- Warranty Verification

Warranty coverage begins the day the ice machine is installed.

Warranty Registration

Completing the warranty registration process is a quick and easy way to protect your investment.

Scan the QR code with your smart device or enter the link in a web browser to complete your warranty registration.



WWW.MANITOWOCICE.COM/SERVICE/WARRANTY#WARRANTY-REGISTRATION

Registering your product insures warranty coverage and streamlines the process if any warranty work is required.

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Chapter 2 Installation

Location of Ice Machine

The location selected for the ice machine must meet the following criteria. If any of these criteria are not met, select another location.

1. The location must be indoors and free from airborne and other contaminants.
2. The ambient temperature must be:
 - HE0070: Higher than 50 °F (10 °C) and lower than 110 °F (43 °C) .
 - HE0120: Higher than 35 °F (1.6 °C) and lower than 110 °F (43 °C)
3. Water inlet lines - water pressure to the machine must be:
 - HE0070: Above 34 psi (2.4 bar) and below 90 psi (6.2 bar).
 - HE0120: Above 20 psi (1.4 bar) and below 80 psi (5.6 bar).
4. The location must not be near heat-generating equipment or in direct sunlight.
5. The location must be capable of supporting the weight of the ice machine and a full bin of ice.
6. The location must allow enough clearance for water, drain and electrical connections in the rear of the ice machine.
7. The ice machine must use legs or be sealed to the floor. Before sealing to the floor, the rubber bumpers on the bottom of the ice machine must be removed.
8. The location must not obstruct airflow through or around the ice machine. Refer to the clearance requirements chart.

Warning

Do not obstruct ice machine vents or openings.

Notice

The ice machine must be protected if it will be subjected to temperatures below 32°F (0°C). Failure caused by exposure to freezing temperatures is not covered by the warranty.

Clearance Requirements

H0070 H0120	Self-Contained Air-Cooled	Self-Contained Water-Cooled
Top/Sides	5"(127mm)*	5"(127mm)*
Back	5"(127mm)*	5"(127mm)*

*There is no minimum clearance requirement for the top or left and right sides of the ice machine. The listed values are recommended for efficient operation and servicing only.

NOTE: The ice machine may be built into a cabinet.

Ice Machine Heat of Rejection

Ice Machine Model	Heat of Rejection ¹	
	Air conditioning ²	Peak
H0070	1600	2350
H0120	1750	2600

1. BTU/Hour

2. Because the heat of rejection varies during the ice making cycle. The listed values are average values.

Ice machines, like other refrigeration equipment, reject heat through the condenser. It is helpful to know the amount of heat rejected by the ice machine when sizing air conditioning equipment where self-contained air-cooled ice machines are installed.

Leveling the Ice Machine

After moving the ice machine into the installation location, it must be leveled for proper operation. Follow these steps to level the ice machine:

1. Screw the leveling legs onto the bottom of the ice machine.
2. Screw the foot of each leg in as far as possible.

 Caution

The legs must be screwed in tightly to prevent them from bending.

3. Move the ice machine into its final position.

 Warning

Do not obstruct ice machine vents or openings.

4. Level the ice machine by using a level on top of the ice machine. Turn each foot as necessary to level the ice machine from front to back and side to side.

Electrical Service

 Warning

All wiring must conform to local, state and national codes.

 Warning

When in use, be sure to power the ice machine according to the specifications marked on the Model/Serial Plate.

VOLTAGE

The maximum allowable voltage variation is $\pm 10\%$ of the rated voltage at ice machine start-up (when the electrical load is highest).

FUSE/CIRCUIT BREAKER

A separate fuse/circuit breaker must be provided for each ice machine. Circuit breakers must be H.A.C.R. rated (does not apply in Canada).

 Warning

The ice machine must be grounded in accordance with national and local electrical codes.

TOTAL CIRCUIT AMPACITY

The total circuit ampacity is used to determine the wire size of the power supply line.

The wire size (or gauge) is also dependent upon location, materials used, length of run, etc. This must be determined by a qualified electrician.

GROUND FAULT CIRCUIT INTERRUPTER

Ground Fault Circuit Interrupter (GFCI/GFI) protection is a system that shuts down the electric circuit (opens it) when it senses an unexpected loss of power, presumably to ground. CHOICE does not recommend the use of a GFCI/GFI circuit protection with our equipment. If code requires the use of a GFCI/GFI, then you must follow the local code. The circuit must be dedicated, sized properly, and there must be a panel GFCI/GFI breaker. We do not recommend GFCI/GFI outlets, as they are known for more intermittent nuisance trips than panel breakers.

 Warning

If the power cord of the ice machine is damaged, do not operate the machine until it has been replaced by an authorized service provider or qualified personnel.

ELECTRICAL SPECIFICATIONS

Important

Due to continuous improvements, this information is for reference only. Please refer to the ice machine serial number tag to verify electrical data. Serial tag information overrides information listed on this page.

Ice Machine	Voltage/ Phase/ Cycle	Air-Cooled		Water-Cooled	
		Maximum Fuse/Circuit Breaker	Total Amps	Maximum Fuse/Circuit Breaker	Total Amps
H0070	230/1/50	15	3.8		
H0120	230/1/50	15	4.0		

Water Supply & Drain Connections

Drinking Water Supply

According to the local water quality, determine whether it is necessary to install a water treatment system to avoid the formation of sediment and to filter out impurities and remove the smell of bleaching powder.

Important

When installing a Manitowoc water filtration system, be sure to follow the instructions provided with the filtration system for pipe installation.

Follow these guidelines to install the water inlet lines:

1. If you are installing a water filter system, refer to the installation instructions supplied with the filter system for ice making water inlet connections.
2. Do not connect the ice machine to a hot water supply. Be sure all hot water restrictors installed for other equipment are working. (Check valves on sink faucets, dishwashers, etc.)
3. If water pressure exceeds the maximum recommended pressure, obtain a water pressure regulator from your local distributor.
4. Install a water shut-off valve and union for both the ice-making and condenser water lines.
5. Insulate water inlet lines to prevent condensation.

Drain Connections

- Drain lines must have a 1.5 inch (3.8 cm) drop of run for each meter (3 feet), and must not create traps.
- The floor drain must be large enough to accommodate drainage from all drains.
- Run separate bin, Ice Water Out and water-cooled condenser drain(when applicable) lines. Insulate them to prevent condensation.
- Vent the Ice Water Out drain. Do not vent the bin drain or condenser drain on water-cooled models.

COOLING TOWER APPLICATIONS

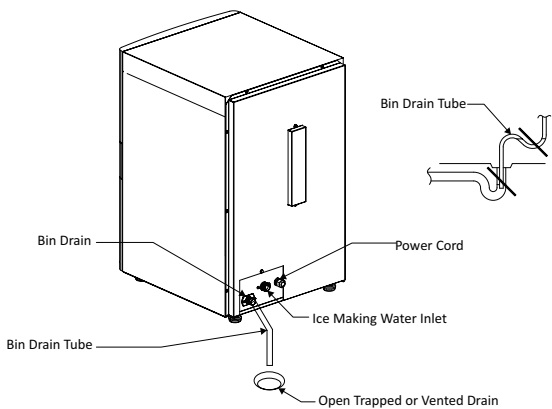
(Water-Cooled Models)

A water cooling tower installation does not require modification of the ice machine. The water regulator valve for the condenser continues to control the refrigeration discharge pressure.

It is necessary to know the amount of heat rejection and the pressure drop through the condenser and water valves (inlet and outlet) when using a cooling tower on an ice machine.

- Water entering the condenser must not exceed 90°F (32°C).
- Water flow through the condenser must not exceed 5 gallons (19 liters) per minute.
- Allow for a pressure drop of 7 psi (48 kPa) between the condenser water inlet and the outlet of the ice machine.
- Water exiting the condenser must not exceed 110°F (43°C).

Water Supply and Drain Line Sizing/Connections



Location	Ice Making Water Inlet	Bin Drain
HE0070 Inlet Water Tempe.	50°F (10°C) Min. 90°F (32°C) Max.	--
HE0070 Inlet Water Pressure	34 psi (240 kPa) Min. 90 psi (6200 kPa) Max.	--
HE0120 Inlet Water Tempe.	33°F (0.6°C) Min. 90°F (32°C) Max.	--
HE0120 Inlet Water Pressure	20 psi (140 kPa) Min. 80 psi (550 kPa) Max.	--
Ice Machine Fitting	3/4" GAS Thread	7/8" Fitting Barbed

Before Starting the Ice Machine

All CHOICE ice machines are factory-operated and adjusted before shipment. Normally, new installations do not require any adjustment.

To ensure proper operation, follow the Operational Checks as specified in Section 3. Completing the Operational Checks is the responsibilities of the owner.

Adjustments and maintenance procedures outlined in this manual are not covered by the warranty.

⚠ Warning

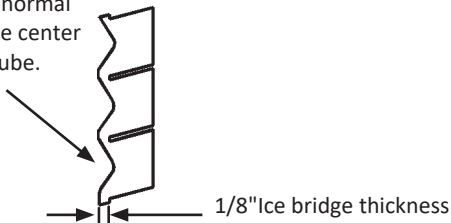
Personal Injury Potential - Do not operate equipment that has been misused, abused, neglected, damaged, or altered/modified from that of original manufactured specifications.

ICE THICKNESS ADJUSTMENT

The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8" (3.2 mm).

1. Inspect the bridge connecting the cubes. It should be about 1/8" (3.2 mm) thick.

Notice the normal dimple in the center of the cube.



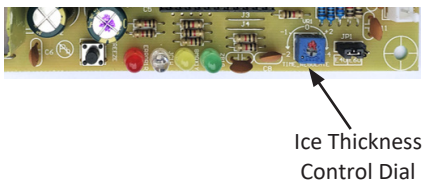
2. If adjustment is necessary, please follow bellow steps:

HE0070:

Step 1 Remove the front panel and the contral box cover, find the ice thickness control dial on the contral board.

Step 2 Turn the ice thickness control dial clockwise to

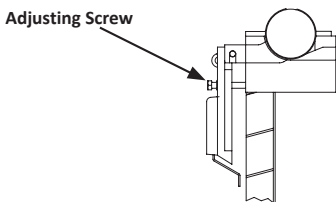
increase bridge thickness or counterclockwise to decrease bridge thickness.



HE0120:

Step 1 Turn the ice thickness control probe adjusting screw clockwise to increase bridge thickness, or counterclockwise to decrease bridge thickness.

Step 2 Turning the adjustment 1/3 of a turn will change the ice thickness about 1/16" (1.5 mm).



NOTE: Make sure the ice thickness probe wire and the bracket do not restrict movement of the probe.

Checklist

- ☐ Is the ice machine level?
- ☐ Has all the inner packaging been removed?
- ☐ Have all of the electrical and water connections been made?
- ☐ Has the supply voltage been tested and checked against the rating on the nameplate?
- ☐ Are all components installed?
- ☐ Has the ice machine been installed where ambient temperatures will remain in the range of 50 °F - 110 °F (10 °C - 43 °C) for HE0070/35°F - 110 °F (1.6 °C - 43 °C) for HE0120?
- ☐ Has the ice machine been installed where the incoming water temperature will remain in the range of 50 °F - 90 °F (10 °C - 32 °C) for HE0070/33°F - 90 °F (0.6 °C - 32 °C) for HE0120?
- ☐ Are all electrical leads free from contact with refrigeration lines and moving equipment?
- ☐ Has the owner/operator been instructed regarding maintenance and the use of Manitowoc Cleaner and Sanitizer?
- ☐ Has the owner/operator completed the warranty registration?
- ☐ Has the ice machine and bin been sanitized?
- ☐ Has this manual been given to the owner/operator?
- ☐ Is the on-off-wash switch set to the ON position?

Chapter 3 Operation

HE0070

ICE MAKING SEQUENCE OF OPERATION

INITIAL START-UP OR START-UP AFTER AUTOMATIC SHUT-OFF

1. Water Inlet and Pressure Equalization
 - Turn the toggle switch to “ICE” position, the water inlet valve energized, 180 seconds later, the hot gas valve solenoid is energized, 45 seconds after the hot gas valve solenoid is energized, the compressor is energized.
2. Refrigeration System Start-up
 - 5 seconds after the compressor is energized, the hot gas valve solenoid and water inlet valve are de-energized, the fan motor is energized, ice machine goes into pre-chill cycle.

FREEZE SEQUENCE

3. Pre-chill Cycle
 - 30 seconds after the compressor is energized, the water pump is energized, ice machine goes into freeze cycle.
4. Freeze Cycle
 - After 30 seconds of pre-chill, the water pump starts working, and water flows evenly through the evaporator, and through each ice cube tray, and freezes into ice.
 - After 6 minutes in freeze cycle, the control board will read temperature of the condenser outlet. Based on this temperature the control board automatically determines duration of the ice making process.
 - When the freeze cycle is end, water pump and fan motor are de-energized. (Else if the condenser

outlet temperature is greater than 45 °C one minute before the beginning of freeze sequence, the fan will keep working during harvest cycle.)

HARVEST CYCLE

5. Harvest Cycle

- One minute before the end of freeze cycle, the control board will read temperature of the condenser outlet. Based on this temperature the control board determines the duration of ice harvesting.
- When the freeze cycle is end, water pump and fan motor are de-energized, ice machine goes into harvest cycle. (If the condenser outlet temperature is greater than 45 °C one minute before freeze sequence beginning, the fan will keep working during ice collection)
- When ice machine goes into harvest cycle the hot gas valve and water inlet valve are energized. 40 seconds later, the water inlet valve is de-energized.
- The hot gas valve also opens to divert hot refrigerant gas into the evaporator. The refrigerant gas warms the evaporator causing the cubes to slide, as a sheet, off the evaporator and into the storage bin.
- After ice harvesting is completed, the ice machine goes into a new pre-chill cycle(step 3).

FULL OF BIN

6. Automatic shutdown

- When the storage bin is full, the ice will come in contact with the bin thermistor which is located inside the bin. When the bin thermistor temp is less than or equal to "low temp setting", machine will shut down automatically. Once a 3 minute delay has elapsed and bin thermistor temp is greater than "high temp setting", ice machine will restart (step 1-2).

ENERGIZED PARTS CHART

Sequence		Control Board Relays				Length of "ON" Time
		Water Pump	Water Inlet Valve	Hot Gas Valve	Fan Motor	
Initial Start-up or Start-up After Automatic Shut-Off	Water Fill	OFF	ON	OFF	OFF	180 Seconds
	Balance	OFF	ON	ON	OFF	45 Seconds
	Refrigeration System Start-up	OFF	ON	ON	OFF	5 Seconds
Freezing Sequence	Pre-chill	OFF	OFF	OFF	ON	30 Seconds
	Freeze	ON	OFF	OFF	ON	6min+Auto.
Harvest Sequence		OFF	ON	OFF*	ON	WIV - 40S HGV - Auto.
Automatic Shut-off		OFF	OFF	OFF	OFF	
*Fan Motor may ON: If the condenser outlet temperature is greater than 45 °C one minute before the beginning of freeze sequence, the fan will keep working during harvest cycle.						

