UnderCounter Ice Machines

HF Series

Technician's Handbook

Part Number: 040009910 01/25

Safety Notices

Safety Notices

Read these precautions to prevent personal injury:

- Read this manual thoroughly before installing,operating or performing maintenance on the equipment. Failure to follow instructions in this manual can cause property damage, injury or death.
- Routine adjustments and maintenance procedures outlined in this manual are not covered by the warranty.
- Proper installation, care and maintenance are essential for maximum performance and trouble-free operation of your equipment. Visit our website www.manitowocice.com for manual updates, translations, or contact information for service agents in your area.
- This equipment contains high voltage electricity and refrigerant charge. Installation and repairs are to be performed by properly trained technicians aware of the dangers of dealing with high voltage electricity and refrigerant under pressure. The technician must also be certified in proper refrigerant handling and servicing procedures. All lockout and tag out procedures must be followed when working on this equipment.
- This equipment is intended for indoor use only. Do not install or operate this equipment in outdoor areas.

Definitions

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury. This applies to the most extreme situations.

⚠ Warning

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ Caution

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

Notice

Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).

NOTE: Indicates useful, extra information about the procedure you are performing.

⚠Warning

Follow these precautions to prevent personal injury during installation of this equipment:

- Installation must comply with all applicable equipment fire and health codes with the authority having jurisdiction.
- To avoid instability the installation area must be capable of supporting the combined weight of the equipment and product. Additionally the equipment must be level side to side and front to back.
- Do not damage the refrigeration circuit when installing, maintaining or servicing the unit.
- Connect to a potable water supply only.
- This equipment contains refrigerant charge. Installation of the line sets must be performed by a properly trained and EPA certified refrigeration technician aware of the dangers of dealing with refrigerant charged equipment.
- These products are hermetically sealed and contain fluorinated greenhouse gas R404A..

⚠Warning

Follow these electrical requirements during installation of this equipment.

- All field wiring must conform to all applicable codes of the authority having jurisdiction. It is the responsibility of the end user to provide the disconnect means to satisfy local codes. Refer to rating plate for proper voltage.
- This appliance must be grounded.
- This equipment must be positioned so that the plug is accessible unless other means for disconnection from the power supply (e.g., circuit breaker or disconnect switch) is provided.
- Check all wiring connections, including factory terminals, before operation. Connections can become loose during shipment and installation.

⚠ DANGER

Do not operate equipment that has been misused, abused, neglected, damaged, or altered/modified from that of original manufactured specifications. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision concerning use of the appliance by a person responsible for their safety. Do not allow children to play with, clean or maintain this appliance without proper supervision.

⚠Warning

Follow these precautions to prevent personal injury while operating or maintaining this equipment:

- Read this manual thoroughly before operating, installing or performing maintenance on the equipment. Failure to follow instructions in this manual can cause property damage, injury or death.
- Crush/Pinch Hazard. Keep hands clear of moving components. Components can move without warning unless power is disconnected and all potential energy is removed.
- Moisture collecting on the floor will create a slippery surface. Clean up any water on the floor immediately to prevent a slip hazard.
- Objects placed or dropped in the bin can affect human health and safety. Locate and remove any objects immediately.
- Never use sharp objects or tools to remove ice or frost. Do not use mechanical devices or other means to accelerate the defrosting process.
- When using cleaning fluids or chemicals, rubber gloves and eye protection (and/or face shield) must be worn.

⚠ DANGER

Follow these precautions to prevent personal injury during use and maintenance of this equipment:

- It is the responsibility of the equipment owner to perform a Personal Protective Equipment Hazard Assessment to ensure adequate protection during maintenance procedures.
- Do Not Store Or Use Gasoline Or Other Flammable Vapors Or Liquids In The Vicinity Of This Or Any Other Appliance. Never use flammable oil soaked cloths or combustible cleaning solutions for cleaning.
- Risk of fire/shock. All minimum clearances must be maintained. Do not obstruct vents or openings.
- Failure to disconnect power at the main power supply disconnect could result in serious injury or death. The power switch DOES NOT disconnect all incoming power.
- All utility connections and fixtures must be maintained in accordance with the authority having jurisdiction.
- Turn off and lockout all utilities (gas, electric, water) according to approved practices during maintenance or servicing.

⚠ DANGER

Follow these precautions to prevent personal injury during use and maintenance of this equipment:

- Units with cords must be plugged into individual branch circuits. During movement, cleaning or repair it is necessary to unplug.
- Never use a high-pressure water jet for cleaning on the interior or exterior of this unit. Do not use power cleaning equipment, steel wool, scrapers or wire brushes on stainless steel or painted surfaces.
- The on-site supervisor is responsible for ensuring that operators are made aware of the inherent dangers of operating this equipment.
- Do not operate any appliance with a damaged cord or plug. All repairs must be performed by a qualified service company.

Table of Contents

General Information

Model Numbers

This manual covers the following ice machine models:

Self-Contained Air-Cooled	Self-Contained Water-Cooled
HDF0190A	--
HDF0240A	--
HDF0300A	--

NOTE: The model suffix is used to identify the voltage, special model, or country-specific model. See “How to Read A Model Number” on page 16.

Accessories

Contact your distributor for these optional

accessories:

BIN CASTER

Replaces standard legs.

ARCTIC PURE WATER FILTER SYSTEM

Engineered specifically for ice machines,Arctic Pure water filters are an efficient, dependable, and affordable method of inhibiting scale formation, filtering sediment, and removing chlorine taste and odor.

DE-SCALER AND SANITIZER

Manitowoc Ice Machine de-scaler and Sanitizer are the only solutions approved for use with CHOICE products.

De-scaler PN	Sanitizer PN
000016525	000016528

How to Read A Model Number

H D E 0240 A -261 IC

- **H** — **CHOICE Ice Machine**
  - H Series
- **D** — Ice Type
  - D - Dice
  - Y - Half Dice
- **E** — Refrigerant Type
  - E - R134a
  - F - R404A
- **0240** — Nornimal Production(@70/50)
  - 0190 - Produces~190lb/day
  - 0240 - Produces~240lb/day
  - 0300 - Produces~300lb/day
- **A** — Condenser Type
  - A - Air Cooled
  - W - Water Cooled
- **-261** — Electrical Configuration
  - 161 - 115/60/1
  - 261 - 208~230/60/1
  - 251 - 220~240/50/1(S=230)
  - 263 - 208~230/60/3
  - 270 - 200/50-60/3
- **IC** — Power Cord Option
  - Blank - Junction Box
  - Z - Cord without Plug
  - I - Oblique V Blades(Aus)

  Market identifier
  - Blank - Not Market Specific
  - S - Saudi Arabia(GCC)
  - K - Korea(KC)
  - C - China(CCC)

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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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 higher than 40 °F (4 °C) and must be lower than 110 °F (43 °C).
3. Water inlet lines - water pressure to the machine must be above 20 psi (1.38 bar) and below 80 psi (5.52 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.

⚠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.

⚠Warning

Do not obstruct ice machine vents or openings.

Clearance Requirements

H0190 H0240 H0300	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
H0190	2300	3100
H0240	2400	3400
H0300	3800	6000

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

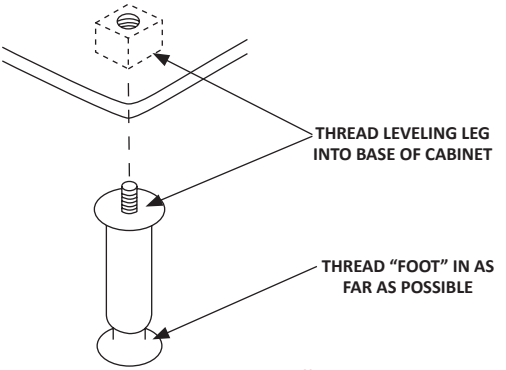
The legs must be screwed in tightly to prevent them from bending.

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.



Leg Installation

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 ±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
H0190	230/1/50	15	3.8	-	-
H0240	230/1/50	15	4.0	-	-
H0300	230/1/50	15	5.0	-	-

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.

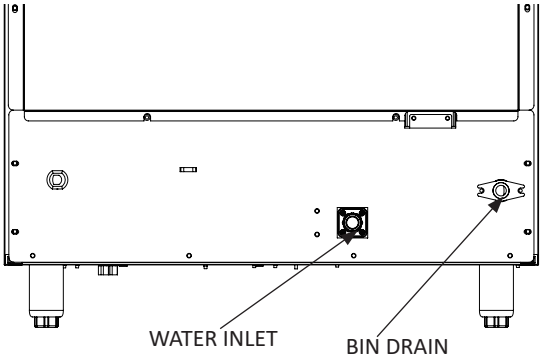
Follow these guidelines to install the water inlet lines:

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 of 80 psi (552 kPa), 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.

Water Supply and Drain Line Sizing/Connections



Location	Inlet Water Temp.	Inlet Water Pressure	Ice Machine Fitting
Ice Making Water Inlet	**Min.** 33°F (0.6°C) **Max.** 90°F (32°C)	**Min.** 20 psi (140 kPa) **Max.** 80 psi (550 kPa)	3/8" Female Pipe Thread
Bin Drain	--	--	1/2" Female Pipe Thread
Condenser Water Inlet	**Min.** 33°F (0.6°C) **Max.** 90°F (32°C)	**Min.** 20 psi (140 kPa) **Max.** 275 psi (1896 kPa)	3/8" Female Pipe Thread **H0300 Only** 1/2" Female Pipe Thread
Condenser Water Drain	--	--	1/2" Female Pipe Thread

⚠Warning

Do not apply heat to water inlet valve or water drain fittings.Heating will damage the nonmetallic connector.

Do not over tighten fittings. Two turns after hand tight is the maximum.

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).

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.

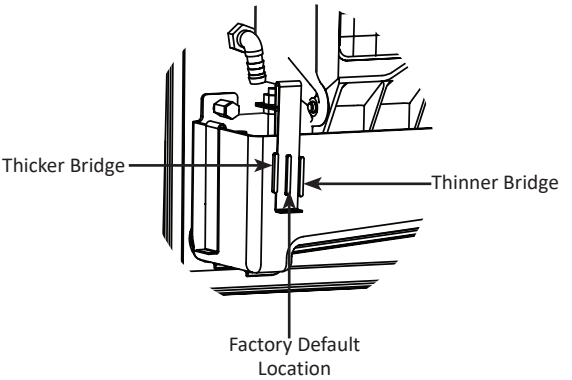
⚠Warning

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 can be adjusted to three levels.

1. Pull forward on the bottom of the bracket until clear of the tab.
2. Slide the bracket over the desired tab and release.
   - The center position is the normal factory setting.
   - To increase bridge thickness, raise the water level.
   - To decrease bridge thickness, lower the water level.



Model	Total Ice Weight from One Cycle	
	Minimum - Maximum	Minimum - Maximum
H0190	2.26 - 2.93 lbs	1025 - 1329 grams
H0240	2.26 - 2.93 lbs	1025 - 1329 grams
H0300	2.26 - 2.93 lbs	1025 - 1329 grams

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 40 °F - 110 °F (4 °C - 43 °C)?
- ☐ Has the ice machine been installed where the incoming water temperature will remain in the range of 33 °F - 90 °F (0.6 °C - 32 °C)?
- ☐ 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?

Touch Pad Features

The touch pad offers a series of pressure sensitive buttons to control ice machine operation and provide operational status.

On/Off - Blue = Machine Is On
Off = Machine Is Off

Delay - Blue = Delay Mode Is On
Off = Delay Mode Is Off

Clean - Yellow = Clean Cycle Is On
Off = Cleaning Is Off
Flashing = Cleaning Is Paused

Bin Full - Blue = Bin Is Full
Off = Bin Is Not Full

Service - Red = Safety Limit
Off = Doesn't Need Service

ON/OFF Button

The On/Off Button is used to start and stop ice making. The blue light indicates whether the ice machine is Ice Making (light on) or Off (light off).

NOTE: If ice is on the evaporator (during the freeze or harvest cycle) and the On/Off button is pressed, the next cycle will have a thick slab of ice. Press the On/Off button and allow the ice to melt off the evaporator, then start a new freeze cycle.

Delay Button

Pressing the Delay button will start a delay period. The ice machine will finish the freeze and harvest cycle and then

start the delay period.

- Pressing the button once will start a 4 hour delay period.
- Pressing the button twice will start a 12 hour delay period.
- Pressing the button three times will start a 24 hour delay period.
- Pressing the button four times will cancel the delay periods.

NOTE: The delay period will be canceled if power is interrupted to the ice machine. When power is restored, the ice machine will remain Off.

Clean Button

Pressing the Clean button for 3 seconds with the machine off will start a clean cycle. After the clean cycle is complete, the ice machine will automatically start an ice making cycle.

- Pressing the Clean button again within 45 seconds of the clean cycle starting will abort the clean cycle.
- Pressing the On/Off button anytime during the clean cycle will de-energize the On/Off LED and the ice machine will stop after the clean cycle is complete.
- Pressing the Clean button will pause the clean cycle. The On/Off and Clean lights will flash on/off to indicate pause mode. Pressing the Clean button again will continue the clean cycle from the point of interruption.

NOTE: Opening the ice damper for 30 seconds will cancel the clean cycle.

Bin Full Light

The Bin Full light energizes when the bin is full or is de-energized if the bin is not full.

Service Light

The Service light indicates the machine needs attention.

Refer to Section 5 for more information if this light is energized.

Ice Making Sequence of Operation

NOTE: The On/Off button must be depressed and the ice damper must be closed before the ice machine will start.

Initial Start-up from Shutoff

The dump valve energizes to purge any water in the water trough down the drain. The harvest valve energizes to equalize refrigerant pressures before the compressor starts.

Freeze Cycle

Prechill - The refrigeration system chills the evaporator before water flow over the evaporator starts. The water inlet valve energizes during the pre-chill and remains on until the ice thickness float switch is satisfied.

Freeze - With water trough thermistor , the following sequence occurs in the frezze cycle:

- When the water temperature reaches 34°F, the water pump will de-energize for 25 seconds, then re-energizes.
- When the water pump restarts the water inlet solenoid energizes for 7 seconds.
- Water flowing across the evaporator will start to freeze and build ice on the evaporator. After a sheet of ice has formed, the harvest float switch signals the control board to start a harvest cycle.

Harvest Cycle

Every third cycle the remaining water is purged down the drain. The refrigerant gas warms the evaporator and the sheet of cubes slides off the evaporator and into the storage bin. If all cubes fall clear of the ice damper the ice machine starts another freeze cycle. The maximum harvest time is a total of 7 minutes.

If the bin switch does not activate within 3.5 minutes, the harvest cycle extends another 3.5 minutes.

Full Bin Cycle

If the ice damper is held open by ice cubes, the ice machine shuts off. When the ice damper closes, the ice machine starts a new cycle at Initial Start-up from Shutoff. The ice machine will remain off for a 3 minute delay period.

Thaw Cycle

The maximum harvest time is a total of 7 minutes. If the bin switch does not activate within 7 minutes a thaw cycle initiates using the following sequence:

1. The compressor de-energizes.
2. The water inlet valve energizes and fills the water trough.
3. The water pump energizes for 2 minutes and circulates water over the evaporator. If the bin switch did not open & close.
4. The water dump valve energizes and drains water from the water trough.
5. Step 1 through 4 repeat.
6. If the damper does not open/close after step 5, the control board assumes no ice is on the evaporator and an initial startup cycle starts.

- If the bin switch opens & closes anytime during the thaw cycle the ice machine starts a new freeze cycle.
- If the bin switch opens and remains open for 30 seconds at any point in the thaw cycle the ice machine will enter an automatic shutoff cycle.
- The maximum water fill time for the thaw cycle is 105 seconds for each of the two possible thaw cycles.