OPERATIONAL CHECKS

GENERAL

Your ice machine was factory-operated and adjusted before shipment. Normally, a newly installed ice machine does not require any adjustment.

To ensure proper operation, always follow these Operational Checks when starting the ice machine:

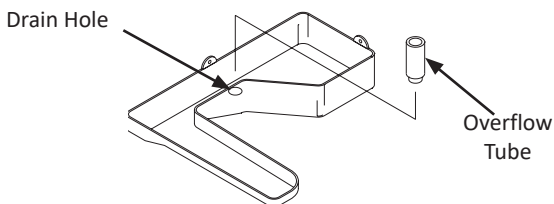
- For the first time
- After a prolonged out of service period
- After cleaning and sanitizing

NOTE: Routine adjustments and maintenance procedures outlined in this manual are not covered by the warranty.

WATER INLET VALVE CHECK

The water inlet valve is energized during the ice harvesting process, and the water level will rise until it flows out of the overflow tube into the drain hole. Make sure the overflow tube is installed in place in the water trough.

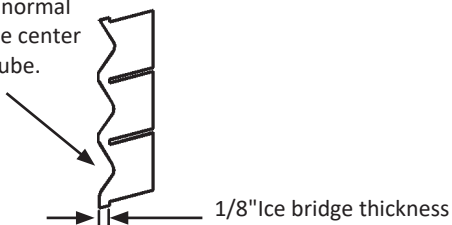
NOTE: The water level in the water trough is not adjustable.



ICE THICKNESS ADJUSTMENT

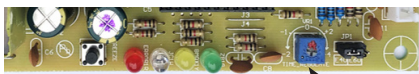
The TIME REGULATE is factory-set to maintain the ice bridge thickness at 1/8 in.(3.2 mm).

Notice the normal dimple in the center of the cube.



Step 1 Inspect the bridge connecting the cubes. It should be about 1/8 in. (3.2 mm) thick.

Step 2 If adjustment is necessary, remove the front panel and the control box cover, find the ice thickness control dial on the control board. Turn the ice thickness control dial clockwise to increase bridge thickness or counterclockwise to decrease bridge thickness.



Ice Thickness
Control Dial

SAFTY LIMITS

SAFTY LIMITS #1—FREEZING TIME LIMIT

If the freeze time exceeds 36 minutes for 3 consecutive freeze cycle, the ice machine will automatic stop and the orange light on control board flashes slowly until the toggle switch is turned to OFF.

SAFTY LIMITS #2—HARVEST TIME LIMIT

If the harvest time exceeds 5 minutes for 3 consecutive harvest cycle, the ice machine will automatic stop and the orange light on control board flashes quickly until the toggle switch is turned to OFF.

LED DEFINITION

Red Light	Light on	Condenser outlet Temp. >80 °C or < 5 °C
	Flash (1time/1s)	The bin thermistor malfunction
Orange Light	Flash (1time/1s)	Safety limit #1
	Flash Rapidly (4 times/s)	Safety limit #2
Yellow Light	Light on	The storage bin full
	Flash (1time/1s)	Washing model
	Flash Rapidly (4 times/s)	Finish washing
Green Light	Light on	Freeze cycle
	Flash (1time/1s)	Initial start-up, water in
	Flash Rapidly (4 times/s)	Harvest cycle

NOTE: When the ice machine standby, all LED lights on.

HE0120

ICE MAKING SEQUENCE OF OPERATION

INITIAL START-UP OR START-UP AFTER

AUTOMATIC SHUT-OFF

1. Pressure Equalization

- Before the compressor starts the hot gas valve is energized for 15 seconds to equalize pressures during the initial refrigeration system start-up.

2. Refrigeration System Start-Up

- The compressor starts after the 15-second pressure equalization, and remains on throughout the entire Freeze and Harvest Sequences. The hot gas valve remains on for 5 seconds during initial compressor start-up and then shuts off.

FREEZE SEQUENCE

3. Prechill

- The compressor is on for 30 seconds prior to water flow to Prechill the evaporator.

4. Freeze

- The water pump starts after the 30-second Prechill. An even flow of water is directed across the evaporator and into each cube cell, where it freezes.
- When sufficient ice has formed, the water flow (not the ice) contacts the ice thickness probe. After approximately 7 seconds of continual water contact, the Harvest Sequence is initiated. The ice machine cannot initiate a Harvest Sequence until a 6-minute freeze time has been surpassed.

HARVEST SEQUENCE

5. Harvest

- The water pump de-energizes stopping flow over the evaporator. The rising level of water in the water trough diverts water out of the overflow tube, purging excess minerals from the water trough. The hot gas valve also opens to divert hot refrigerant gas into the evaporator.
- The refrigerant gas warms the evaporator causing the cubes to slide, as a sheet, off the evaporator and into the storage bin. The sliding sheet of cubes contacts the ice damper, opening the bin switch. The momentary opening and re-closing of the bin switch terminates the Harvest Sequence and returns the ice machine to the Freeze Sequence (steps 3 - 4).

AUTOMATIC SHUT-OFF

6. Automatic Shut-Off

- When the storage bin is full at the end of a Harvest Sequence, the sheet of cubes fails to clear the ice damper and will hold it down. After the ice damper is held open for 7 seconds, the ice machine shuts off. The ice machine remains off for 3 minutes before it can automatically restart.
- The ice machine remains off until enough ice has been removed from the storage bin to allow the ice to fall clear of the damper. As the ice damper swings back to the operating position, the bin switch recloses and the ice machine restarts (steps 1 - 2), provided the 3-minute delay period is complete.

ENERGIZED PARTS CHART

Sequence		Control Board Relays				Relay		Length of "ON" Time
		Water Pump	Hot Gas Valve	Relay Coil	Comp.	Fan Motor		
Initial Start-up or Start-up After Automatic Shut-Off	Pressure Equalization	OFF	ON	OFF	OFF	OFF	15 Seconds	
	Refrigeration System Start-up	OFF	ON	ON	ON	ON	5 Seconds	
Freezing Sequence	Pre-chill	OFF	OFF	ON	ON	ON	30 Seconds	
	Freeze	ON	OFF	ON	ON	ON	Until 7 sec. water contact with ice thickness probe	
Harvest Sequence		OFF	ON	ON	OFF	ON	Bin switch activation	
Automatic Shut-off		OFF	OFF	OFF	OFF	OFF	Until bin switch recloses	
* Condenser Fan Motor: The fan motor is wired through a fan cycle pressure control, therefore, it may cycle on and off.								

SAFTY LIMITS

SAFTY LIMITS #1—FREEZING TIME LIMIT

If the freeze time reaches 60 minutes, the control board automatically initiates a harvest cycle.

3 consecutive cycles outside the time limit= 1 hour Stand-by Mode.

If the toggle switch is turned to OFF then to ICE position, the ice machine will re-start.

SAFTY LIMITS #2—HARVEST TIME LIMIT

If the harvest time reaches 3.5 minutes, the control board automatically return the ice machine to the freeze cycle.

3 consecutive cycles outside the time limit = Safety Limit (must be MANUALLY reset)..

If the toggle switch is turned to OFF then to ICE position, the ice machine will re-start.

SAFETY LIMIT STAND-BY MODE

The first time a safety limit shut down occurs, the ice machine turns off for 60 minutes (Stand-by Mode).

The ice machine will then automatically restart to see if the problem reoccurs. During the Stand-by Mode the harvest light will be flashing continuously and a safety limit indication can be viewed. If the same safety limit is reached a second time (the problem has reoccurred), the ice machine will initiate a safety limit shut down and remain off until it is manually restarted. During a safety limit shut down the harvest light will be flashing continuously.

OPERATIONAL CHECKS

GENERAL

Your ice machine was factory-operated and adjusted before shipment. Normally, a newly installed ice machine does not require any adjustment.

To ensure proper operation, always follow these Operational Checks when starting the ice machine:

- for the first time;
- after a prolonged out of service period;
- after cleaning and sanitizing.

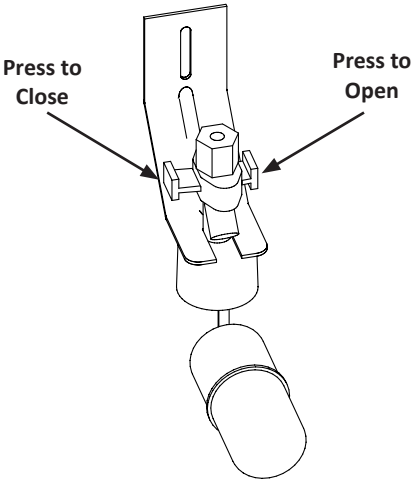
NOTE: Routine adjustments and maintenance procedures outlined in this manual are not covered by the warranty.

Important

It is recommended that adjustments made to this ice machine be made by a qualified technician. Improper adjustment may seriously affect the life of this ice machine.

WATER FLOAT VALVE CHECK

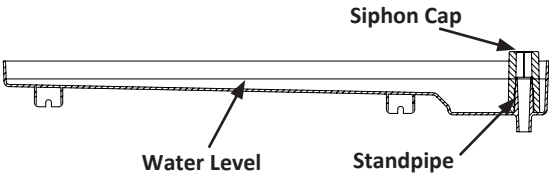
Before water will flow into the water trough the float valve shut-off must be in the OPEN position.



SIPHON SYSTEM

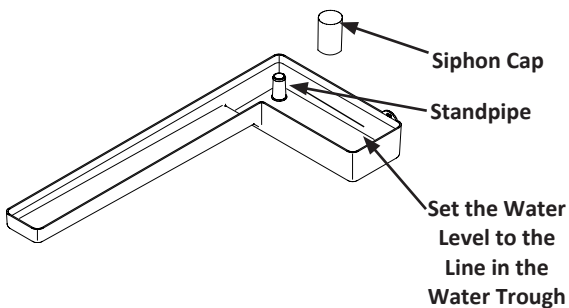
To reduce mineral build-up and cleaning frequency, the water in the sump trough must be purged during each harvest cycle.

When the water pump de-energizes the level in the water trough rises above the standpipe starting a siphon action. The siphon action stops when the water level in the sump trough drops. When the siphon action stops, the float valve refills the water trough to the correct level.



WATER LEVEL CHECK

Check the water level while the ice machine is in the ice mode and the water pump is running. The correct water level is 1/4" (6.3 mm) to 3/8" (9.5 mm) below the top of the standpipe a line in the water trough indicates the correct level.



SIPHON SYSTEM CHECK

The float valve is factory-set for the proper water level. If adjustments are necessary:

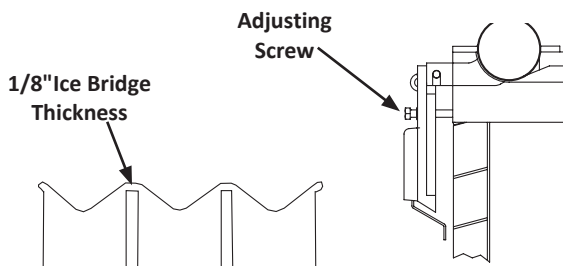
1. Verify the ice machine is level (see "Leveling the Ice Machine" on page 20).
2. Remove the siphon cap from the standpipe.
3. Place the main ON/OFF/WASH toggle switch to the ON position, and wait until the float valve stops adding water.
4. Adjust the water level to (1/4" to 3/8" [6.3 to 9.5 mm] below the standpipe) the line in the water trough.
5. Loosen the two screws on the float valve bracket.
6. Raise or lower the float valve assembly as necessary, then tighten the screws.
7. Move the main ON/OFF/ WASH toggle switch to the OFF position. The water level in the trough will rise above the standpipe and run down the drain.
8. Replace the siphon cap on the standpipe, and verify water level and siphon action by repeating steps 3 through 5.

ICE BRIDGE THICKNESS CHECK

The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8" (3.2 mm).

1. Inspect the bridge connecting the cubes. It should be about 1/8" (3.2 mm) thick.
2. If adjustment is necessary, turn the ice thickness probe adjustment screw clockwise to increase bridge thickness, or counterclockwise to decrease bridge thickness.

NOTE: Turning the adjustment 1/3 of a turn will change the ice thickness about 1/16" (1.5 mm).



NOTE: Make sure the ice thickness probe wire and the bracket do not restrict movement of the probe.

Chapter 4 Maintenance

General

The end user is responsible for maintaining the ice machine in accordance with the instructions in this manual. Maintenance procedures are not covered by the warranty.

Cleaning and maintenance of the ice machine can improve its reliability, increase performance, and help save on water and power consumption. Ice production will be maintained within the manufacturer's guidelines, and unwanted repairs due to maintenance issues will be minimized.

If there are heavy scale deposits, consult a qualified water company and ask them to test the water quality and recommend an appropriate water treatment method. A dirty ice machine must be disassembled, descaled, and sanitized.

Sanitizing can be performed independently and more frequently than de-scaling if desired.

Manitowoc ice machine de-scaler and sanitizer are the only products approved for use on CHOICE ice machines.

Caution

Use only approved Ice Machine Descaler and Sanitizer for this application (Manitowoc De-scaler part number 000016525 and Manitowoc Sanitizer part number 000016528). It is a violation of Federal law to use these solutions in a manner inconsistent with their labeling. Read and understand all labels printed on bottles before use.

Caution

Do not mix the de-scaler and sanitizer solutions together. Failure to follow the instructions on the label will violate relevant laws.

Warning

Wear rubber gloves and safety goggles (and/or face shield) when handling Ice Machine De-scaler or Sanitizer.

Detailed De-scaling and Sanitizing Procedure

Ice machine de-scaler is used to remove lime scale and mineral deposits.

Ice machine sanitizer disinfects and removes algae and slime.

De-scale and sanitize the ice machine at least every six months.

- The ice machine and storage bin should be descaled and sanitized separately.
- All ice cubes must be discarded during de-scaling and sanitizing.
- Remove all mineral deposits in areas in direct contact with water.

DE-SCALING PROCEDURE

Step 1 Ice must not be on the evaporator during the de-scale/sanitize cycle. Follow one of the methods below:

- Set the toggle switch to the OFF position after ice falls from the evaporator at the end of a harvest cycle.
- Set the switch to OFF and allow the ice to melt off the evaporator(s).

Notice

Never use anything to force ice from the evaporator. Damage may result.

Step 2 Remove all ice from the bin.

Step 3 Mix a solution of de-scaler and lukewarm water. Use the ratio in the table below to mix a de-scaler solution to thoroughly de-scale the ice machine.

Model	Water	Mixed with
H0070/H0120	1L	1Package

! Caution

Do not mix more than 2 packets of descaler per 34 oz(1 Liter) of warm water. Contents will not dissolve properly.

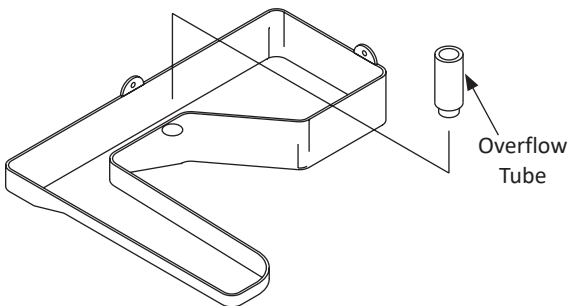
! Caution

Do not pour packgae directly into the ice machine trough. Power must be dissolved in 34 oz(1 Liter) of water first.