Energized Parts Chart

Ice Making of Sequence of Operation		Water Pump	Harvest Valve	Water Inlet Valve	Dump Valve	Compressor & Fan Motor*	Harvest Float Switch	Ice Thickness Float Switch	Lenght of Time
Initial Star-up	Water Purge	OFF	ON	OFF	ON	OFF	Closed	Closed	20 Sec.
	Refri. System Start-up	OFF	ON	OFF	OFF	ON	Closed	Closed	5 Sec.
Freeze Cycle	Prechill	OFF	OFF	ON	OFF	ON	Open	Closed	60 Sec. 120 Seconds Initial Cycle After Automatic Shutoff
	Freeze	ON**	OFF	ON**	OFF	ON	Open Then Closed	Closed then Open	Until Harvest Float Switch closes for 10 continual seconds

Ice Making of Sequence of Operation		Water Pump	Harvest Valve	Water Inlet Valve	Dump Valve	Compressor & Fan Motor*	Harvest Float Switch	Ice Thickness Float Switch	Lenght of Time
Harvest Sequence	Water Purge	OFF	ON	OFF	ON	ON	Closed	Closed	20 Sec.(After initial cycle every 3rd cycle purge water)
	Harvest	OFF***	ON	OFF***	OFF***	ON	Closed	Closed	Bin switch activation
Automatic Shutoff		OFF	OFF	OFF	OFF	OFF	Closed	Closed	3 Minutes Delay and Bin Switch Re-closure

* Condenser Fan Motor: The fan motor is wired through a fan cycle pressure control; therefore, it may cycle on and off.

** When the water temperature reaches 34°F the water pump de-energizes for 25 seconds . When the pump restarts the water inlet valve energizes for 7 seconds.

*** Will be energized during harvest when time exceeds 3.5 minutes.

Control Board Timers

The control board has the following non-adjustable timers:

- The ice machine is locked into the freeze cycle for 6 minutes before a harvest cycle can be initiated.
- The freeze time lock in feature is bypassed on the initial cycle (manual start or after a full bin/safety limit condition).
- The water inlet valve is de-energized 1 minute after the freeze cycle starts. The control board will energize the water inlet valve one more time 3 minutes into the freeze cycle.
- If the harvest float switch is in the down position for 10 continuous seconds during the start of a freeze cycle, a harvest sequence is initiated.
- The maximum freeze time is 35 minutes at which time the control board automatically initiates a harvest sequence.
- The maximum harvest time is a total of 7 minutes. If the bin switch does not activate within 3.5 minutes, the harvest cycle extends another 3.5 minutes. If 7 minutes is exceeded a thaw cycle starts.
- After the initial harvest cycle from either an automatic shut off or initial start the dump valve solenoid will only energize and purge the water in the water trough every third cycle.

Safety Limits

Safety limits are stored and indicated by the control board. The number of cycles required to stop the ice machine varies for each safety limit.

Safety limits can be reset by pressing the On/Off button and starting a new ice making cycle.

A safety limit shutdown is indicated by an energized Service Light on the touch pad. Refer to Section 5 if you receive a safety limit indication.

Safety Limit 1

If the freeze time reaches 30 minutes, the control board automatically initiates a harvest cycle.

- After 3 consecutive 30 minutes cycles control board light SL#1 along with the touch pad Service (wrench) light will flash on/off at 1 second intervals.
- After 6 consecutive 30-minute freeze cycles occur, the ice machine stops and the SL#1 light on the control board and the Service (wrench) light on the touch pad will be on continuously.

Safety Limit 2

- If the harvest time reaches 3.5 minutes, the control board automatically energizes the water pump and extends the harvest cycle another 3.5 minutes (7 minutes total).
- If the ice damper does not open and close within the 7 minute harvest cycle, the ice machine enters a water thaw cycle for 170 seconds.
- If the damper does not open and close within the 170 second thaw cycle, a second thaw cycle starts.
- The control board automatically initiates a freeze sequence when the thaw cycle(s) is complete.
- If 3 consecutive 7 minute harvest and thaw cycles occur, the ice machine stops.

Safety Limit 3

If the freeze time reaches 4 minutes and water is not sensed, the ice machine stops and initiates a 30 minute delay period. The ice machine will automatically restart at the end of the 30 minute delay period. If 100 consecutive failures occur, the ice machine stops.

- Safety Limit 3 is bypassed on the initial cycle (manual start or after a full bin/safety limit condition). For all subsequent cycles if the freeze time reaches 4 minutes and water is not sensed, the ice machine stops and initiates a 30 minute delay period. Control board lights SL#1 and SL#2 along with the touch pad Service

(wrench) light will flash on/off at 1 second intervals.

- The ice machine automatically restarts at the end of the 30 minute delay period and stops flashing the control board and Service (wrench) lights.
- If 100 consecutive failures occur the ice machine stops and the touch pad Service (wrench) light remains energized.

Operational Checks

ICE THICKNESS CHECK

After a harvest cycle, inspect the ice cubes in the ice storage bin. The ice bridge connects the ice cubes and must be set to maintain an ice bridge thickness of 1/8" (3.2 mm). To adjust the thickness of the bridge refer to "Ice Thickness Adjustment" on page 27.

WATER PURGE BYPASS

Every third harvest cycle the remaining water in the water trough is purged down the drain.

To bypass this feature (purge every harvest):

1. Press & hold the "CLEAN" button for at least 3 seconds while in the ice making cycle.
2. Press the "DELAY" button.
3. The red "SERVICE" light will flash 5 times to indicate bypass.
4. Repeat steps to reinstate "third harvest cycle water purge." Now the red "SERVICE" light will flash 6 times.

NOTE: Bypassing the Water Purge will increase water usage.

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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

CONTROL OPERATION

Pressing and holding the Clean button for 3 seconds starts the clean cycle. The Clean and On/Off lights energize indicating the clean cycle has started and ice making will automatically start when the clean cycle is complete.

- Setting the ice machine to stop after the clean cycle: Press the On/Off button. The On/Off light will de-energize, indicating the ice machine will stop after the clean cycle.
- Pausing the clean cycle: Press the Clean button. The clean light will flash indicating the clean cycle has paused. Pressing the Clean button again will restart the clean cycle.

NOTE: If the ice damper is open for 2 seconds, the clean cycle will pause. If the damper is open for 30 seconds, the clean cycle will be canceled.

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.

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-scaler the ice machine.

Model	Water	Mixed with
H0190/H0240/H0300	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 To start a clean cycle, press the Clean button. Water will flow through the water dump valve and down the drain. Wait until the water trough refills, then add the prepared ice machine de-scaler to the water trough.

Notice

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

⚠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 5 Wait until the clean cycle is complete (approximately 22 minutes) then press the On/Off button and disconnect power and water supplies to the ice machine.

⚠Warning

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

Step 6 Remove parts for de-scaling.

Refer to the "Parts Removal" on page 44. Continue with step 7 when the parts have been removed.

Step 7 Mix a solution of de-scaler and warm water. Depending on 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.

Solution Type	Water	Mixed with
De-scaler	3.7 L	4package de-scaler

⚠Caution

Do not immerse electrical connectors or motors for any components in water, de-scaler, or sanitizer solutions.

Step 8 Use half 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 brush, sponge, or cloth (not a wire brush) to carefully clean the parts. Soak the parts for 5 minutes (15 – 20 minutes for heavily scaled parts). Rinse all components with clean water.

Step 9 While components are soaking, use half 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

Rinse all areas thoroughly with clean water.

DETAILED SANITIZING

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

Step 10 Mix a solution of sanitizer and warm water.

Solution Type	Water	Mixed With
Sanitizer	11.4 L	3package sanitizer

Step 11 Use half of the sanitizer solution to sanitize all removed components(Refer to “Parts Removal” on page 44). Use a spray bottle to liberally apply the solution to all surfaces of the removed parts or soak the removed parts in the sanitizer and water solution. Do not rinse parts after sanitizing.

Step 12 Use half of the sanitizer solution to sanitize all foodzone surfaces of the ice machine and bin. 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
- Bin bottom, sides, and top

Do not rinse the sanitized areas.

Step 13 Apply food grade lubricant to all o-rings, then replace all removed components. Wait 10 minutes and then reapply power and water to the ice machine

Step 14 Mix a solution of sanitizer and lukewarm water.

Model	Water	Mixed with
H0190/H0240/H0300	1L	1Package

Step 15 Press the Clean button. Water will flow through the water dump valve and down the drain. Wait until the water trough refills, then add the prepared ice machine sanitizer to the water trough.

Step 16 Wait until the sanitize cycle is complete (approximately 22 minutes) then press the Ice button to start ice making.