Step 4 Depending on the model of ice machine, the operating procedure is as follows::

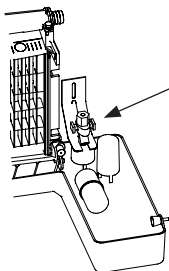
HE0070:

- Close the water inlet valve to the ice machine, unplug the overflow tube, and reinsert the overflow tube after the water in the trough has emptied;
- Place the toggle switch in the CLEAN position. Add the de-scaler solution in the trough.
- 5 minutes after the start of the cleaning cycle, open the water inlet valve to the ice machine.



HE0120:

- Place the toggle switch in the CLEAN position.
- Close the water inlet switch on the float valve and add cleaning water in the trough until exceeding the water level line and triggering the siphon drain.
- Wait for the trough to empty, then add the de-scaler solution in the trough.
- Open the water inlet switch on the float valve.



Water Inlet Switch

NOTE: Switch to the left to open the water inlet, switch to the right to close the water inlet.



Caution

Be sure to pour all of the prepared solution down the trough.

Step 5 Wait until the clean cycle is complete, then place the toggle switch in the OFF position. Then disconnect power to the ice machine.

NOTE:

- When clean cycle completed, HE0070 needs to be manually unplugged the overflow tube to empty the trough.
- HE0070 takes approximately 45 minutes. HE0120 takes approximately 25 minutes.



Warning

Disconnect the electric power to the ice machine at the electric service switch box.

Step 6 Remove parts for de-scaling. Please refer to

“Parts Removal” on page 24 and continue with step 7 when the parts have been removed.

Step 7 Mix a solution of de-scaler and lukewarm water. Depending upon the amount of mineral buildup, a larger quantity of solution may be required. Use the ratio in the table below to mix enough solution to thoroughly clean all parts.

Model	Water	Mixed with
H0070 H0120	3.7L	4Package

Step 8 Use 1/2 of the de-scaler solution to clean all components. The de-scaler solution will foam when it contacts lime scale and mineral deposits; once the foaming stops use a soft-bristle nylon brush, sponge or cloth (NOT a wire brush) to carefully clean the parts. Soak parts for 5 minutes (15-20 minutes when heavily scaled). Rinse all components with clean water.

Step 9 While components are soaking, use 1/2 of the de-scaler solution to clean all foodzone surfaces of the ice machine and bin. Use a nylon brush or cloth to thoroughly clean the following ice machine areas:

- Evaporator plastic parts – including top, bottom and sides
- Bin bottom, sides and top

Step 10 Rinse all areas thoroughly with clean water.

DETAILED SANITIZING

NOTE: Sanitizing can be performed separately.

Caution

Do not mix De-scaler and Sanitizer solutions together. It is a violation of Federal law to use these solutions in a manner inconsistent with their labeling.

Step 11 Mix a solution of sanitizer and lukewarm water.

Solution Type	Water	Mixed with
Sanitizer	11.4L	3Package

Step 12 Use 1/2 of the sanitizer solution to sanitize all removed components. Use a spray bottle to liberally apply the solution to all surfaces of the removed parts or soak the removed parts in the sanitizer/water solution. Do not rinse parts after sanitizing.

Step 13 Use 1/2 of the sanitizer solution to sanitize all foodzone surfaces of the ice machine and bin (or dispenser). Use a spray bottle to liberally apply the solution. When sanitizing, pay particular attention to the following areas:

- Evaporator plastic parts - including top, bottom and sides
- Ice machine base (top of bin) and area above the water trough
- Bin sides and bottom

Do not rinse the sanitized areas.

Step 14 Replace all removed components. Wait 10 minutes.

Step 15 Mix a solution of sanitizer and lukewarm water.

Model	Water	Mixed with
H0070 H0120	1L	1Package

Caution

Do not pour package directly into the ice machine trough. Power must be dissolved in 34 oz(1 Liter) of water first.

Step 16 Reapply power to the ice machine.

Step 17 Refer to Step 4 on page 45 to add sanitizer solution in the trough and start a clean cycle.

Caution

Be sure to pour all of the prepared solution down the trough.

Step 18 After the sanitize cycle is complete(HE0070 needs to be manually unplugged the overflow tube to empty the trough),then move the toggle switch to the ICE position to start ice making.

Parts Removal

Warning

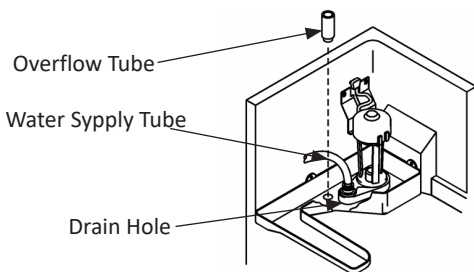
Before proceeding with the following steps, be sure to disconnect the ice machine from the power source.

HE0070

A. Removing the overflow tube

- Lift the overflow tube and shake it back and forth until it is taken out from the drain hole.

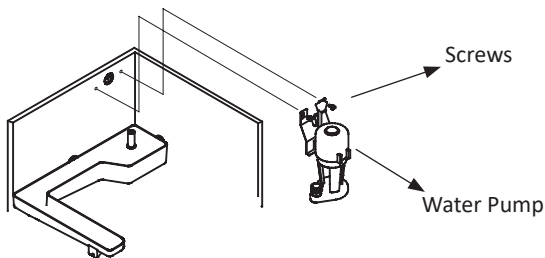
NOTE: When installing the overflow tube, make sure that it is tightly inserted into the drain hole to prevent water leakage during operation.



B. Remove the water supply tube Connecting the Water Pump and Water Distribution Tube.

C. Remove Water Pump

- Disconnect the power cord of the pump
- Loosen the screws securing the pump-mounting bracket to the bulkhead
- Lift the pump and bracket assembly off the mounting screws



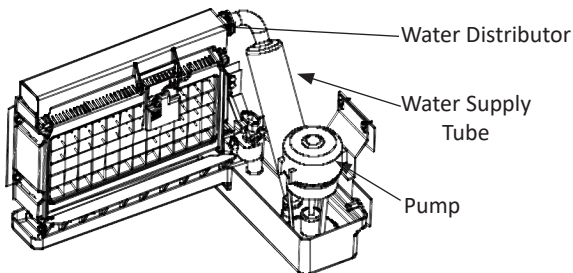
NOTE: Do not soak water pump motor in De-scaler or Sanitizer solution.

D. Remove Water Trough

- Remove the screws holding the water trough to the walls of the cabinet.

HE0120

A. Remove the water supply tube Connecting the Water Pump and Water Distributer.



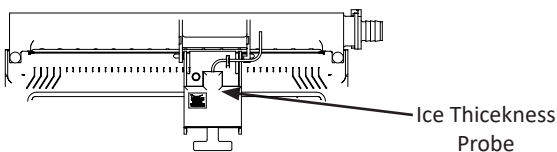
B. Remove Water Pump

- Unplug the power cord of the water pump from the rear of the ice machine.
- Loosen the screws securing the pump mounting bracket to the bulkhead
- Lift the pump and bracket assembly off the mounting screws.

NOTE: Do not soak water pump motor in De-scaler or Sanitizer solution.

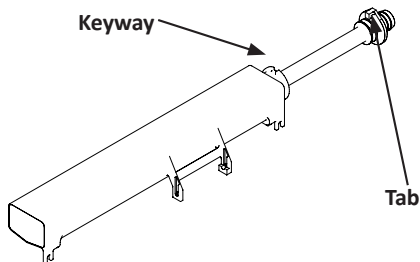
C. Remove the Ice Thickness Probe

- Compress the side of the ice thickness probe near the top hinge pin and remove it from the bracket.



D. Remove the Water Distributor

- Loosen the two thumbscrews, which secure the distribution tube.
- Lift the right side of the distribution tube up off the locating pin, then slide it back and to the right.
- Twist both of the inner tube ends until the tabs line up with the keyways.
- Pull the inner tube ends outward.

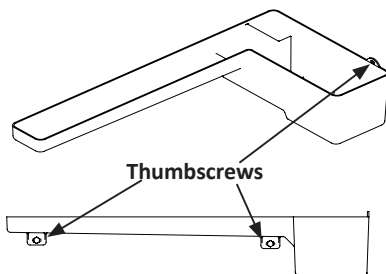


E. Remove the Water Trough

- Apply downward pressure on the drain tube and

remove from the bottom of the water trough.

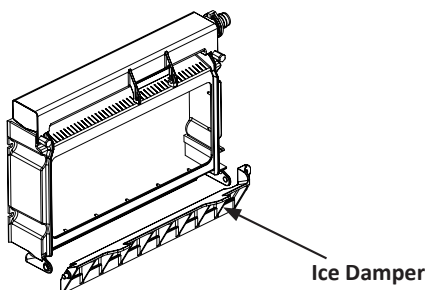
- Remove the upper thumbscrew.
- While supporting the water trough remove the two thumbscrews from beneath the water trough.
- Remove the water trough from the bin area.



F. Remove the ice damper

- Grasp ice damper and apply pressure toward the left hand mounting bracket.
- Apply pressure to the right hand mounting bracket with thumb.
- Pull ice damper forward when the right hand ice damper pin disengages.

NOTE: When installing the ice amper, apply pressure to the right hand mounting bracket with thumb, then push ice damper toward evaporator until right hand damper pin engages.



Preventive Descaling Procedure

This procedure de-scales all components in the water flow path, and is used to de-scale the ice machine between the bi-yearly detailed de-scaling and sanitizing procedure.

Ice machine de-scaler is used to remove lime scale and mineral deposits.

Step 1 Press the On/Off button after ice falls from the evaporator at the end of a Harvest cycle. Or, press the On/Off button and allow the ice to melt off the evaporator.

 Caution

Never use anything to force ice from the evaporator. Damage may result.

Step 2 Mix a solution of de-scaler and lukewarm water. Use the ratio in the table below to mix a de-scaler solution to thoroughly de-scaler the ice machine.

Model	Water	Mixed with
H0070/H0120	1L	1Package

 Caution

Do not mix more than 2 packets of descaler per 34 oz(1 Liter) of warm water. Contents will not dissolve properly.

 Caution

Do not pour packgae directly into the ice machine trough. Power must be dissolved in 34 oz(1 Liter) of water first.

Step 3 Refer to “Step 4” on page 45 to start a clean cycle and add the prepared ice machine de-scaler to the water trough.

Notice

Be sure to pour all of the prepared solution down the trough.

Step 4 Wait until the clean cycle is complete.

Ice Machine Inspection

Check all water fittings and lines for leaks. Also, make sure the refrigeration tubing is not rubbing or vibrating against other tubing, panels, etc.

Do not put anything (boxes, etc.) in front of the ice machine. There must be adequate airflow through and around the ice machine to maximize ice production and ensure long component life.

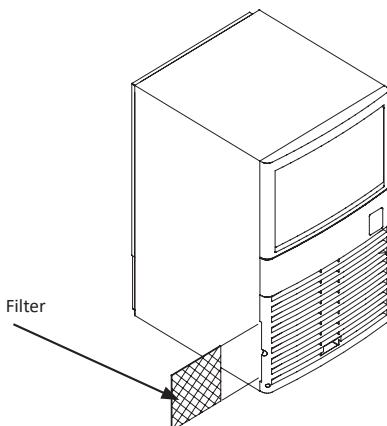
Exterior Cleaning

Clean the area around the ice machine as often as necessary to maintain cleanliness and efficient operation.

Wipe surfaces with a damp cloth rinsed in water to remove dust and dirt from the outside of the ice machine. If a greasy residue persists, use a damp cloth rinsed in a mild dish soap and water solution. Wipe dry with a clean, soft cloth.

Cleaning the Condenser Filter

The washable filter on self-contained ice machines is designed to catch dust, dirt, lint and grease. Clean the filter with a mild soap and water.



Cleaning the Condenser

Warning

Disconnect electric power to the ice machine head section and the remote condensing unit at the electric service switches before cleaning the condenser.

A dirty condenser restricts airflow, resulting in excessively high operating temperatures. This reduces ice production and shortens component life.

- Clean the condenser at least every six months.

Warning

The condenser fins are sharp. Use care when cleaning them.

- Shine a flashlight through the condenser to check for dirt between the fins.
- Blow compressed air or rinse with water from the inside out (opposite direction of airflow).

If dirt still remains call a service agent to clean the condenser.

Removal from Service/Winterization

1. Clean and sanitize the ice machine.
2. Move the toggle switch to the OFF position and turn off the ice machine.
3. Remove the overflow tube to drain the water trough.
4. Turn off the water supply, disconnect the drain and the incoming ice-making water line at the rear of the ice machine..

Make sure no water is trapped inside the ice machine incoming water lines, drain lines,distribution tubes, etc.

Blow compressed air through the line if necessary.

Chapter 5 Component Check Procedures

Electrical Components

MAIN FUSE

Function

The control board fuse stops ice machine operation if electrical components fail causing high amp draw.

Specifications

- HE0070:The main fuse is 250 Volt, 6.3 amp
- HE0120:The main fuse is 250 Volt, 10 amp.

Warning

High (line) voltage is applied to the control board at all times. Removing the control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

Check Procedure

1. If the bin switch light is on with the ice damper closed, the fuse is good.

Warning

Disconnect electrical power to the entire ice machine before proceeding.

2. Remove the fuse. Check the resistance across the fuse with an ohmmeter.

Reading	Result
Open (OL)	Replace fuse
Closed (O)	Fuse is good

ON/OFF/WASH TOGGLE SWITCH

Function

The switch is used to place the ice machine in ON, OFF or WASH mode of operation.

Specifications

Single-pole, double-throw switch.The switch is connected into a varying low D.C. voltage circuit.

Check Procedure

NOTE: Because of a wide variation in D.C. voltage,it is not recommended that a voltmeter be used to check toggle switch operation.

1. Inspect the toggle switch for correct wiring.
2. Isolate the toggle switch by disconnecting all wires from the switch or by disconnecting the Molex connector from the control board.
3. Check across the toggle switch terminals using a calibrated ohmmeter.

NOTE: Where the wire numbers are connected to the switch terminals, or refer to the wiring diagram to take proper readings.

HE0070

Switch Setting	Terminals	Ohm Reading
ON	60-61	Closed
	60-62	Open
	61-62	Open
WASH	60-61	Closed
	60-62	Closed
	61-62	Open
OFF	60-61	Open
	60-62	Open
	61-62	Open

HE0120

Switch Setting	Terminals	Ohm Reading
ON	24-21	Open
	24-20	Closed
	20-21	Open
WASH	24-20	Closed
	24-21	Closed
	20-21	Open
OFF	24-20	Open
	24-21	Open
	20-21	Open

4. Replace the toggle switch if ohm readings do not match all three-switch settings.

ICE THICKNESS CONTROL DIAL(ONLY HE0070)



Ice Thickness
Control Dial

HOW ICE THICKNESS CONTROL DIAL WORK

The Ice Thickness Control Dial can adjust the freeze cycle time -2 min.~+4 min. to control the thickness of ice. (Increase clockwise, decrease counterclockwise).

ADJUST THE ICE THICKNESS CONTROL DIAL

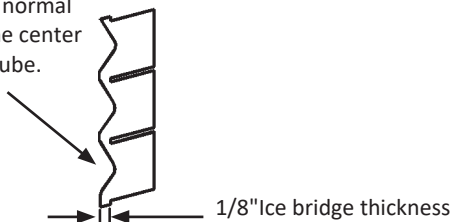
When the power is on, pressure and hold the reset button, and after 10 seconds, enter the ice compensation time calibration mode, and the 4 LED Lights flash slowly (1 time/second). At this time, rotate the ice thickness control dial slowly, when the 4 LED Lights flash rapidly (3 times/second), indicating that the ice compensation time is 0 (factory default), then pressure the reset button again to exit the calibration mode.

ICE CUBE THICKNESS CHECK

Cube size for HE0070 is determined by measuring the

slab weight (the combined weight of all cubes from one harvest cycle). To determine proper slab weight follow the instructions listed below:

Notice the normal dimple in the center of the cube.



1. Ensure the air filter, front, and back panels are installed properly and close the bin door.
2. During the Third harvest cycle open the bin door and catch the entire slab of ice.
3. Weigh the ice slab. The combined weight of all cubes from one harvest should weigh between 7-9 oz (200-270g). If the slab weight is within this range, the ice machine is working properly and no further action is needed. If the slab weight is not within this range or you desire a slightly thicker or thinner cube, continue to step 4.

⚠ Warning

Do not touch electrical wires. Disconnect power to the ice machine before making any ice thickness adjustments.

4. Remove the air filter.
5. Remove the two screws holding the front panel in place and remove the front cover.
6. Locate the ice thickness control dial on the control board. Turn the dial clockwise for a thicker cube or counterclockwise for a thinner cube.
7. Ensure all of the panels and air filter are reinstalled properly and the bin door is closed. Repeat steps 1-3.

ICE THICKNESS PROBE (ONLY HE0120)

HOW THE PROBE WORKS

CHOICE's electronic sensing circuit does not rely on refrigerant pressure, evaporator temperature, water levels or timers to produce consistent ice formation.

As ice forms on the evaporator, water (not ice) contacts the ice thickness probe. After the water completes this circuit across the probe continuously for 6-10 seconds, a harvest cycle is initiated.

FREEZE TIME LOCK-IN FEATURE

The ice machine control system incorporates a freeze time lock-in feature. This prevents the ice machine from short cycling in and out of harvest.

The control board locks the ice machine in the freeze cycle for six minutes. If water contacts the ice thickness probe during these six minutes, the harvest light will come on (to indicate that water is in contact with the probe), but the ice machine will stay in the freeze cycle. After the six minutes are up, a harvest cycle is initiated. This is important to remember when performing diagnostic procedures on the ice thickness control circuitry.

To allow the service technician to initiate a harvest cycle without delay, this feature is not used on the first cycle after moving the toggle switch OFF and back to ON.

MAXIMUM FREEZE TIME

The control system includes a built-in safety, which will automatically cycle the ice machine into harvest after 60 minutes in the freeze cycle.

BIN SWITCH (ONLY HE0120)

Function

Bin switch operation is controlled by the movement of the ice damper. The bin switch has two main functions:

The ice damper must be up (bin switch closed) to start ice making.

1. Terminating the harvest cycle and returning the ice machine to the freeze cycle.
This occurs when the bin switch is opened and closed again within 7 seconds of opening during the harvest cycle.
2. Automatic ice machine shut-off.
If the storage bin is full at the end of a harvest cycle, the sheet of cubes fails to clear the ice damper and holds it down. After the ice damper is held down for 7 seconds, the ice machine shuts off.
The ice machine remains off until enough ice is removed from the storage bin to allow the sheet of cubes to drop clear of the ice damper. As the ice damper swings back to the operating position, the bin switch closes and the ice machine restarts.

Important

The ice damper must be up (bin switch closed) to start ice making.

Check Procedure

1. Set the toggle switch to OFF.
2. Watch the bin switch light on the control board.
3. Move the ice damper upward, toward the evaporator. The bin switch must close. The bin switch light “on” indicates the bin switch has closed properly.
4. Move the ice damper away from the evaporator. The bin switch must open. The bin switch light “off” indicates the bin switch has opened properly.

Ohm Test

1. Disconnect the bin switch wires to isolate the bin

switch from the control board.

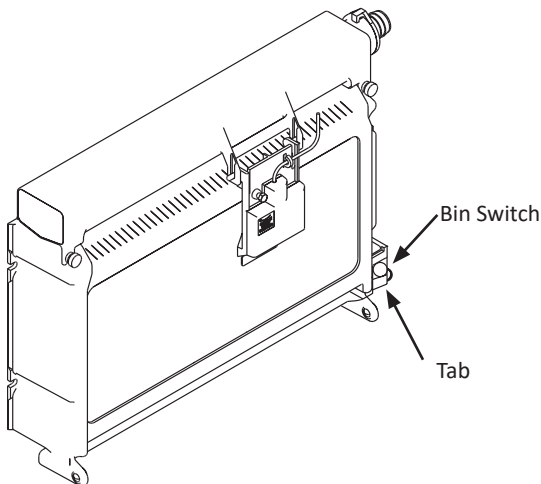
2. Connect an ohmmeter to the disconnected bin switch wires.
3. Cycle the bin switch open and closed numerous times by opening and closing the water curtain.

NOTE: To prevent mis-diagnosis:

- Always use the water curtain magnet to cycle the switch (a larger or smaller magnet will affect switch operation).
- Watch for consistent readings when the bin switch is cycled open and closed (bin switch failure could be erratic).

Bin Switch Removal

1. Disconnect power to the ice machine at service disconnect.
2. Disconnect bin switch wires in control box.
3. Depress tab on right side of evaporator with thumb.
4. Slide bin switch to right to remove.
5. Pull wiring into evaporator compartment.



BIN THERMISTOR (ONLY HE0070)

Function

The bin thermistor stops the ice machine when the bin is full. When ice cubes contact the bin thermistor bulb holder, the bin thermistor opens and stops the ice machine. When ice cubes no longer contact the bin thermistor bulb holder, the bin thermistor closes and the ice machine starts.

Specifications

Control	Condenser Outlet Temp.	Setting
Bin Thermistor	> 30°C	Cut in: 4.0°C Cut out: 2.0°C
	≤ 30°C	Cut in: 2.5°C Cut out: 1.5°C

10,000 Ohms ± 2% at 25°C (77°F)

Check Procedure

Warning

High (line) voltage is applied to the control board at all times. Removing the control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

Warning

Disconnect electrical power to the entire ice machine before proceeding.

Verify that the thermistor resistance is accurate and corresponds to the high and low temperature ranges.

1. Remove the back panel to access the bin thermistor.
2. Disconnect the thermistor at the control board. Connect the ohmmeter to the isolated thermistor wire leads. At the same time fix a thermocouple thermometer near the thermistor.

3. Measure the resistance of the thermistor with the ohmmeter and detect the temperature at the probe location, and refer to the resistance table below to confirm whether the probe is normal.

Temperature/Resistance Chart

As the temperature rises at the thermistor block, the resistance drops.

Important

If the ohmmeter reads "OL," check the scale setting on the meter before assuming the thermistor is bad.

Resistance Chart

Temperature of Thermistor		Resistance
°C	°F	K Ohms (x 1000)
15.6° - 21.1°	60° - 70°	14.12 - 11.63
21.1° - 26.7°	70° - 80°	11.63 - 9.63
26.7° - 32.2°	80° - 90°	9.63 - 7.73
32.2° - 37.8°	90° - 100°	7.73 - 6.25
37.8° - 43.3°	100° - 110°	6.25 - 5.26
43.3° - 48.9°	110° - 120°	5.26 - 4.30
48.9° - 54.4°	120° - 130°	4.30 - 3.65
54.4° - 60.0°	130° - 140°	3.65 - 3.02
60.0° - 65.6°	140° - 150°	3.02 - 2.51
65.6° - 71.1°	150° - 160°	2.51 - 2.16
71.1° - 76.7°	160° - 170°	2.16 - 1.82
76.7° - 82.2°	170° - 180°	1.82 - 1.58
82.2° - 87.8°	180° - 190°	1.58 - 1.34
87.8° - 90.0°	190° - 194°	1.34 - 1.27

LIQUID LINE THERMISTOR (ONLY HE0070)

Fuction

The liquid line thermistor senses the refrigeration system liquid line temperature. This is used in conjunction with

the control board to determine the length of the freeze and harvest cycles.

Specifications

10,000 Ohms ± 2% at 25°C (77°F)

 Caution

Use only CHOICE thermistors.

Check Procedure

Thermistors generally fail because of moisture or physical damage. CHOICE liquid line thermistors are encased in a specially designed, moisture-sealed aluminum block. This eliminates physical damage and moisture concerns.

Verify that the thermistor resistance is accurate and corresponds to the high and low temperature ranges.

1. Disconnect the thermistor at the control board.
Connect the ohmmeter to the isolated thermistor wire leads.
2. Using a temperature meter capable of taking readings on curved copper lines, attach the temperature meter-sensing device to the liquid line next to the thermistor aluminum block.

Important

Do not simply “insert” the sensing device under the insulation. It must be attached to and reading the actual temperature of the copper liquid line.

3. With the ice machine running, verify that the temperature of the discharge line (step 2) corresponds to the thermistor resistance reading (step 1) as stated in the temperature/resistant chart.

Important

If the thermistor would fail closed, the light on the control board will flash rapidly.

If the thermistor would fail open, the light on the control board will flash slowly.

Temperature/Resistance Chart

As the temperature rises at the thermistor block, the resistance drops.

Important

If the ohmmeter reads “OL,” check the scale setting on the meter before assuming the thermistor is bad.

Resistance Chart

Temperature of Thermistor		Resistance
°C	°F	K Ohms (x 1000)
15.6° - 21.1°	60° - 70°	14.12 - 11.63
21.1° - 26.7°	70° - 80°	11.63 - 9.63
26.7° - 32.2°	80° - 90°	9.63 - 7.73
32.2° - 37.8°	90° - 100°	7.73 - 6.25
37.8° - 43.3°	100° - 110°	6.25 - 5.26
43.3° - 48.9°	110° - 120°	5.26 - 4.30
48.9° - 54.4°	120° - 130°	4.30 - 3.65
54.4° - 60.0°	130° - 140°	3.65 - 3.02
60.0° - 65.6°	140° - 150°	3.02 - 2.51
65.6° - 71.1°	150° - 160°	2.51 - 2.16
71.1° - 76.7°	160° - 170°	2.16 - 1.82
76.7° - 82.2°	170° - 180°	1.82 - 1.58
82.2° - 87.8°	180° - 190°	1.58 - 1.34
87.8° - 90.0°	190° - 194°	1.34 - 1.27

Diagnosing Start Components

If the compressor attempts to start, or hums and trips the overload protector, check the start components before replacing the compressor.

CAPACITOR

Visual evidence of capacitor failure can include a bulged terminal end or a ruptured membrane. Do not assume a capacitor is good if no visual evidence is present. A good test is to install a known good substitute capacitor. Use a capacitor tester when checking a suspect capacitor. Clip the bleed resistor off the capacitor terminals before testing.

RELAY

The relay has a set of contacts that connect and disconnect the start capacitor from the compressor start winding. The contacts on the relay are normally open. The relay senses the voltage generated by the start winding and closes and then opens the contacts as the compressor motor starts. The contacts remain open until the compressor is de-energized.

COMPRESSOR ELECTRICAL DIAGNOSTICS

The compressor does not start or will trip repeatedly on overload.

CHECK RESISTANCE (OHM) VALUES

NOTE: Compressor windings can have very low ohm values. Use a properly calibrated meter.

Perform the resistance test after the compressor cools. The compressor dome should be cool enough to touch (below 120°F/49°C) to ensure that the overload is closed and the resistance readings will be accurate.

1. Disconnect power from the condensing unit and remove the wires from the compressor terminals.
2. The resistance values between C and S and between C and R, when added together should equal the resistance value between S and R.

3. If the overload is open, there will be a resistance reading between S and R, and open readings between C and S and between C and R. Allow the compressor to cool, then check the readings again.

CHECK MOTOR WINDING TO GROUND

Check continuity between all three terminals and the compressor shell or copper refrigeration line. Scrape metal surface to get good contact. If continuity is present, the compressor windings are grounded and the compressor should be replaced.

To determine if the compressor is seized check the amp draw while the compressor is trying to start.

COMPRESSOR DRAWING LOCKED ROTOR

The two likely causes of this are:

- Defective starting component
- Mechanically seized compressor

To determine which you have:

1. Install high and low side gauges.
2. Try to start the compressor.
3. Watch the pressures closely.
 - If the pressures do not move, the compressor is seized. Replace the compressor.
 - If the pressures move, the compressor is turning slowly and is not seized. Check the capacitors and relay.

COMPRESSOR DRAWING HIGH AMPS

The continuous amperage draw on start-up should not be near the maximum fuse size indicated on the serial tag.

The wiring must be correctly sized to minimize voltage drop at compressor start-up. The voltage when the compressor is trying to start must be within $\pm 10\%$ of the nameplate voltage.

Fan Cycle Control (Only HE0120)

FUNCTION

Cycles the fan motor on and off to maintain proper operating discharge pressure.

The fan cycle control closes on an increase, and opens on a decrease in discharge pressure.

SPECIFICATIONS

Model	Cut-In (Close)	Cut-Out (Open)
HE0120	145 psig ±5	110 psig ±5

CHECK PROCEDURE

Disconnect electrical power to the ice machine at the electrical service disconnect.

Verify fan motor windings are not open or grounded, and fan spins freely.

Connect manifold gauges to ice machine.

Hook voltmeter in parallel across the fan cycle control, leaving wires attached.

Reconnect electrical power to the ice machine and set the ON/OFF/WASH toggle switch to ON.

Wait until water flows over the evaporator then refer to chart below.

System Pressure:	Reading Should Be:	Fan Should Be:
above cut-in	0 volts	running
below cut-out	line voltage	off

Chapter 6 Troubleshooting

Questions to Ask the Customer

An ice machine may manifest problems only at certain times of a day, but operate normally otherwise. Asking the user for some information can be helpful for assessment or even crucial in the final diagnosis.

Ask these questions before service:

- When does the malfunction occur? (Evening, day, all day or just during the freeze cycle)
- When is ice production low? (A certain day in a week, every day, or weekend)
- Describe the ice machine's status in detail.
- Has anyone ever operated the ice machine?
- Did the air switch, water supply, or ambient temperature change when the ice machine was in downtime?
- What has caused the water pressure to increase or decrease significantly?