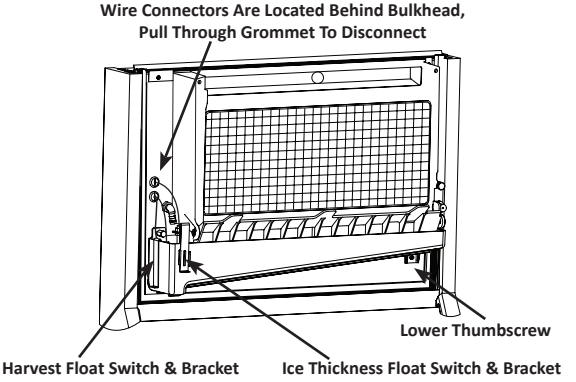
Parts Removal

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

A. Remove the ice thickness and harvest float switch.

Pull forward on the bottom of the bracket until clear of the tab, then slide bracket upward to remove the bracket and float switch as an assembly.

NOTE: At this point, the component can easily be cleaned. If complete removal is desired, follow the wires to the bulkhead grommet (exit point) in the back wall. Pull the wire connector through the bulkhead grommet, then disconnect the wire leads from the connector.



Important

Reversing the mounting location of the ice thickness and the harvest floats will result in a safety limit 2 failure.

- The ice thickness float must be mounted to the front of the water trough and the electrical connection must be in the top bulkhead grommet.
- The harvest float must be mounted to the side of the water trough and the electrical connection must be in the bottom bulkhead grommet.
- The wire connectors for each float are different and will not allow incorrect electrical bulkhead connection.

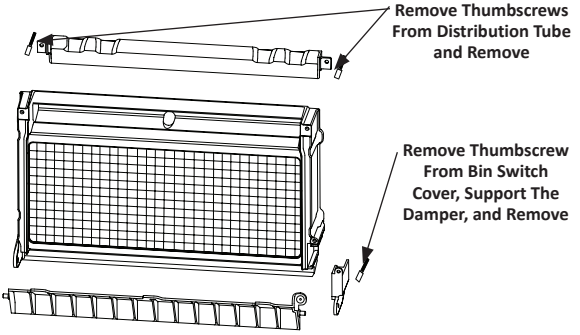
B. Remove water trough thermistor and water trough.

- While supporting the water trough, remove the upper thumbscrew and lift off the thermistor.
- Continue supporting the water trough and remove the thumbscrew from beneath the water trough.
- Remove the water trough from the bin area.

NOTE: At this point, the thermistor can easily be cleaned. If complete removal is desired, follow the wires to the bulkhead grommet (exit point) in the back wall. Pull the wire connector through the bulkhead grommet, then disconnect the wire leads from the connector.

C. Remove the ice damper and water distribution tube.

- Remove thumbscrew from bin switch cover.
- Support ice damper and then pull bin switch cover and ice damper forward to remove.
- Remove thumbscrews from the water distribution tube, then remove.



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 sanitinzing 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
H0190/H0240/H0300	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 Start a clean cycle. Wait until the water trough refills, then 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. Press the On/Off button to turn off the ice machine.
3. Turn off the water supply, disconnect and drain the incoming ice-making water line at the rear of the ice machine, and drain the water trough.
4. Energize the ice machine, wait one minute for the water inlet valve to open, and blow compressed air in both the incoming water and the drain openings in the rear of the ice machine to remove all water.
5. Press the On/Off button and disconnect the electric power at the circuit breaker or the electric service switch.
6. Fill spray bottle with sanitizer and spray all interior food zone surfaces. Do not rinse and allow to air dry.
7. Replace all panels.

Main Fuse

Fuction

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

Specifications

250 Volt, 10 amp.

> **⚠Warning**
>
> High (line) voltage is applied to the control board at all times. Removing the control board fuse or pressing the power button will not remove the power supplied to the control board.

Check Procedure

1. If the curtain 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

Bin Switch

Function

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

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. Press the power button to OFF.
2. Watch the curtain light on the control board.
3. Move the ice damper upward, toward the evaporator. The bin switch must close. The curtain light “on” indicates the bin switch has closed properly.
4. Move the ice damper away from the evaporator. The bin switch must open. The curtain 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).

Touch Pad

Function

User interface to select ice making, delay start or cleaning cycle and provides feedback on ice machine operation.

Check For Normal Operation

Action	Normal Function
Press and hold the control board test button for 3 seconds	All Touch Pad lights turn on
Press test button	All Touch Pad lights turn off
With power light energized press the delay button 4 times	Cycles through 4 hour delay, 12 hour delay, 24 hour delay and off
Press and hold the power button for 3 seconds	Power light turns off
Press and hold the clean button for 3 seconds	Clean light turns on
Press and hold the clean button for 3 seconds	Clean light turns off
If any switches do not operate correctly, disconnect main power to the ice machine to reset the control board and perform a second test. If the second test doesn't show normal function, perform the Ohm test to verify the issue is not a wiring or control board issue.	

Ohm Test

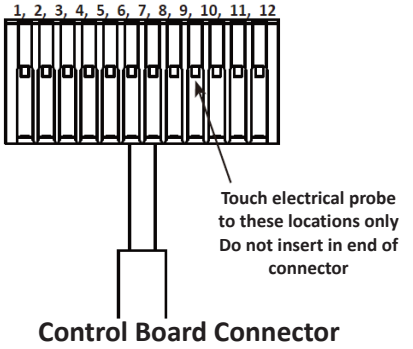
Disconnect power from ice machine.

Disconnect wire from control board and Ohm touch pad and interconnecting wire to verify correct operation.

Pressing and depressing the touch pad must open and close the circuit. A switch that functions correctly will close as the button is pressed and open as the button is released.

Do not insert electrical probe into end of connector. This will stretch the connector and cause intermittent connection issues. All readings must be taken on the flat exterior of the connector.

Selection	Wires
On/Off	#2 & #7
Delay	#3 & #7
Clean	#4 & #7



Float Switch

Function

Open and close to indicate to the control board the level of water in the water trough.

Specifications

Normally closed, float operated magnetic reed switch.

The float switch contacts are closed in the down position. When water raises the float to the up position the magnet in the float opens the contacts.

Check Procedure

The ice machine uses two float switches.

Ice Thickness Float -Indicates the water level has been reached.

Harvest Float - Indicates a harvest cycle needs to be initiated.

Initial testing can be performed by viewing the control board light(s) while raising and lowering the float. The corresponding control board light must turn on and off

when the float is raised and lowered.

HARVEST FLOAT SWITCH:

A. The light must be on in the up position.

B. The light must be off in the down position.

> **⚠ Caution**
>
> Do not disassemble float for Descaling - Incorrect reassembly of the float will result in an ice machine that will not harvest.

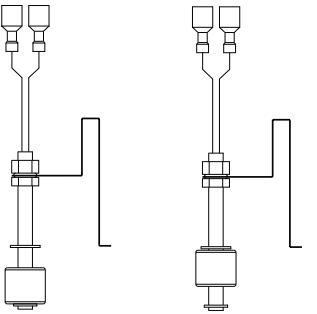
ICE THICKNESS FLOAT SWITCH:

A. The light must be off in the down position.

B. The light must be on in the up position.

If the control board light does not respond to the float proceed with step 1 below.

1. Disconnect power to the ice machine, pull the wire connector for the float switch through the bulkhead and disconnect.
2. Attach an ohm meter lead to each float switch wire.
3. Place the float in the down position - The float switch must be closed.
4. Place the float in the up position - The float switch must be open.



Float Closed **Float Open**

NOTE: Make adjustments with the ice machine in the off position. Making adjustments during the freeze cycle may produce an initial sheet of ice that is thicker than future cycles.

Float	Float Up	Float Down
Ice Thickness Float	OL	< 1 Ohm
Harvest Float	OL	< 1 Ohm

Water Trough Thermistor

Function

Thermistor resistance values change with temperature. The value supplied to the control board is used to identify temperature at the thermistor location.

When the resistance value indicates a temperature of 34°F (1.1°C) the control board will delay the water pump for 25 seconds. When the water pump restarts the water inlet valve will energize for 7 seconds then turn off.

NOTE: If the ice machine is experiencing long freeze cycle shut down, we recommend removing the thermistor and bracket permanently.

Check Procedure

THERMISTOR

1. Disconnect thermistor from control board and measure resistance.
2. Measure temperature at the thermistor.
3. Compare measured resistance/temperature readings to resistance/temperature relationship chart.
   A. Within 10% of the published resistance value Thermistor is good.
   B. Not within 10% of the published resistance value - Thermistor is defective.

CONTROL BOARD OPERATION

1. Disconnect thermistor from control board - The control board thermistor LED will flash 1 second on and 1 second off.
2. The control board will default to the 3.75 minute pump delay in the freeze cycle.

THERMISOTR CHART

Important

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

Temperature of Thermistor		Resistance
°C	**°F**	**K Ohms (x1000)**
-7 - -1.0	19 - 30	**47.06 - 34.36**
0.0	32	**32.65**
0.5	33	**31.82**
1.0	33.8	**31.03**
1.1	34	**30.85**
1.5	34.7	**30.25**
2.0	35.6	**29.49**
2.5	36.5	**28.76**
3.0	37	**28.05**
3.5	38	**27.36**
4.0 - 10.5	39-51	**26.68 - 19.43**
11.0 - 15.0	52 - 59	**18.97 - 15.71**
15.5 - 20.0	60 - 68	**15.35 - 12.49**
20.5 - 25.0	69 - 77	**12.21 - 10.00**
25.5 - 30.0	78 - 86	**9.78 - 8.05**
30.5 - 35.0	87 - 95	**7.88 - 6.39**
36.5 - 40.0	98 - 104	**6.14 - 5.32**
40.5 - 46.0	105 - 115	**5.22 - 4.20**

NOTE: The control board will default to a 3.75 minute pump delay in the freeze cycle, whenever the thermistor is disconnected or reads outside the resistance ranges in the table.

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.

Single Phase Compressors

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 Windings 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 gauge.
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 ±10% of the nameplate voltage.

Fan Cycle Control

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)
HF0190/HF0240/ HF0300	250 psig ±5	**200 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 gauge to ice machine.

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

Reconnect electrical power to the ice machine and press the power button 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**

High Pressure Cutout(HPCO) Control

Function

Stops the ice machine if subjected to excessive high-side pressure.

The HPCO control is normally closed, and opens on a rise in discharge pressure.

Specifications

Cut-out: 450 psig ±10

Cut-in: Automatic reset

(Must be below 300 psig to reset)

Check Procedure

1. Switch to OFF.
2. Connect manifold gauge.
3. Hook voltmeter in parallel across the HPCO, leaving wires attached.
4. On water-cooled models, close the water service valve to the water condenser inlet. On self-contained air-cooled models, disconnect the fan motor.
5. Set to ON - No water or air flowing through the condenser will cause the HPCO control to open because of excessive pressure. Watch the pressure gauge and record the cut-out pressure.

⚠Warning

If discharge pressure exceeds 460 psig and the HPCO control does not open, press the power button to stop ice machine operation.

Replace the HPCO control if it:

- Will not reset (below 300 psig)
- Does not open at the specified cut-out point

Filter-Driers

The filter-drier used on CHOICE ice machines are manufactured to CHOICE specifications.

The difference between a CHOICE drier and an offthe-shelf drier is in filtration. A CHOICE drier has dirt-retaining filtration, with fiberglass filters on both the inlet and outlet ends. This is very important because ice machines have a back-flushing action that takes place during every harvest cycle.

A CHOICE filter-drier has a very high moisture removal capability and a good acid removal capacity.

Important

The liquid line drier is covered as a warranty part. The liquid line drier must be replaced any time the system is opened for repair.

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?

Control Board Test Mode

NOTE: The ice damper/bin switch can be open or closed and does not effect the operation of the test mode.

To enter the test mode press and hold the test switch on the control board for 3 seconds. Refer to "Electronic Control Boards" on page 110 for test button location. The control board test mode performs the following functions for a 2 minute time period:

- Energizes all control board relays
- Energizes all control board lights
- Energizes all touch pad control lights

After the 2 minute test period the control board will complete 500 ice making cycles, then stop.

CANCELING A TEST CYCLE:

To cancel a test cycle press the test button a second time.

TO CANCEL A TEST CYCLE PRESS THE TEST BUTTON A SECOND TIME.

The test cycle will restart each time the test button is pressed for a 3 second time period.

OPERATING ICE MACHINE WITH TOUCH PAD REMOVED

The ice machine is designed to allow diagnostic procedures to run ice making cycles if a touch pad is defective. Use the control board test mode to operate the ice machine without connecting the touch pad. Refer to "Electronic Control Boards" on page 110 for test button location.

NOTE: Ice machine operate for 500 cycles in test mode.

Ice Machine Will Not Run

⚠Warning

High (line) voltage is applied to the control board at all times. Removing the control board fuse or pressing the power button will not remove the power supplied to the control board.

1. Verify primary voltage is supplied to ice machine and the fuse/circuit breaker is closed.
2. Verify control board fuse is okay.

NOTE: If any control board lights are on, 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 power button functions properly. A defective power button may keep the ice machine in the OFF mode. Refer to t"Touch Pad" on page 51 when Steps 1 –3 test good.
5. Be sure Steps 1 – 4 were followed thoroughly. Intermittent problems are not usually related to the control board. Replace control board if touch pad operation is correct.

Ice Machine Cycles into Harvest at the Incorrect Time

GENERAL

NOTE: The ice machine will make a thick or double slab when a new freeze cycle is started with ice already present on the evaporator.

TWO OF THE MOST COMMON SCENARIOS ARE:

- Power is cycled off/on with ice on the evaporator.
- The ice damper/bin switch is opened/closed in the harvest cycle before the ice releases.

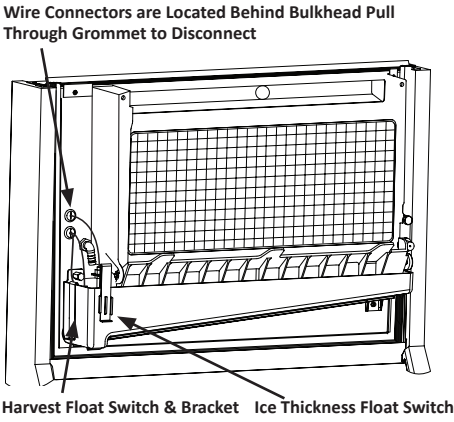
Remove all ice from the evaporator before starting

diagnostic procedures.

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. After six minutes a harvest cycle can be initiated. To allow the service technician to initiate a harvest cycle without delay, this feature is not used on the first cycle after pressing the power button OFF and back to ON.

Harvest Float



⚠Caution

Do not disassemble a float for descaling/sanitizing or troubleshooting. The float magnet is not located in the center of the float and incorrect reassembly will result in an ice machine that will not harvest.

ICE MACHINE DOES NOT CYCLE INTO HARVEST WHEN THE HARVEST FLOAT IS DOWN/CLOSED

Step 1 Disconnect power to the ice machine, remove the electrical panel to allow viewing of the control board lights and pull the wire connector for the harvest float switch through the bulkhead and disconnect. Attach a jumper wire to the wire terminals connected to the control board.

Step 2 Bypass the freeze time lock-in feature by pressing the power button to cycle the ice machine on. Wait until water flows over the evaporator, then refer to chart.

Result	Correction
10 seconds into the freeze cycle the ice machine cycles from freeze to harvest and the control board harvest light energizes.	The ice thickness float switch, connectors or wiring is causing the malfunction.
The harvest light comes on, but the ice machine remains in the freeze cycle.	The ice machine is in a 6 minute freeze lock - Cycle on/off and retest.
The harvest light stays off and the ice machine remains in freeze.	Replace the control board.

ICE MACHINE CYCLES INTO HARVEST CYCLE BEFORE THE HARVEST FLOAT IS DOWN/CLOSED

Step 1 Disconnect power to the ice machine, remove the electrical panel to allow viewing of the control board lights and pull the wire connector for the harvest float switch through the bulkhead and disconnect.

Step 2 Reapply power and press the power button to cycle the ice machine off/on and bypass the freeze time lock-in feature. Wait until water flows over the evaporator, then refer to chart.

Result	Correction
The harvest light does not come on and the ice machine stays in freeze.	10 seconds into the freeze cycle the ice machine cycles from freeze to harvest and the control board harvest light energizes.
10 seconds into the freeze cycle the ice machine cycles from freeze to harvest and the control board harvest light energizes.	Replace the control board.