HE0070

ICE MACHINE WILL NOT RUN

Warning

High (line) voltage is applied to the control board at all times. Removing control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

1. Verify primary voltage is supplied to ice machine.
2. Verify the fuse/circuit breaker is closed. If the control board light functions, the fuse is okay.
3. Verify toggle switch functions properly. A defective toggle switch may keep the ice machine in the off mode.
4. Verify bin thermostat functions properly. A defective bin thermostat can falsely indicate a full bin of ice.
5. Verify low DC voltage is properly grounded. Loose DC wire connections may intermittently stop the ice machine.
6. Replace the control board.
7. Be sure Steps 1-5 were followed thoroughly. Intermittent problems are not usually related to the control board.

ICE PRODUCTION CHECK AND ICE THICKNESS ADJUST

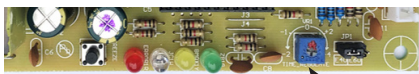
Cube size to the HE0070 is determined by measuring the slab weight (the combined weight of all cubes from one harvest cycle). To determine proper slab weight, follow the instructions listed below.

1. Ensure the air filter, front, and back panels are installed properly and close the bin door.
2. During the **Third** harvest cycle open the bin door and catch the entire slab of ice.
3. Weigh the ice slab. The combined weight of all cubes from one harvest should weigh between 7- 9 oz (200-270g). If the slab weight is within this range, the ice machine is working properly and no further action is needed. If the slab weight is not within this range or you desire a slightly thicker or thinner cube, continue to step 4-7.

Warning

Disconnect electric power to the ice machine at the electric switch box before proceeding.

4. Remove the air filter.
5. Remove the two screws holding the front panel in place and remove the front cover.
6. Locate the ice thickness control dial on the control board (see figure). Turn the dial clockwise for a thicker cube or counterclockwise for a thinner cube.
7. Ensure all of the panels and air filter are reinstalled properly and the bin door is closed. Repeat steps 1-3.



Ice Thickness
Control Dial

INSTALLATION AND VISUAL INSPECTION CHECKLIST

Ice machine is not level

- Level the ice machine

Condenser is dirty

- Clean the condenser

Water filtration is plugged (if used)

- Install a new water filter

Water drains are not vented

- Run and vent drains according to the Installation Manual.

WATER SYSTEM CHECKLIST

A water-related problem often causes the same symptoms as a refrigeration system component malfunction.

Water system problems must be identified and eliminated prior to replacing refrigeration components.

Water area (evaporator) is dirty

- Clean as needed

Water inlet pressure not between 34 and 90 psig (2.4-6.2bar, 240-620 kPa)

- Install a water regulator valve or increase the water pressure.

Incoming water temperature is not between 10°C and 43°C (50-110°F)

- If too hot, check the hot water line check valves in other store equipment.

Water filtration is plugged (if used)

- Install a new water filter

Vent tube is not installed on water outlet drain

- See installation Instruction

Hoses, fitting, etc., are leaking water

- Repair/replace as needed.

Water is spraying out of the sump trough area

- Stop the water spray

Uneven water flow across the evaporator

- Clean the ice machine.

Water is freezing behind the evaporator

- Correct the water flow.

Plastic extrusions and gaskets are not secured to the evaporator

- Remount/replace as needed.

REFRIGERATION SYSTEM

The HE0070 ice machine have a very small refrigerant charge, and we do not recommend diagnosing the ice machine using refrigerant pressures. For this reason we have not included refrigeration access fittings. Verify that your water flow is even across the entire evaporator before diagnosing the refrigeration system. Mineral build-up on the evaporator assembly can cause water tracking and an erratic ice fill pattern. Clean with Ice Machine De-scaler to remove any mineral build-up before entering the refrigeration system.

The following can be used for diagnostics:

1. Capillary Tube failures or low refrigerant charge will always result in a starving evaporator.
2. Assume 86°F (30°C) air temperature, 68°F (20°C) water temperature.

Suction line temperature at the compressor will range from 86°F (30°C) three minutes into the cycle to 8°F (-13°C) at the end of the freeze cycle. An obstructed capillary tube or low refrigerant charge will have a suction line temperature higher than normal.

Discharge line temperature at the compressor will range from 168°F (76°C) to 140°F (60°C) through the freeze cycle. An obstructed capillary tube or low refrigerant charge will have a lower discharge line temperature than normal.

Suction line temperature at the compressor will range from 64°F (18°C) to 111°F (44°C) through the harvest cycle. An obstructed capillary tube will not affect suction

line temperature range during the harvest cycle. Low refrigerant charge will have a lower temperature than normal.

Discharge line temperature at the compressor will range from 180°F (82°C) to 150°F (60°C) through the harvest cycle. The obstructed capillary tube will not affect discharge line temperature range during the harvest cycle. Low refrigerant charge will have a lower temperature than normal.

Ice fill pattern will vary depending on severity of the obstruction or refrigeration loss. Ice fill patterns will range from no ice on the entire evaporator to thin only at the evaporator outlet (thin at the bottom, thick at the top of the evaporator).

ICE FORMATION PATTERN

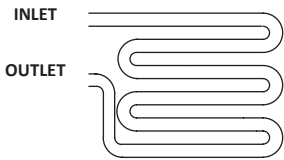
Evaporator ice formation pattern analysis is helpful in ice machine diagnostics.

Analyzing the ice formation pattern alone cannot diagnose an ice machine malfunction. However, when this analysis is used along with Refrigeration System Operational Analysis Table, it can help diagnose an ice machine malfunction.

Any number of problems can cause improper ice formation.

Example: An ice machine formation that is “extremely thin at the outlet” could be caused by a hot water supply, water leaking water out the overflow pipe, a faulty water float valve, a low refrigerant charge, etc.

Normal Ice Formation



HE0070 Evaporator Tubing Routing

Ice forms across the entire evaporator surface.

At the beginning of the Freeze cycle, it may appear that

more ice is forming on the inlet of the evaporator than at the outlet. At the end of the Freeze cycle, ice formation at the outlet will be close to, or just a bit thinner than, ice formation at the inlet. The dimples in the cubes at the outlet of the evaporator may be more pronounced than those at the inlet. This is normal.

If ice forms uniformly across the evaporator surface, but does not do so in the proper amount of time, this is still considered a normal ice fill pattern.

Extremely Thin at Evaporator Outlet

There is no ice, or a considerable lack of ice formation on the outlet of the evaporator.

Examples: No ice at all at the outlet of the evaporator, but ice forms at the inlet half of the evaporator. Or, the ice at the outlet of the evaporator reaches the correct thickness, but the outlet of the evaporator already has 1/2" to 1" of ice formation.

Possible cause: Water loss, low on refrigerant, hot water supply, faulty float valve, etc.

Extremely Thin at Evaporator Inlet

There is no ice, or a considerable lack of ice formation at the inlet of the evaporator. Examples: The ice at the outlet of the evaporator reaches the correct thickness, but there is no ice formation at all at the inlet of the evaporator.

Possible cause: Insufficient water flow etc.

Spotty Ice Formation

There are small sections on the evaporator where there is no ice formation. This could be a single corner, or a single spot in the middle of the evaporator. This is generally caused by loss of heat transfer from the tubing on the backside of the evaporator.

No Ice Formation

The ice machine operates for an extended period, but there is no ice formation at all on the evaporator.

Possible cause: Water float valve, water pump, low refrigerant charge, compressor, etc.

HOT GAS VALVE

General

The hot gas valve is an electrically operated valve that opens when energized, and closes when de-energized.

Normal Operation

The valve is de-energized (closed) during the freeze cycle and energized (open) during the harvest cycle. The valve is positioned between the receiver and the evaporator and performs two functions:

1. Prevents refrigerant from entering the evaporator during the freeze cycle.
The hot gas valve is not used during the freeze cycle. The hot gas valve is de-energized (closed) preventing refrigerant flow from the receiver into the evaporator.
2. Allows refrigerant vapor to enter the evaporator in the harvest cycle.
During the harvest cycle, the hot gas valve is energized (open) allowing refrigerant gas from the discharge line of the compressor to flow into the evaporator. The heat is absorbed by the evaporator and allows release of the ice slab.

Exact pressure vary according to ambient temperature and ice machine model. Harvest pressures for HE0120 can be found in the Cycle Time/24 Hour Ice Production/Refrigerant Pressure Charts in this book.

HOT GAS ANALYSIS

The valve can fail in two positions:

- Valve will not open in the harvest cycle.
- Valve remains open during the freeze cycle.

VALVE WILL NOT OPEN IN THE HARVEST CYCLE

Although the circuit board has initiated a harvest cycle, the evaporator temperature remains unchanged from the freeze cycle.

 Caution

Coil must be seated 100% on solenoid to function correctly. Install coil with a twisting motion to properly seat.

VALVE REMAINS OPEN IN THE FREEZE CYCLE:

Symptoms of hot gas valve remaining partially open during the freeze cycle can be similar to symptoms of an expansion valve, float valve or compressor problem. Symptoms are dependent on the amount of leakage in the freeze cycle.

A small amount of leakage will cause increased freeze times and an ice fill pattern that is “Thin at the Outlet”, but fills in at the end of the cycle.

As the amount of leakage increases the length of the freeze cycle increases and the amount of ice at the outlet of the evaporator decreased.

Refer to the Parts Manual for proper valve application. If replacement is necessary, use only “original” CHOICE replacement parts.

Use the following procedure and table to help determine if a hot gas valve is remaining partially open during the freeze cycle.

1. Wait 5 minutes into the freeze cycle.
2. Feel the inlet of the hot gas valve(s).

Important

Feeling the hot gas valve outlet or across the hot gas valve itself will not work for this comparison. The hot gas valve outlet is on the suction side (cool refrigerant). It may be cool enough to touch even if the valve is leaking.

3. Feel the compressor discharge line.

 Warning

The inlet of the hot gas valve and the compressor discharge line could be hot enough to burn your hand. Just touch them momentarily.

4. Compare the temperature of the inlet of the hot gas valves to the temperature of the compressor discharge line.

Findings	Comments
The inlet of the harvest valve is cool enough to touch and the compressor discharge line is hot. Cool & Hot	This is normal as the discharge line should always be too hot to touch and the harvest valve inlet, although too hot to touch during harvest, should be cool enough to touch after 5 minutes into the freeze cycle.
The inlet of the harvest valve is hot and approaches the temperature of a hot compressor discharge line. Hot & Hot	This is an indication something is wrong, as the harvest valve inlet did not cool down during the freeze cycle. If the compressor dome is also entirely hot, the problem is not a harvest valve leaking, but rather something causing the compressor (and the entire ice machine) to get hot.
Both the inlet of the harvest valve and the compressor discharge line are cool enough to touch. Cool & Cool	This is an indication something is wrong, causing the compressor discharge line to be cool to be touch. This is not caused by a harvest valve leaking.

5. Record your findings on the table.

SAFETY LIMIT CHECKLIST

After 6 minutes in freeze cycle, if control board detecting the condenser outlet temperature higher than 80°C or below 5°C), ice machine will automatic stop and the red light on control board light on.

SAFETY LIMIT #1

If the freeze time exceeds 36 minutes for 3 consecutive freeze cycle, the ice machine will automatic stop and the orange light on control board flashes slowly until the toggle switch is turned to OFF.

SAFETY LIMIT #2

If the harvest time exceeds 5 minutes for 3 consecutive harvest cycle, the ice machine will automatic stop and the orange light on control board flashes quickly until the toggle switch is turned to OFF.

HE0120

ICE MACHINE WILL NOT RUN

Warning

High (line) voltage is applied to the control board at all times. Removing control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

1. Verify primary voltage is supplied to ice machine and the fuse/breaker is closed.

2. Verify control board fuse is okay.

NOTE: If the bin switch light functions the fuse is okay.

3. Verify the bin switch functions properly. A defective bin switch can falsely indicate a full bin of ice.

4. Verify ON/OFF/WASH toggle switch function properly. A defective toggle switch may keep the ice machine in the OFF mode.

5. Verify low DC voltage is properly grounded. Loose DC wire connections may intermittently stop the ice machine.

6. Be sure Steps 1-5 were followed thoroughly. Intermittent problems are not usually related to the control board.

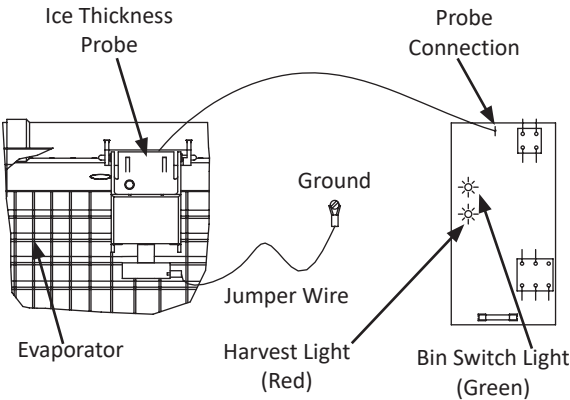
7. Replace the control board.

ICE THICKNESS CONTROL CIRCUITRY

ICE MACHINE DOES NOT CYCLE INTO HARVEST WHEN WATER CONTACTS THE ICE THICKNESS CONTROL PROBE

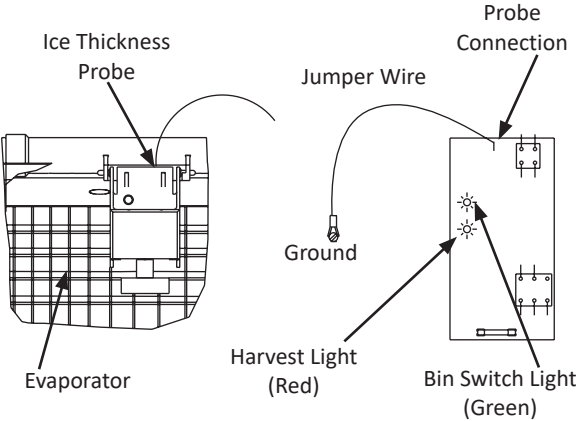
Step 1 Bypass the freeze time lock-in feature by moving the ON/OFF/WASH switch to OFF and back to ON. Wait until the water starts to flow over the evaporator.

Step 2 Clip the jumper wire to the ice thickness probe and any cabinet ground.



Step 2 Jumper wire connected from probe to ground	
Monitoring Harvest Light	Correction
The harvest light comes on, and 6-10 seconds later, ice machine cycles from freeze to harvest.	The ice thickness control circuitry is functioning properly. Do not change any parts.
The harvest light comes on but the ice machine stays in the freeze sequence.	The ice control circuitry is functioning properly. The ice machine is in a 6 minute freeze time lock-in. Verify Step1 of this procedure was followed correctly.
The harvest light does not come on.	Proceed to Step3.

Step 3 Disconnect the ice thickness probe from the control board terminal. Clip the jumper wire to the terminal on the control board and nay cabinet ground. Monitor the harvest light.

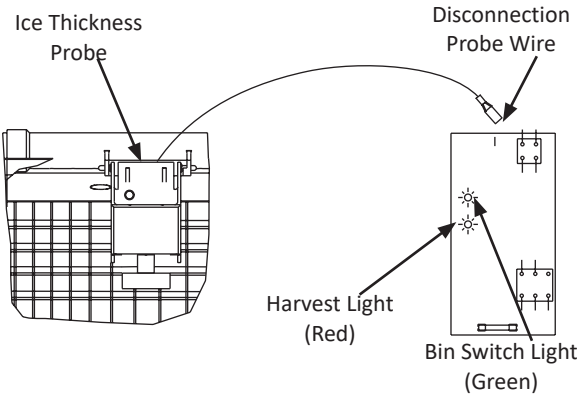


Step 3 Jumper wire connected from control board terminal to ground	
Monitoring Harvest Light	Correction
The harvest light comes on, and 6-10 seconds later, ice machine cycles from freeze to harvest.	The ice thickness probe is causing the malfunction.
The harvest light comes on but the ice machine stays in the freeze sequence.	The ice control circuitry is functioning properly. The ice machine is in a 6 minute freeze time lock-in. Verify Step1 of this procedure was followed correctly.
The harvest light does not come on.	The control board is causing the malfunction.

ICE MACHINE CYCLES INTO HARVEST BEFORE WATER CONTACT WITH THE ICE THICKNESS PROBE

Step 1 Bypass the freeze time lock-in feature by moving the ON/OFF/WASH switch to OFF and back to ON. Wait until the water starts to flow over the evaporator, then monitor the harvest light.

Step 2 Disconnect the ice thickness probe from the control board terminal.



Step 2 Disconnect probe from control board terminal.	
Monitoring Harvest Light	Correction
The harvest light stays off and the ice machine remains in the freeze sequence.	The ice thickness probe is causing the malfunction. Verify that the ice thickness probe is adjust correctly.
The harvest light comes on, and 6-10 seconds later, the ice machine cycles from freeze to harvest.	The control board is causing the malfunction.

ICE PRODUCTION CHECK

The amount of ice machine produces directly relates to the operating water and air temperatures. This means an ice machine with a 70°F (21.2°C) ambient temperature and 50°F (10°C) water produces more ice than the same ice machine with 90°F (32.2°C) ambient temperature and 70°F (21.2°C) water.

1. Determine the ice machine operating conditions:
Air temp entering condenser: _____ °C
Air temp around ice machine: _____ °C
Water temp entering sump trough: _____ °C
2. Refer to the appropriate 24- Hour Ice Production Chart. Use the operating conditions determined in Step 1 to find published 24 hr. ice production: _____
 - Times are in minutes.
Example: 1 min., 15 sec. converts to 1.25 min.
(15 Seconds/ 60 seconds = 0.25 minutes)
 - Weights are in pounds.
Example: 2 lb., 6 oz. converts to 2.375 lb.
(6 oz./ 16 oz. = .375 lb.)
3. Perform an ice production check using the formula below:

$$1. \quad \frac{\text{Freeze Time}}{\text{Freeze Time}} + \frac{\text{Harvest Time}}{\text{Harvest Time}} = \frac{\text{Total Cycle Time}}{\text{Total Cycle Time}}$$

$$2. \quad \frac{\text{Mins in 24 Hrs}}{\text{Mins in 24 Hrs}} \div \frac{\text{Total Cycle Time}}{\text{Total Cycle Time}} = \frac{\text{Cycle Per Day}}{\text{Cycle Per Day}}$$

$$3. \quad \frac{\text{Weight of One Harcest}}{\text{Weight of One Harcest}} \times \frac{\text{Cycle Per Day}}{\text{Cycle Per Day}} = \frac{\text{Actual 24 Hr Production}}{\text{Actual 24 Hr Production}}$$

- Weighing the ice is the only 100% accurate check. However, if the ice pattern is normal and the 1/8" (.44cm) thickness is maintained, the ice slab weights listed with the 24-Hour Ice Production Charts may be used.

4. Compare the results of step 3 with step 2. Ice production is normal when these numbers match closely. If they match closely, determine if:
 - Another larger ice machine is required.
 - Relocating the existing equipment to lower the load conditions is required.
 - Contact the local CHOICE distributor for information on available options and accessories.

INSTALLATION AND VISUAL INSPECTION CHECKLIST

Ice machine is not level

- Level the ice machine

Condenser is dirty

- Clean the condenser

Water filtration is plugged (if used)

- Install a new water filter

Water drains are not run separately and/or are not vented

- Run and vent drains according to the Installation Manual.

WATER SYSTEM CHECKLIST

A water-related problem often causes the same symptoms as a refrigeration system component malfunction.

Example: A water dump valve leaking during the freeze cycle, a system low on charge, and a plugged capillary tube have similar symptoms.

Water system problems must be identified and eliminated prior to replacing refrigeration components.

Water area (evaporator) is dirty

- Clean as needed

Water inlet pressure not between 20 and 80 psig (1-5 bar, 138-552 kPa)

- Install a water regulator valve or increase the water pressure.

Incoming water temperature is not between 1.7°C and 32.2°C (35-90°F)

- If too hot, check the hot water line check valves in other store equipment.

Water filtration is plugged (if used)

- Install a new water filter

Vent tube is not installed on water outlet drain

- See installation Instruction

Hoses, fitting, etc., are leaking water

- Repair/replace as needed.

Water is spraying out of the sump trough area

- Stop the water spray

Uneven water flow across the evaporator

- Clean the ice machine.

Water is freezing behind the evaporator

- Correct the water flow.

Plastic extrusions and gaskets are not secured to the evaporator

- Remount/replace as needed.

ICE FORMATION PATTERN

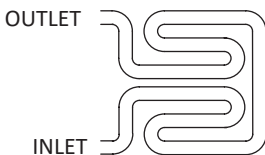
Evaporator ice formation pattern analysis is helpful in ice machine diagnostics.

Analyzing the ice formation pattern alone cannot diagnose an ice machine malfunction. However, when this analysis is used along with CHOICE's Refrigeration System Operational Analysis Table, it can help diagnose an ice machine malfunction.

Any number of problems can cause improper ice formation.

Example: An ice formation that is "extremely thin at the outlet" could be caused by a hot water supply, water leaking out the overflow pipe, faulty water float valve, a low refrigerant charge, etc.

NORMAL ICE FORMATION



HE0120 Evaporator Tubing Routing

Ice forms across the entire evaporator surface.

At the beginning of the Freeze cycle, it may appear that more ice is forming on the inlet of the evaporator than at the outlet. At the end of the Freeze cycle, ice formation at the outlet will be close to, or just a bit thinner than, ice formation at the inlet. The dimples in the cubes at the outlet of the evaporator may be more pronounced than those at the inlet. This is normal.

If ice forms uniformly across the evaporator surface, but does not do so in the proper amount of time, this is still considered a normal ice fill pattern.

EXTREMELY THIN AT EVAPORATOR OUTLET

There is no ice, or a considerable lack of ice formation on the outlet of the evaporator.

Examples: No ice at all at the outlet of the evaporator, but ice forms at the inlet half of the evaporator. Or, the ice at the outlet of the evaporator reaches the correct thickness, but the outlet of the evaporator already has 1/2" to 1" of ice formation.

Possible cause: Water loss, low on refrigerant, hot water supply, faulty float valve, etc..

EXTREMELY THIN AT EVAPORATOR INLET

There is no ice or a considerable lack of ice formation at the inlet of the evaporator.

Examples: The ice at the outlet of the evaporator reaches the correct thickness, but there is no ice formation at all at the inlet of the evaporator.

Possible cause: Insufficient water flow etc..

SPOTTY ICE FORMATION

There are small sections on the evaporator where there is no ice formation. This could be a single corner, or a single spot in the middle of the evaporator. This is generally caused by loss of heat transfer from the tubing on the back side of the evaporator.

NO ICE FORMATION

The ice machine operation for an extended period, but there is no ice formation at all on the evaporator.

Possible cause: Water float valve, water pump, low refrigerant charge, compressor, etc..

SAFETY LIMIT FEATURE

In addition to the standard safety controls, your CHOICE ice machine features built-in safety limits that will stop the ice machine if conditions arise which could cause a major component failure.

Before calling for service, re-start the ice machine using the following procedure:

1. Move the ON/OFF/WASH toggle switch to OFF and then back to ON.
2. If the safety limit feature has stopped the ice machine, it will restart after a short delay. Proceed to step 4.
3. If the ice machine does not restart, see “Ice machine does not operate”.
4. Allow the ice machine to run to determine if the condition is reoccurring.
 - A. If the ice machine stops again, the condition has reoccurred. Call for service.
 - B. If the ice machine continues to run, the condition has corrected itself. Allow the ice machine to continue running.

SAFETY LIMITS

In addition to standard safety controls, the control board has two built in safety limit controls which protect the ice machine from major component failures.

Safety Limit #1: If the freeze time reaches 60 minutes, the control board automatically initiates a harvest cycle. 3 cycles outside the time limit = 1hour Stand-by Mode.

Safety Limit #2: If the harvest time reaches 3.5 minutes, the control board automatically returns the ice machine to the freeze cycle. 3 consecutive cycles outside the time limit = Safety Limit (must be MANUALLY reset).

Safety Limit Stand-by Mode: The first time a safety limit shut down occurs, the ice machine turns off for 60 minutes (Stand-by Mode). The ice machine will then automatically restart to see if the problem reoccurs. During the Stand-by Mode the harvest light will be flashing continuously and a safety limit indication can be viewed. If the same safety limit is reached a second time (the problem has reoccurred), the ice machine will initiate a safety limit shut down and remain off until it is manually restarted. During a safety limit shut down the harvest light will be flashing continuously.

Determining Which Safety Limit Stopped the Ice Machine:

When a safety limit condition causes the ice machine to stop, the harvest light on the control board continually flashes on and off. Use the following procedures to determine which safety limit has stopped the ice machine.

1. Move the toggle switch to OFF.
2. Move the toggle switch back to ON.
3. Watch the harvest light. It will flash one or two times, corresponding to safety limits 1 and 2, to indicate which safety limit stopped the ice machine.

After safety limit indication, the ice machine will restart and run until a safety limit is exceeded again.

SAFETY LIMIT NOTES

- A safety limit indication is completed before the water pump starts. Water contacting the ice thickness probe

in the freeze cycle will cause the harvest light to flash. Do not mistake a harvest light flashing in the freeze cycle with a safety limit indication.

- A continuous run of 100 harvests automatically erases the safety limit code.
- The control board will store and indicate only one safety limit- the last one exceeded.
- If the toggle switch is moved to the OFF position and then back to the ON position prior to reaching the 100-harvest point, the last safety limit exceeded will be indicated.
- If the harvest light did not flash prior to the ice machine restarting, then the ice machine did not stop because it exceeded a safety limit.

ANALYZING WHY SAFETY LIMITS MAY STOP THE ICE MACHINE

According to the refrigeration industry, a high percentage of compressor failure is a result of external causes. These can include flooding or starving expansion valves, dirty condensers, water loss to the ice machine, etc. The safety limits protect the ice machine (primarily the compressor) from external failures by stopping ice machine operation before major component damage occurs.

The safety limit system is similar to a high-pressure cutout control. It stops the ice machine, but does not tell what is wrong. The service technician must analyze the system to determine what caused the high-pressure cutout, or a particular safety limit, to stop the ice machine.

The safety limits are designed to stop the ice machine prior to major component failures, most often a minor problem or something external to the ice machine. This may be difficult to diagnose, as many external problems occur intermittently.

Example: An ice machine stops intermittently on safety limit #1 (long freeze times). The problem could be a low ambient temperature at night, a water pressure drop; the water is turned off one night a week, etc.

When a high-pressure cutout or a safety limit stops the ice machine, they are doing what they are supposed to do. That is, stopping the ice machine before a major component failure occurs.

Refrigeration and electrical component failures may also trip a safety limit. Eliminate all electrical components and external causes first. If it appears that the refrigeration system is causing the problem, use CHOICE's Refrigeration System Operational Analysis Table, along with detailed charts, checklists, and other references to determine the cause.

SAFETY LIMIT CHECKLIST

The following checklists are designed to assist the service technician in analysis. However, because there are many possible external problems, do not limit your diagnosis to only the items listed.

SAFETY LIMIT #1

Freeze time exceeds 60 minutes for 3 consecutive freeze cycles.

Possible Cause Checklist

Improper installation

- Refer to "Installation and Visual Inspection Checklist".

Water System

- Water Level set too high (water escaping through overflow tube)
- Low water pressure (20 psig min.)
- High water pressure (80 psig max.)
- High water temperature (32.2°C)
- Clogged water distribution tube
- Dirty/defective float valve
- Defective water pump

Electrical System

- Ice thickness probe out of adjustment
- Harvest cycle not initiated electrically

- Contactor not energizing
- Compressor electrically non-operational Refrigeration System
- High inlet air temperature (43.3°C max.)
- Restricted condenser air flow
- Dirty condenser fins
- Defective fan cycling control
- Defective fan motor
- Non-CHOICE components
- Improper refrigerant charge
- Defective compressor
- Plugged capillary tube
- Non-condensable in refrigeration system
- Plugged or restricted high side refrigerant lines or component
- Defective hot gas valve

SAFETY LIMIT #2

Harvest time exceeds 3.5 minutes for 3 consecutive harvest cycles.

Possible Cause Checklist

Improper installation

- Refer to “Installation and Visual Inspection Checklist”.

Water System

- Water area (evaporator) dirty
- Dirty/defective water dump valve
- Vent tube not installed on water outlet drain
- Water freezing behind evaporator
- Plastic extrusions and gaskets not securely mounted to the evaporator
- Low water pressure (20 psig min.)
- Loss of water from sump area

- Clogged water distribution tube
- Dirty/defective float valve
- Defective water pump

Electrical System

- Ice thickness probe out of adjustment
- Ice thickness probe dirty
- Bin switch defective
- Premature harvest

Refrigeration System

- High inlet air temperature (43.3°C max.)
- Restricted condenser air flow
- Dirty condenser fins
- Defective fan cycling control
- Defective fan motor
- Non-CHOICE components
- Defective hot gas valve
- Improper refrigerant charge
- Defective fan cycling control

LOW REFRIGERANT CHARGE

Important

Confirm water float valve is set correctly. An overflowing standpipe mimics these symptoms exactly.

SYMPTOMS:

- Ice Fill Pattern
 - Thin on top two rows of the evaporator
 - Thin on entire left side of the evaporator
 - Thick on the bottom of the evaporator
 - Freeze time longer than normal

Diagnosis can be confirmed by adding 2 oz (56.7g) of refrigerant: if the suction line temperature drops or the ice

fill pattern on the top two rows fills in, the ice machine is low on refrigerant. Refer to "Charging Procedures" on page 104.

OVERCHARGED SYSTEM

Suction line temperature will be slightly low during freeze cycle 5°F(3°C). Discharge line temperature is normal. Actual amperage readings will be higher than nameplate rating.

HOT GAS VALVE

General

The hot gas valve is an electrically operated valve that opens when energized, and closes when de-energized.

Normal Operation

The valve is de-energized (closed) during the freeze cycle and energized (open) during the harvest cycle. The valve is positioned between the receiver and the evaporator and performs two functions:

1. Prevents refrigerant from entering the evaporator during the freeze cycle.
The hot gas valve is not used during the freeze cycle. The hot gas valve is de-energized (closed) preventing refrigerant flow from the receiver into the evaporator.
2. Allows refrigerant vapor to enter the evaporator in the harvest cycle.
During the harvest cycle, the hot gas valve is energized (open) allowing refrigerant gas from the discharge line of the compressor to flow into the evaporator. The heat is absorbed by the evaporator and allows release of the ice slab.