Ice Production Check

The amount of ice a machine produces directly relates to the operating water and air temperatures. This means an ice machine with a 70°F (21°C) ambient temperature and 50°F (10°C) water produces more ice than the same ice machine with 90°F (32°C) ambient and 70°F (21°C) water.

1. Determine the ice machine operating conditions:
   Air temp entering condenser:____°
   Air temp around ice machine:____°
   Water temp entering sump trough:____°
2. Refer to the appropriate "Cycle Times/24-Hour Ice Production/Refrigerant Pressure Charts" on page 103. Use the operating conditions determined in Step 1 to find published 24-Hour Ice Production:_____
   - Times are in minutes.
     Example: 1 min. 15 sec. converts to 1.25 min.
     (15 seconds ÷ 60 seconds = .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.	_____	+	_____	=	_____	
	Freeze Time		Harvest Time		Total Cycle Time	
2.	_____	÷	_____	=	_____	
	Minutes in 24 Hrs		Total Cycle Time		Cycles Per Day	
3.	_____	×	_____	=	_____	
	Weight of One Harvest		Cycles Per Day		Actual 24-Hour Production	

Weighing the ice is the only 100% accurate check.

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/Visual Inspection Checklist

Ice machine is not level

- Ice machine is not level

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 starving TXV have similar symptoms.

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

Water area (evaporator) is dirty

- Descale as needed

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

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

Incoming water temperature is not between 40°F (3°C) and 90°F (32°C)

- Incoming water temperature is not between 40°F (3°C) and 90°F (32°C)

Water filtration is plugged (if used)

- Install a new water filter

Vent tube is not installed on water outlet drain

- See Installation Instructions

Hoses, fittings, etc., are leaking water

- Repair/replace as needed

Water valve is stuck open, closed or is leaking

- Descale/replace as needed

Water is spraying out of the sump trough area

- Stop the water spray

Uneven water flow across the evaporator

- Descale the ice machine

Water is freezing behind the evaporator

- Correct the water flow

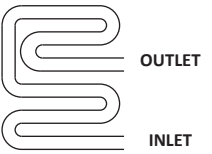
Plastic extrusions and gaskets are not secured to the evaporator

- Remount/replace as need.

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.



HF0190/HF0240/HF0300

Examples of Evaporator Tubing Routing

NORMAL ICE FORMATION

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, starving TXV, 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, flooding TXV, 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, starving expansion valve, 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.

Service Light: The Service light energizes whenever a safety limit has been exceeded.

SAFETY LIMIT 1

If the freeze time reaches 35minutes, the control board automatically initiates a harvest cycle.

- After 3 consecutive 35 minutes cycles control board light SL#1 along with the touch pad Service (wrench) light will flash on/off at 1 second intervals.
- If 6 consecutive 35 minutes freeze cycles occur, the ice machine stops and the SL#1 light on the control board and the Service (wrench) light on the touch pad will be on continuously.

SAFETY LIMIT 2

- If the harvest time reaches 3.5 minutes, the control board automatically energizes the water pump and extends the harvest cycle another 3.5 minutes (7 minutes total).
- If the ice damper does not open and close within the 7 minute harvest cycle the ice machine enters a water thaw cycle for 170 seconds.
- If the damper does not open/close within the 170 second thaw cycle, a second thaw cycle starts.
- The control board automatically initiates a freeze sequence when the thaw cycle(s) is complete.
- If 3 consecutive 7 minute harvest/thaw cycles occur, the ice machine stops and the SL#2 light on the control board and the Service (wrench) light on the touch pad will be on continuously.

SAFETY LIMIT 3

If the freeze time reaches 4 minutes and water is not sensed (float remains down for 10 continuous seconds) the ice machine stops.

- Safety Limit 3 is bypassed on the initial cycle (manual start or after a full bin/safety limit condition). For all subsequent cycles if the freeze time reaches 4 minutes and water is not sensed, the ice machine stops and initiates a 30 minute delay period. Control board lights SL#1 and SL#2 along with the touch pad Service

(wrench) light will flash on/off at 1 second intervals.

- The ice machine automatically restarts at the end of the 30 minute delay period and stops flashing the control board and Service (wrench) lights.
- If 100 consecutive failures occur the ice machine stops and the touch pad Service (wrench) light remains energized.

DETERMINING WHICH SAFETY LIMIT STOPPED THE ICE MACHINE

When a safety limit condition causes the ice machine to stop, the safety limit light on the control board continually flashes on and off.

CONTROL BOARD SAFETY LIMIT LIGHT OPERATION, BEFORE THE POWER BUTTON HAS BEEN CYCLED ON/OFF:

Watch the safety limit lights on the control board:

- SL#1 flashes = 3 or more 35 minute cycles
- SL#1 continuously on = Six 35 minute freeze cycles
- SL#2 flashes = One 3.5 minute harvest cycles
- SL#2 continuously on = 3 consecutive 3.5-minute harvest cycles
- SL#1 & SL#2 flash = SL#3, neither float opened within 4 minutes of the freeze cycle.

CONTROL BOARD SAFETY LIMIT LIGHT OPERATION USING THE POWER BUTTON:

1. Press and hold the power button for 3 seconds.
2. Press the power button again to start ice making.
3. Watch the safety limit lights.

- One will flash corresponding to safety limits 1 or 2.

4. Safety limit 3 is indicated by both SL#1 & SL#2 flashing.

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

SAFETY LIMIT NOTES

- 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 power button is cycled OFF and then ON prior to reaching the 100-harvest point, the last safety limit exceeded will be indicated.

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 35 minutes for 3 consecutive freeze cycles.

Possible Cause Checklist:

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

WATER SYSTEM

- Water Level too high or defective float switch (water escaping water trough)
- Low water pressure (20 psig min.)
- High water pressure (80 psig max.)
- High water temperature (90°F/32.2°C max.)
- Clogged water distribution tube
- Dirty/defective water inlet valve
- Defective water pump

ELECTRICAL SYSTEM

- Harvest cycle not initiated electrically

- Contactor not energizing
- Compressor electrically non-operational
- Restricted condenser air flow
- High inlet air temperature (110°F/43.3°C max.)
- Condenser discharge air re-circulation
- Dirty condenser fins
- Defective fan cycling control
- Defective fan motor
- Low water pressure (20 psig min.)
- High water temperature (90°F/32.2°C max.)
- Dirty condenser

REFRIGERATION SYSTEM

- Non-CHOICE components
- Improper refrigerant charge
- Defective compressor
- TXV starving or flooding (check bulb mounting)
- Non-condensible in refrigeration system
- Plugged or restricted high side refrigerant lines or component
- Defective harvest valve

Safety Limit #2

Harvest time exceeds 3.5 minutes for 3 Consecutive harvest cycles.

Possible Cause Checklist:

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

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 water inlet valve
- Defective water pump

ELECTRICAL SYSTEM

- Water inlet valve defective
- Bin switch defective
- Premature harvest

REFRIGERATION SYSTEM

- Non-CHOICE components
- Improper refrigerant charge
- Defective harvest valve
- TXV flooding (check bulb mounting)
- Defective fan cycling control

Safety Limit 3

Freeze time reaches 4 minutes and water is not sensed.

Possible Cause Checklist:

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

WATER SYSTEM

- Dirty/defective water dump valve
- Low water float valve dirty or defective
- Vent tube not installed on water outlet drain
- Low water pressure (20 psig min.)

- Dirty defective water filter (when used)
- Loss of water from sump area
- Dirty/defective water inlet valve

ELECTRICAL SYSTEM

- Water inlet valve coil defective
- Low water float valve defective

Analyzing Discharge Pressure

PROCEDURE

1. Determine the ice machine operating conditions:
   Air temperature entering condenser _____
   Air temperature around ice machine _____
   Water temperature entering sump trough _____
2. Refer to "Installation/Visual Inspection Checklist" on page 68 for ice machine being checked.
   Use the operating conditions determined in step 1 to find the published normal discharge pressures.
   Freeze Cycle _____
   Harvest Cycle _____
3. Perform an actual discharge pressure check.

	Freeze Cycle PSIG	**Harvest Cycle PSIG**
Beginning of Cycle		
Middle of Cycle		
End of Cycle		

4. Compare the actual discharge pressure (Step 3) with the published discharge pressure (Step 2).

The discharge pressure is normal when the actual pressure falls within the published pressure range for the ice machine's operating conditions. It is normal for the discharge pressure to be higher at the beginning of the freeze cycle (when load is greatest), then drops throughout the freeze cycle.

DISCHARGE PRESSURE HIGH CHECKLIST

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

RESTRICTED CONDENSER AIR FLOW

- High inlet air temperature
- Condenser discharge air re-circulation
- Dirty condenser fins
- Defective fan cycling control
- Defective fan motor

IMPROPER REFRIGERANT CHARGE

- Overcharged
- Non-condensible in system
- Wrong type of refrigerant

OTHER

- Non-CHOICE components in system
- High side refrigerant lines/component restricted (before mid-condenser)

FREEZE CYCLE DISCHARGE PRESSURE LOW CHECKLIST

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

IMPROPER REFRIGERANT CHARGE

- Undercharged
- Wrong type of refrigerant

OTHER

- Non-CHOICE components in system
- High side refrigerant lines/component restricted (before mid-condenser)
- Defective fan cycle control

Analyzing Suction Pressure

The suction pressure gradually drops throughout the freeze cycle. The actual suction pressure (and drop rate) changes as the air and water temperature entering the ice machine changes. These variables also determine the freeze cycle times.

To analyze and identify the proper suction pressure drop throughout the freeze cycle, compare the published suction pressure to the published freeze cycle time.

NOTE: Analyze discharge pressure before analyzing suction pressure. High or low discharge pressure may be causing high or low suction pressure.

PROCEDURE

1. Determine the ice machine operating conditions.
   Example:
   Air temperature entering condenser: 90°F/32.2°C
   Air temperature around ice machine: 80°F/26.7°C
   Water temperature entering water fill valve: 70°F/21.1°C
2. Refer to "Cycle Time" and "Operating Pressure" charts for ice machine model being checked. Using operating conditions from Step 1, determine published freeze cycle time and published freeze cycle suction pressure.
   Example:
   Published freeze cycle time: 14.8 - 15.9 minutes
   Published freeze cycle suction pressure: 65 - 26 psig
3. Compare the published freeze cycle time and published freeze cycle suction pressure. Develop a chart.
   Example:
   Published Freeze Cycle Time (minutes)

1	2	4	7	10	12	14
|	|	|	|	|	|	|
65	55	47	39	34	30	26

   Published Freeze Cycle Suction Pressure (psig)

In the example, the proper suction pressure should be approximately 39 psig at 7 minutes; 30 psig at 12 minutes; etc.

4. Perform an actual suction pressure check at the beginning, middle and end of the freeze cycle. Note the times at which the readings are taken.
   Example:
   Manifold gauge set was connected to the example ice machine and suction pressure readings taken as follows: _____ PSIG
   Beginning of freeze cycle: 79 (at 1 min.)
   Middle of freeze cycle: 48 (at 7 min.)
   End of freeze cycle: 40 (at 14 min.)
5. Compare the actual freeze cycle suction pressure (Step 4) to the published freeze cycle time and pressure comparison (Step 3). Determine if the suction pressure is high, low or acceptable.
   Example:
   In this example, the suction pressure is considered high throughout the freeze cycle. It should have been:
   Approximately 65 psig (at 1 minute) – not 79
   Approximately 39 psig (at 7 minutes) – not 48
   Approximately 26 psig (at 14 minutes) – not 40

SUCTION PRESSURE HIGH CHECKLIST

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

DISCHARGE PRESSURE

- Discharge pressure is too high, and is affecting suction pressure, refer to "Discharge Pressure High Checklist" on page 78.

IMPROPER REFRIGERANT CHARGE

- Overcharged
- Wrong type of refrigerant
- Non-condensible in system

OTHER

- Non-CHOICE components in system
- Harvest valve leaking
- TXV flooding (check bulb mounting)
- Defective compressor

SUCTION PRESSURE LOW CHECKLIST

IMPROPER INSTALLATION

- Refer to "Installation/Visual Inspection Checklist" on page 68

DISCHARGE PRESSURE

- Discharge pressure is too low, and is affecting suction pressure, refer to "Freeze Cycle Discharge Pressure Low Checklist" on page 78.

IMPROPER REFRIGERANT CHARGE

- Undercharged
- Wrong type of refrigerant

OTHER

- Non-CHOICE components in system
- Improper water supply over evaporator refer to"Water System Checklist" on page 68.
- Loss of heat transfer from tubing on back side of evaporator
- Restricted/plugged liquid line drier
- Restricted/plugged tubing in suction side of refrigeration system
- TXV starving

NOTE: Do not limit your diagnosis to only the items listed in the checklists.

Harvest Valve

GENERAL

The harvest 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 harvest valve is not used during the freeze cycle. The harvest 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 harvest 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 pressures vary according to ambient temperature and ice machine model. Harvest pressures can be found in the "Cycle Times/24-Hour Ice Production/Refrigerant Pressure Charts" on page 103.

HARVEST VALVE 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.

VALVE REMAINS OPEN IN THE FREEZE CYCLE

Symptoms of a harvest 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 decreases.

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 harvest valve is remaining partially open during the freeze cycle.

1. Wait five minutes into the freeze cycle.
2. Feel the inlet of the harvest valve(s).

Important

Feeling the harvest valve outlet or across the harvest valve itself will not work for this comparison.

The harvest 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 harvest 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 harvest 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 the touch. This is not caused by a harvest valve leaking.

5. Record your findings on the table.

Comparing Evaporator Inlet/Outlet Temperatures

GENERAL

The temperatures of the suction lines entering and leaving the evaporator alone cannot diagnose an ice machine. However, comparing these temperatures during the freeze cycle, along with using CHOICE's Refrigeration System Operational Analysis Table, can help diagnose an ice machine malfunction.

The actual temperatures entering and leaving the evaporator vary by model, and change throughout the freeze cycle. This makes documenting the "normal" inlet and outlet temperature readings difficult. The key to the diagnosis lies in the difference between the two temperatures five minutes into the freeze cycle. These temperatures must be within 7°F (4°C) of each other.

PROCEDURE

Use this procedure to document freeze cycle inlet and outlet temperatures.

1. Use a quality temperature meter, capable of taking temperature readings on curved copper lines.
2. Attach the temperature meter sensing device to the copper lines entering and leaving the evaporator.

Important

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

3. Wait five minutes into the freeze cycle.
4. Record the temperatures below and determine the difference between them.

_____	_____	_____
Inlet Temperature	Difference must be within 7°F (4°C) at 5 minutes into the freeze cycle	Outlet Temperature

5. Use this with other information gathered on the Refrigeration System Operational Analysis Table to determine the ice machine malfunction.

Discharge Line Temperature Analysis

GENERAL

Knowing if the discharge line temperature is increasing, decreasing or remaining constant can be an important diagnostic tool. Maximum compressor discharge line temperature on a normally operating ice machine steadily increases throughout the freeze cycle. Comparing the temperatures over several cycles will result in a consistent maximum discharge line temperature.

Ambient air temperatures affect the maximum discharge line temperature.

Higher ambient air temperatures at the condenser = higher

discharge line temperatures at the compressor.

Lower ambient air temperatures at the condenser = lower discharge line temperatures at the compressor.

Regardless of ambient temperature, the freeze cycle discharge line temperature will be higher than 150°F (66°C) on a normally operating ice machine.

PROCEDURE

Connect a temperature probe on the compressor discharge line within 6" (15.2 cm) of the compressor. Observe the discharge line temperature for the last three minutes of the freeze cycle and record the maximum discharge line temperature.

DISCHARGE LINE TEMPERATURE ABOVE 150°F (66°C) AT END OF FREEZE CYCLE:

Ice machines that are operating normally will have consistent maximum discharge line temperatures above 150°F (66°C).

Verify the expansion valve sensing bulb is positioned and secured correctly.

DISCHARGE LINE TEMPERATURE BELOW 150°F (66°C) AT END OF FREEZE CYCLE

Ice machines that have a flooding expansion valve will have a maximum discharge line temperature that decreases each cycle.

Verify the expansion valve sensing bulb is 100% insulated and sealed airtight. Condenser air contacting an incorrectly insulated sensing bulb will cause overfeeding of the expansion valve.