Exact pressure vary according to ambient temperature and ice machine model. Harvest pressures for HE0120 can be found in the Cycle Time/24 Hour Ice Production/ Refrigerant Pressure Charts in this book.

HOT GAS ANALYSIS

The valve can fail in two positions:

- Valve will not open in the harvest cycle.
- Valve remains open during the freeze cycle.

VALVE WILL NOT OPEN IN THE HARVEST CYCLE

Although the circuit board has initiated a harvest cycle, the evaporator temperature remains unchanged from the freeze cycle.

Caution

Coil must be seated 100% on solenoid to function correctly. Install coil with a twisting motion to properly seat.

VALVE REMAINS OPEN IN THE FREEZE CYCLE:

Symptoms of hot gas valve remaining partially open during the freeze cycle can be similar to symptoms of an expansion valve, float valve or compressor problem. Symptoms are dependent on the amount of leakage in the freeze cycle.

A small amount of leakage will cause increased freeze times and an ice fill pattern that is “Thin at the Outlet”, but fills in at the end of the cycle.

As the amount of leakage increases the length of the freeze cycle increases and the amount of ice at the outlet of the evaporator decreased.

Refer to the Parts Manual for proper valve application. If replacement is necessary, use only “original” CHOICE replacement parts.

Use the following procedure and table to help determine if a hot gas valve is remaining partially open during the freeze cycle.

1. Wait 5 minutes into the freeze cycle.
2. Feel the inlet of the hot gas valve(s).

Important

Feeling the hot gas valve outlet or across the hot gas valve itself will not work for this comparison. The hot gas valve outlet is on the suction side (cool refrigerant). It may be cool enough to touch even if the valve is leaking.

3. Feel the compressor discharge line.

Warning

The inlet of the hot gas valve and the compressor discharge line could be hot enough to burn your hand. Just touch them momentarily.

4. Compare the temperature of the inlet of the hot gas valves to the temperature of the compressor discharge line.

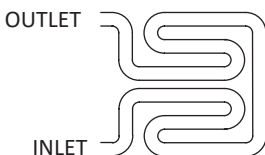
Findings	Comments
The inlet of the harvest valve is cool enough to touch and the compressor discharge line is hot. Cool & Hot	This is normal as the discharge line should always be too hot to touch and the harvest valve inlet, although too hot to touch during harvest, should be cool enough to touch after 5 minutes into the freeze cycle.
The inlet of the harvest valve is hot and approaches the temperature of a hot compressor discharge line. Hot & Hot	This is an indication something is wrong, as the harvest valve inlet did not cool down during the freeze cycle. If the compressor dome is also entirely hot, the problem is not a harvest valve leaking, but rather something causing the compressor (and the entire ice machine) to get hot.
Both the inlet of the harvest valve and the compressor discharge line are cool enough to touch. Cool & Cool	This is an indication something is wrong, causing the compressor discharge line to be cool to be touch. This is not caused by a harvest valve leaking.

5. Record your findings on the table.

REFRIGERATION DIGNOSTICS - HE0120

Important:

- DO NOT install a manifold gauge set on the ice machine! Refrigerant pressures are not used to diagnose this ice machine.
- If the ice machine is “slushing” remove the screen from the bottom of the water pump.
- Normal Ice Fill Pattern is less fill on the left side of the evaporator. This occurs because the refrigeration tubing exits the evaporator on the left side.

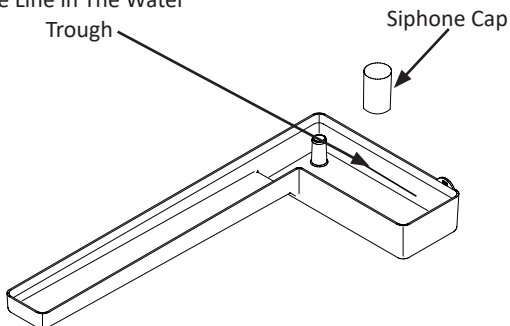


HE0120 Evaporator Tubing Routing

Procedure

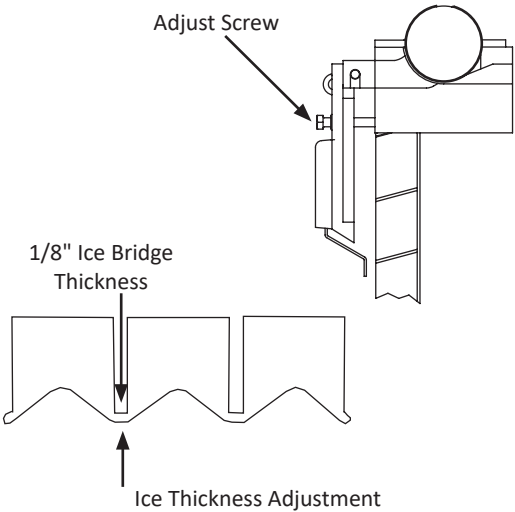
1. Remove siphon cap from siphon tube and verify that the water level is between 1/4 and 3/8 inch (6.4-9.5mm) from the top of the standpipe, a line in the water trough indicates the correct level.

Set The Water Level to
The Line in The Water

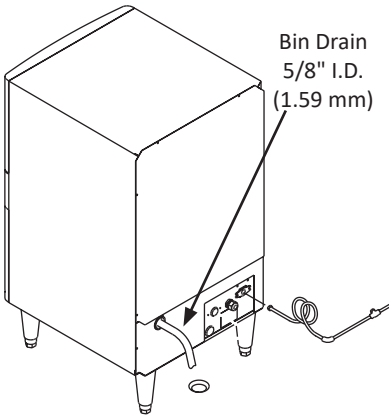


2. Verify that the incoming water pressure is more than 20 psi and less than 80 psi.

3. Verify that the ice thickness probe is properly adjusted.



4. Verify that the machine has properly sized drain line leaving the machine and that the bin drain is not restricted. Refer to "Drain Connections" for installation details.



5. Install thermometer thermocouples on Suction and

Discharge line:

- Digital thermometers with remote thermocouples must be used to obtain temperatures.
 - Suction and Discharge line thermocouples must be within 3" (76.2mm) of the compressor.
 - Thermocouples must be insulated.
 - Doors and all panels must be in place.
 - Initial freeze cycle is not used for diagnostics.
 - Start monitoring temperatures 3 minutes into the second freeze cycle.
6. Compare Suction and Discharge temperatures to "HE0120 Operating Temperatures". The charts list Normal suction and discharge temperatures.

ANALYSIS

Discharge Line Temp	Suction Line Temp	Ice fill Pattern	Refer to Diagnostics for:
Normal	Normal	Less fill on the left side of the evaporator	This is normal operation
Normal or High	High 10° or More	Less fill on the left side and top 2 rows of the evaporator	Low on Refrigerant/ plugged capillary tube
Normal	Low 5° or More	Less fill on the left side of the evaporator	Refrigerant Overcharge

Chapter 7 Refrigerant Recovery/Evacuation

Definitions

RECOVER

To remove refrigerant, in any condition, from a system and store it in an external container, without necessarily testing or processing it in any way.

RECYCLE

To clean refrigerant for re-use by oil separation and single or multiple passes through devices, such as replaceable core filter-driers, which reduce moisture, acidity and particulate matter. This term usually applies to procedures implemented at the field job site or at a local service shop.

RECLAIM

To reprocess refrigerant to new product specifications (see below) by means which may include distillation. A chemical analysis of the refrigerant is required after processing to be sure that product specifications are met. This term usually implies the use of processes and procedures available only at a reprocessing or manufacturing facility.

Chemical analysis is the key requirement in this definition. Regardless of the purity levels reached by a reprocessing method, refrigerant is not considered “reclaimed” unless it has been chemically analyzed and meets ARI Standard 700 (latest edition).

NEW PRODUCT SPECIFICATIONS

This means ARI Standard 700 (latest edition). Chemical analysis is required to assure that this standard is met.

REFRIGERANT RE-USE POLICY

CHOICE recognizes and supports the need for proper handling, re-use, and disposal of CFC and HCFC refrigerants. CHOICE service procedures require recapturing refrigerants, not venting them to the atmosphere.

It is not necessary, in or out of warranty, to reduce or compromise the quality and reliability of your customers' products to achieve this.

Important

CHOICE assumes no responsibility for use of contaminated refrigerant. Damage resulting from the use of contaminated, recovered, or recycled refrigerant is the sole responsibility of the servicing company.

CHOICE approves the use of:

1. New Refrigerant
 - Must be of original nameplate type.
2. Reclaimed Refrigerant
 - Must be of original nameplate type.
 - Must meet ARI Standard 700 (latest edition) specifications.
3. Recovered or Recycled Refrigerant
 - Must be recovered or recycled in accordance with current local, state and federal laws.
 - Must be recovered from and re-used in the same CHOICE product. Re-use of recovered or recycled refrigerant from other products is not approved.
 - Recycling equipment must be certified to ARI
 - Standard 740 (latest edition) and be maintained to consistently meet this standard.
4. Recovered refrigerant must come from a "contaminant-free" system. To decide whether the system is contaminant free, consider:
 - Type(s) of previous failure(s)
 - Whether the system was cleaned, evacuated and recharged properly following failure(s)
 - Whether the system has been contaminated by this failure
 - Compressor motor burnouts and improper past

service prevent refrigerant re-use.

- Refer to “System Contamination Cleanup” on page 123 to test for contamination.

5. “Substitute” or “Alternative” Refrigerant

- Must use only CHOICE-approved alternative refrigerants.
- Must follow CHOICE-published conversion procedures.

RECOVERY AND RECHARGING PROCEDURES

Do not purge refrigerant to the atmosphere. Capture refrigerant using recovery equipment. Follow the manufacturer’s recommendations.

Important

CHOICE assumes no responsibility for the use of contaminated refrigerant. Damage resulting from the use of contaminated refrigerant is the sole responsibility of the servicing company.

Important

Replace the liquid line drier before evacuating and recharging. Use only a CHOICE (O.E.M.) liquid line filter drier to prevent voiding the warranty.

CONNECTIONS

The HE series ice machines are critically charged. There are no refrigerant access ports on HE series ice machines.

1. Locate the high and low side process tubes.
2. Install a piercing valve (saddle valve) on both the high and low side process tubes.

Important

Remove piercing valves after charging. Unit is critically charged.

Important

Purge system with nitrogen while brazing to prevent build up of copper oxide in the refrigeration system.

Important

Manifold gauges must be removed properly to ensure that no refrigerant contamination or loss occurs. A quick disconnect is required for the high side connection unless high side valve has shut off.

RECOVERY/EVACUATION

1. Place the toggle switch in the OFF position.
2. Install manifold gauges, charging scale, and recovery unit or two-stage vacuum pump.
3. Open the high and low side valves on manifold gauges.
4. Perform recovery or evacuation:
 - A. Recovery: Operate the recovery unit as directed by the manufacturer's instructions.
 - B. Evacuation prior to recharging: Pull the system down to 500 microns. Then, allow the pump to run for an additional half hour. Turn off the pump and perform a standing vacuum leak check.

NOTE: Check for leaks using a halide or electronic leak detector after charging the ice machine.

CHARGING PROCEDURES

Important

The charge is critical on all CHOICE ice machines. Use a scale to ensure the proper charge is installed. A quick disconnect is required for the high side connection.

1. Be sure the toggle switch is in the OFF position.
2. Close the vacuum pump valve and the low side manifold gauge valve.

3. Open the high side manifold gauge valve.
4. Using a digital scale add the proper refrigerant charge (shown on nameplate) through the high side.
5. Close/isolate the refrigerant cylinder.
6. Let the system “settle” for 2 to 3 minutes.
7. Place the toggle switch in the ICE position.
8. Close the high side on the manifold gauge set.

NOTE: Manifold gauges must be removed properly to ensure that no refrigerant contamination or loss occurs. A quick disconnect is required for the high side connection unless high side valve has shut off.

9. Make sure that all of the vapor in the charging hoses is drawn into the ice machine before disconnecting the charging hoses.
 - A. Disconnect the water pump.
 - B. Run the ice machine in the freeze cycle.
 - C. Close the high side piercing valve (if required) and remove the high side hose with the quick disconnect.
 - D. Open the high and low side valves on the manifold gauge set. Any refrigerant in the lines will be pulled into the low side of the system.
 - E. Allow the suction pressure to reach 6.89 kPa (0 psi) while the ice machine is in the freeze cycle.
 - F. Using a pinch-off tool, pinch off the high and low side process tubes and remove both piercing valves.
 - G. Using an oxygen/acetylene torch seal the penetrations from the piercing valves.

Important

Remove piercing valves after charging. Unit is critically charged.

System Contamination Cleanup

GENERAL

This section describes the basic requirements for restoring contaminated systems to reliable service.

Important

CHOICE assumes no responsibility for the use of contaminated refrigerant. Damage resulting from the use of contaminated refrigerant is the sole responsibility of the servicing company.

DETERMINING SEVERITY OF CONTAMINATION

System contamination is generally caused by either moisture or residue from compressor burnout entering the refrigeration system.

Inspection of the refrigerant usually provides the first indication of system contamination. Obvious moisture or an acrid odor in the refrigerant indicates contamination.

If either condition is found, or if contamination is suspected, use a Total Test Kit from Totaline or a similar diagnostic tool. These devices sample refrigerant, eliminating the need to take an oil sample. Follow the manufacturer's directions.

If a refrigerant test kit indicates harmful levels of contamination, or if a test kit is not available, inspect the compressor oil.

1. Remove the refrigerant charge from the ice machine.
2. Remove the compressor from the system.
3. Check the odor and appearance of the oil.
4. Inspect open suction and discharge lines at the compressor for burnout deposits.
5. If no signs of contamination are present, perform an acid oil test to determine the type of cleanup required.

Contamination/Cleanup Chart	
Symptoms/Findings	Required Cleanup Procedure
No symptoms or suspicion of contamination	Normal evacuation/recharging procedure
Moisture/Air Contamination symptoms Refrigeration system open to atmosphere for longer than 15 minutes Refrigeration test kit and/or acid oil test shows contamination No burnout deposits in open compressor lines	Mild contamination cleanup procedure
Mild Compressor Burnout symptoms Oil appears clean but smells acid Refrigeration test kit or acid oil test shows harmful acid content No burnout deposits in open compressor lines	Mild contamination cleanup procedure
Severe Compressor Burnout symptoms Oil is discolored, acidic, and smells acid Burnout deposits found in the compressor, lines, and other components	Severe contamination cleanup procedure

MILD SYSTEM CONTAMINATION CLEANUP PROCEDURE

1. Replace any failed components.
2. If the compressor is good, change the oil.
3. Replace the liquid line drier.

NOTE: If the contamination is from moisture, use heat lamps during evacuation. Position them at the compressor, condenser and evaporator prior to evacuation. Do not position heat lamps too close to plastic components, or they may melt or warp.

Important

Dry nitrogen is recommended for this procedure. This will prevent CFC release.

4. Follow the normal evacuation procedure, except replace the evacuation step with the following:
 - A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig.
 - B. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig.
 - C. Change the vacuum pump oil.
 - D. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour on self-contained models, 1 hour on remotes.

NOTE: You may perform a pressure test as a preliminary leak check. You should use an electronic leak detector after system charging to be sure there are no leaks.

5. Charge the system with the proper refrigerant to the nameplate charge.
6. Operate the ice machine.

SEVERE SYSTEM CONTAMINATION CLEANUP PROCEDURE

1. Remove the refrigerant charge.
2. Remove the compressor.
3. Disassemble the hot gas solenoid valve. If burnout deposits are found inside the valve, install a rebuild kit, and replace the capillary tube and head pressure control valve.
4. Wipe away any burnout deposits from suction and discharge lines at compressor.
5. Sweep through the open system with dry nitrogen.

Important

Refrigerant sweeps are not recommended, as they release CFCs into the atmosphere.

6. Install a new compressor and new start components.

7. Install suction line filter-drier in front of compressor.
8. Install a new liquid line drier.
9. Follow the normal evacuation procedure, except replace the evacuation step with the following.

Important

Dry nitrogen is recommended for this procedure.

This will prevent CFC release.

- A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig.
 - B. Change the vacuum pump oil.
 - C. vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig.
 - D. Change the vacuum pump oil.
 - E. Pull vacuum to 500 microns. Run the vacuum pump for 1 additional hour.
10. Charge the system with the proper refrigerant to the nameplate charge.
 11. Operate the ice machine for one hour. Then, check the pressure drop across the suction line filter-drier.
 - A. If the pressure drop is less than 2 psig, the filter-drier should be adequate for complete cleanup.
 - B. If the pressure drop exceeds 2 psig, change the suction line filter-drier and the liquid line drier. Repeat until the pressure drop is acceptable.
 12. Operate the ice machine for 48 – 72 hours. Replace the suction line and liquid line drier if necessary.
 13. Follow normal evacuation procedures.

REPLACING PRESSURE CONTROLS WITHOUT REMOBING REFRIGERANT CHARGE

This procedure reduces repair time and cost. Use it when any of the following components require replacement, and the refrigeration system is operational and leak-free.

- Fan cycle control
- High pressure cut-out control
- High side access valve
- Low side access valve

Important

This is a required in-warranty repair procedure.

1. Disconnect power to the ice machine.
2. Follow all manufacturers' instructions supplied with the pinch-off tool. Position the pinch-off tool around the tubing as far from the pressure control as feasible. (See the figure on next page.) Clamp down on the tubing until the pinch-off is complete.

⚠ Warning

Do not unsolder a defective component. Cut it out of the system. Do not remove the pinch-off tool until the new component is securely in place.

3. Cut the tubing of the defective component with a small tubing cutter.
4. Solder the replacement component in place. Allow the solder joint to cool.
5. Remove the pinch-off tool.
6. Re-round the tubing. Position the flattened tubing in the proper hole in the pinch off tool. Tighten the wing nuts until the block is tight and the tubing is rounded.

NOTE: The pressure controls will operate normally once the tubing is re-rounded. Tubing may not re-round 100%.

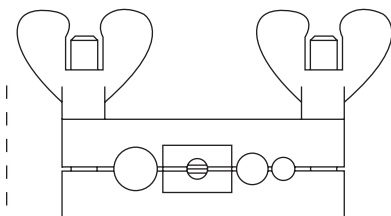


FIG.A- "Pinching OFF" Tubing

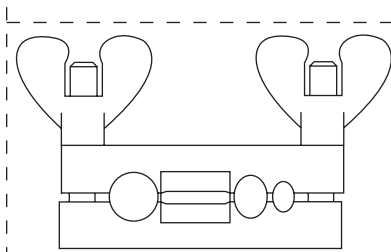


FIG.B- Re-rounding Tubing

TOTAL SYSTEM REFRIGERANT CHARGE

This information is for reference only. Refer to the ice machine serial number tag to verify the system charge. Serial plate information overrides information listed on these pages.

Model	Refrigerant	Charge
HE0070	R134a	6.35 oz (180 g)
HE0120	R134a	7.4 oz (210 g)

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Chapter 8 Charts

General

These charts are used as guidelines to verify correct ice machine operation.

Accurate collection of data is essential to obtain the correct diagnosis.

- Exclude all non-refrigeration issues before diagnosing the refrigeration system.
- Visually inspect the clearances, drains, condensers/filters for dirt and replace the water filter.
- Verify that the water flow is uniform throughout the evaporator.
- Ice production checks that are within 10% of the chart are considered normal. This is due to variances in water and air temperature. Actual temperatures will seldom match the chart exactly.
- Refer to “Operational Analysis Chart” for the list of data that must be collected for refrigeration diagnostics.
- Zero out manifold gauge set before obtaining pressure readings to avoid mis-diagnosis.
- Discharge and suction pressure are highest at the beginning of the cycle. Suction pressure will drop throughout the cycle. Verify the pressures are within the range indicated.

HE0070

NOTE: These characteristics may vary depending on operating conditions.

NOTE: The first cycle, at any temperature, will take up to three minutes longer.

TOTAL CYCLE TIME

Freeze Time + Harvest Time = Total Cycle Time

Ambient Temperature °F/°C	Freeze Time			Harvest Time
	Water Temperature °F/°C			
	50/10	70/21	90/32	
70/21	8-11	9-12	9-12	1.5-3.5
80/27	10-13	11-14	11-14	
90/32	12-15	12-15	12-15	
100/38	13-16	14-17	14-17	

Times are in minutes.

24 HOUR ICE PRODUCTION

Ambient Temperature °F/°C	Inlet Water Temperature °F/°C		
	50/10	70/21	90/32
70/21	66lbs(30kg)	-	-
90/32	-	55lbs(25kg)	-

OPERATING TEMPERATURES

NOTE: Suction temp drops gradually throughout the freeze cycle.

50°F (10°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	47-59	27-1	57-66	-9-26
70/21	64-72	38-8	72-80	1-42
80/27	70-79	40-10	77-83	3-33
90/32	78-82	22-11	72-86	7 - 10
100/38	87-90	23-11	81-89	8-41

70°F (21°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	50-62	29-2	62-66	-8-30
70/21	63-73	38-7	75-77	-2-40
80/27	72-80	40-10	77-82	1-42
90/32	79-83	17-12	75-80	5-32
100/38	88-91	24-11	82-87	8-41

90°F (32°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	51-63	30-3	60-68	-8-30
70/21	65-77	38-8	75-80	-2-41
80/27	71-81	41-10	78-83	1-41
90/32	79-83	17-11	74-84	3-31
100/38	90-93	26-12	82-90	8-41

HE0120

NOTE: These characteristics may vary depending on operating conditions.

NOTE: The first cycle, at any temperature, will take up to three minutes longer.

TOTAL CYCLE TIME

Freeze Time + Harvest Time = Total Cycle Time

Ambient Temperature °F/°C	Freeze Time			Harvest Time
	Water Temperature °F/°C			
	50/10	70/21	90/32	
70/21	14-17	17-20	20-23	1-2
80/27	16-19	20-23	23-26	
90/32	19-22	22-25	26-29	
100/38	23-26	27-30	31-34	

Times are in minutes.

24 HOUR ICE PRODUCTION

Ambient Temperature °F/°C	Inlet Water Temperature °F/°C		
	50/10	70/21	90/32
70/21	115lbs(52kg)	-	-
90/32	-	80lbs(36kg)	-

OPERATING TEMPERATURES

NOTE: Suction temp drops gradually throughout the freeze cycle.

50°F (10°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	55-64	18-7	46-55	7-13
70/21	60-70	15-10	50-60	8-14
80/27	66-77	18-12	53-63	12-17
90/32	71-83	21-13	54-63	16-21
100/38	76-90	26-16	55-66	19-25

70°F (21°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	56-66	19-6	47-56	7-13
70/21	61-69	22-10	51-61	8-14
80/27	66-75	23-11	52-63	11-17
90/32	72-82	26-12	55-64	16-21
100/38	77-88	30-16	59-70	20-25

90°F (32°C) Water

Ambient Temp. °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp. °C	Suction Temp. °C	Discharge Temp. °C	Suction Temp. °C
50/10	56-67	20-9	48-57	7-13
70/21	62-74	22-11	53-62	9-15
80/27	67-79	25-16	53-63	12-18
90/32	73-86	32-17	55-64	16-22
100/38	78-93	35-18	55-65	20-25

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Chapter 9 Wiring Diagrams

Wiring Diagrams

The following pages contain electrical wiring diagrams. Be sure you are referring to the correct diagram for the ice machine you are servicing.

Warning

Always disconnect power before working on electrical circuitry.

WIRING DIAGRAM LEGEND

The following symbols are used on all of the wiring diagrams:

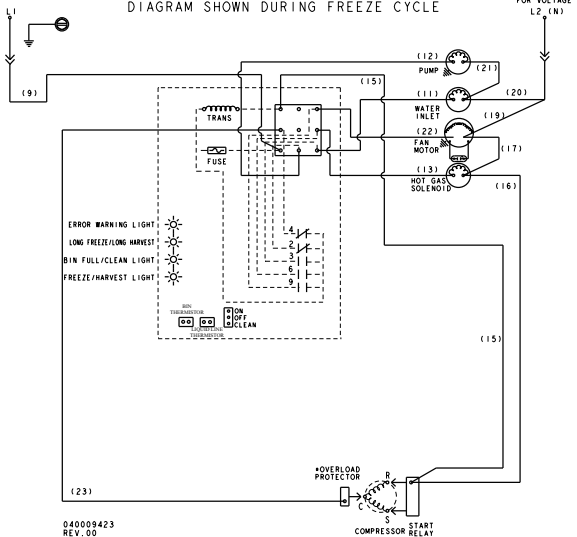
- * Internal Compressor Overload
(Some models have external compressor overloads)
- ** Fan Motor Run Capacitor
(Some models do not incorporate fan motor run capacitor)
- () Wire Number Designation
(The number is marked at each end of the wire)
- >>— Multi-pin Connection
(Electrical Box Side) —>>—
(Compressor Compartment Side)

HE0070

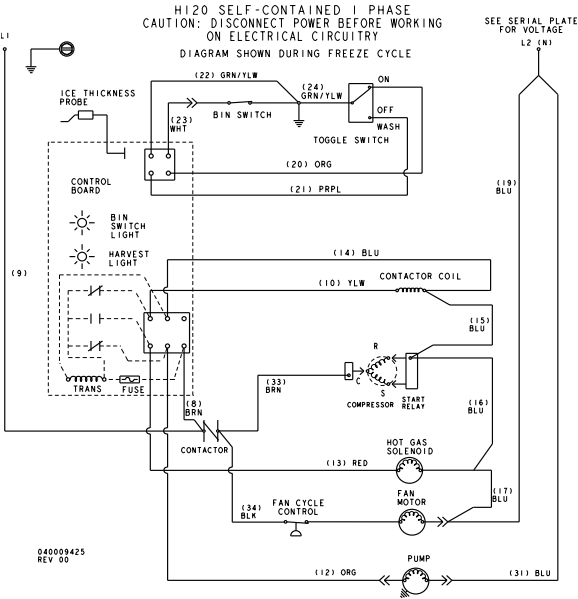
H70 SELF-CONTAINED 1 PHASE
CAUTION: DISCONNECT POWER BEFORE WORKING
ON ELECTRICAL CIRCUITRY

DIAGRAM SHOWN DURING FREEZE CYCLE

SEE SERIAL PLAT
FOR VOLTAGE
L2 (N)

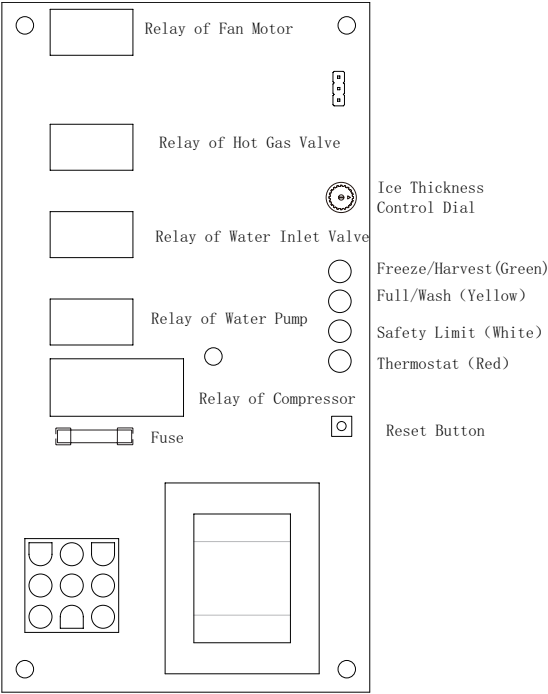


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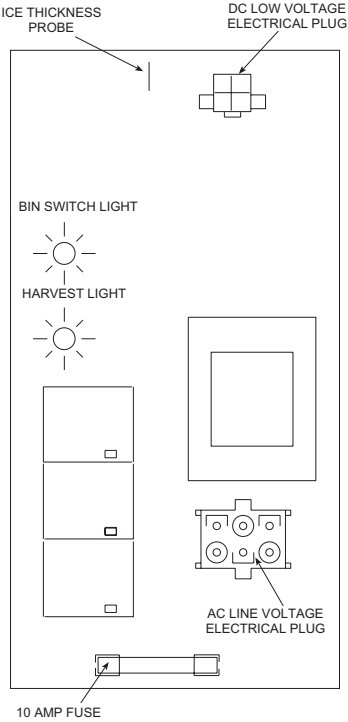


Control Board

HE0070

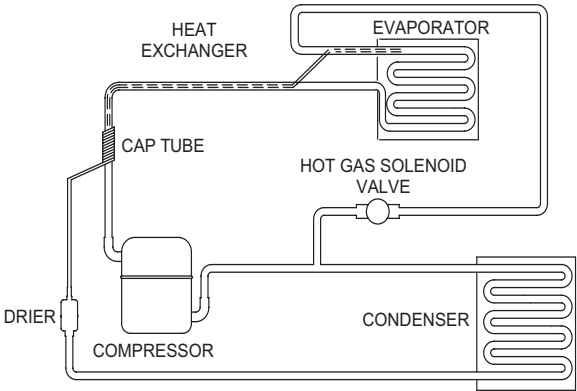


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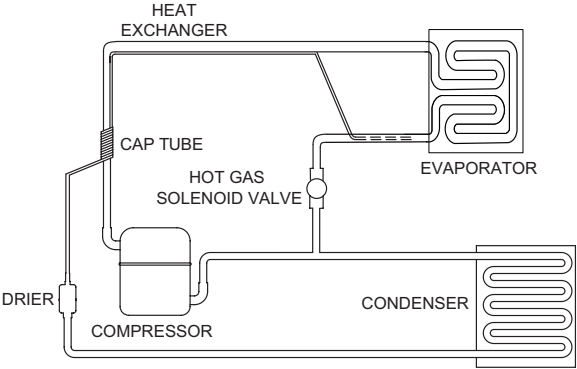


Tubing Schematics

HE0070



HE0120



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