Refrigeration Component Diagnostics

All electrical and water related problems must be corrected before these charts will work properly. These tables must be used with charts, checklists and other references to eliminate refrigeration components not listed and external items and problems that will cause good refrigeration components to appear defective.

The tables list four different defects that may affect the ice machine's operation.

NOTE: A low-on-charge ice machine and a starving expansion valve have very similar characteristics and are listed under the same column.

PRPCEDURE

Step 1 Complete each item individually in the "Operational Analysis" column.

Enter check marks in the boxes.

Each time the actual findings of an item in the "Operational Analysis" column matches the published findings on the table, enter a check mark.
Example: Freeze cycle suction pressure is determined to be low. Enter a check mark in the "low" box.

Perform the procedures and check all information listed. Each item in this column has supporting reference material.

While analyzing each item separately, you may find an "external problem" causing a good refrigerant component to appear bad. Correct problems as they are found. If the operational problem is found, it is not necessary to complete the remaining procedures.

Step 2 Add the check marks listed under each of the four columns. Note the column number with the highest total and proceed to "Final Analysis."

NOTE: If two columns have matching high numbers, a procedure was not performed properly and/or supporting material was not analyzed correctly.

Final Analysis

The column with the highest number of check marks identifies the refrigeration problem.

Column 1 – Harvest Valve Leaking

A leaking harvest valve must be replaced.

Column 2 – Low Charge/TXV Starving

Normally, a starving expansion valve only affects the freeze cycle pressures, not the harvest cycle pressures. A low refrigerant charge normally affects both pressures. Verify the ice machine is not low on charge before replacing an expansion valve.

Add refrigerant charge in 2 oz. increments as a diagnostic procedure to verify a low charge. (Do not add more than the total charge of refrigerant). If the problem is corrected, the ice machine is low on charge. Find the refrigerant leak.

The ice machine must operate with the nameplate charge. If the leak cannot be found, proper refrigerant procedures must still be followed. Change the liquid line drier, evacuate the system and weigh in the proper charge.

If the problem is not corrected by adding charge, the expansion valve is faulty.

Column 3 – TXV Flooding

A loose or improperly mounted expansion valve bulb causes the expansion valve to flood. Check bulb mounting, insulation, etc., before changing the valve.

Column 4 – Compressor

Replace the compressor and start components. To receive warranty credit, the compressor ports must be properly sealed by crimping and soldering them closed. Old start components must be returned with the faulty compressor.

REFRIGERATION ANALYSIS CHART

Operational Analysis	1	2	3	4
Ice Production	Published 24 hour ice production_____ Calculated (actual) 24 hour ice production_____ NOTE: The ice machine is operating properly if the ice fill pattern is normal and ice production is within 10% of charted capacity.			
Installation and Water System	All installation and water related problems must be corrected before proceeding with chart.			
Ice Formation Pattern	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on entire evaporator	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on entire evaporator	Ice formation is normal -or- Ice formation is extremely thin on the bottom of evaporator -or- No ice formation on evaporator	Ice formation is normal -or- No ice formation on entire evaporator

Operational Analysis	1	2	3	4
Safety Limits Refer to "Analyzing Safety Limits" to eliminate all nonrefrigeration problems.	Stops on safety limit: **1 or 2**	Stops on safety limit: **1**	Stops on safety limit: **1 or 2**	Stops on safety limit: **1**
Ice Formation Pattern	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on entire evaporator	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on entire evaporator	Ice formation is normal -or- Ice formation is extremely thin on the bottom of evaporator -or- No ice formation on evaporator	Ice formation is normal -or- No ice formation on entire evaporator

Operational Analysis	1	2	3	4
Freeze Cycle Discharge Pressure _____ _____ **1 minute Middle** _____ **End**	If discharge pressure is High or Low, refer to freeze cycle high or low discharge pressure problem checklist to eliminate problems and/or components not listed on this table before proceeding.			
Freeze Cycle Suction Pressure _____ _____ **1 minute Middle** _____ **End**	If suction pressure is High or Low refer to freeze cycle high or low suction pressure problem checklist to eliminate problems and/or components not listed on this table before proceeding.			
	Suction pressure is **High**	Suction pressure is **Low**	Suction pressure is **High**	Suction pressure is **High**
Harvest Valve	The harvest valve inlet is **HOT** and The compressor discharge line is **HOT**	The harvest valve inlet is **COOL** and The compressor discharge line is **HOT**	The harvest valve inlet is **COOL** and The compressor discharge line is **COOL**	The harvest valve inlet is **COOL** and The compressor discharge line is **HOT**

Operational Analysis	1	2	3	4
Discharge Line Temp. Record freeze cycle discharge line temp at the end of freeze cycle.	Discharge line temp **150°F (66°C) or higher** at the end of freeze cycle	Discharge line temp **150°F (66°C) or higher** at the end of freeze cycle	Discharge line temp **less than 150°F (66°C)** at the end of freeze cycle	Discharge line temp **150°F (66°C) or higher** at the end of freeze cycle
Final Analysis Enter total number of boxes checked in each column.	Harvest Valve Leaking	Low On Charge -or- TXV Starving	TXV Flooding	Compressor

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 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 Ice 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.
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 "Determining Severity of Contamination" on page 97 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 Ice 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

1. Suction side of the compressor through the suction service valve.
2. Discharge side of the compressor through the discharge service valve.

SELF-CONTAINED RECOVERY/EVACUATION

1. Place the power button in the OFF position.
2. Install manifold gauge set, charging cylinder/scale,

and recovery unit or two-stage vacuum pump.

3. Open (backseat) the high and low side ice machine service valves, and open high and low side on manifold gauge set.
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 an electronic leak detector after charging the ice machine.

Follow the Charging Procedures below.

CHARGING PROCEDURES

Important

The charge is critical on all CHOICE ice machines. Use a scale or a charging cylinder to ensure the proper charge is installed.

1. Be sure the power button is in the OFF position.
2. Close the vacuum pump valve, the low side service valve, and the low side manifold gauge valve.
3. Open the high side manifold gauge valve, and backseat the high side service valve.
4. Open the charging cylinder and add the proper refrigerant charge (shown on nameplate) through the discharge service valve.
5. Let the system "settle" for 2 to 3 minutes.
6. Press the power button to the on position.
7. Close the high side on the manifold gauge set.

NOTE: Manifold gauge set must be removed properly to ensure that no refrigerant contamination or loss occurs.

8. Make sure that all of the vapor in the charging hoses is drawn into the ice machine before disconnecting the charging hoses.
    A. Run the ice machine in freeze cycle.
    B. Close the high side service valve at the icemachine.
    C. Open the low side service valve at the ice machine (when supplied) or disconnect the low loss fitting from the access valve.
    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 pressures to equalize while the ice machine is in the freeze cycle.
    F. Close the low side service valve at the ice machine.
9. Remove the hoses from the ice machine and install the caps.

System Contamination Cleanup

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

Important

CHOICE Ice 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 test kit.

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 ontamination	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 acrid 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 acrid 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.

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. If burnout deposits are found, replace the TXV.
4. Wipe away any burnout deposits from suction and discharge lines at compressor.
5. Sweep through the open system with dry nitrogen.
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:
    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. Pull vacuum to 500 microns. Break the 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 filterdrier 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 Removing 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

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.

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

Total System Refrigerant Charge

Model	Air-Cooled	Water-Cooled	Refrigerant Type
HF0190	365g (12.9 OZ)	-	**R404A**
HF0240	351g (12.4 OZ)	-	**R404A**
HF0300	368g (13.0 OZ)	-	**R404A**

Cycle Times/24-Hour Ice Production/ Refrigerant Pressure 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.

HF0240 SELF-CONTAINED AIR-COOLED

NOTE: These characteristics may vary depending on operating conditions.

Total Cycle Time

Freeze Time + Harvest Time = Total Cycle Time

Ambient Temperature °F/°C	Freeze Time Water Temperature °F/°C			Harvest Time
	50/10	70/21	90/32	
70/21	14.1-16.1	17.0-19.3	18.6-21.1	1.0-2.5
80/27	15.2-17.4	18.0-20.5	20.5-23.3	
90/32	16.5-18.8	20.5-23.3	22.7-25.8	
100/38	19.2-21.8	21.9-24.9	23.6-26.8	
110/43	21.9-24.9	23.6-26.8	24.5-27.8	

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	188lbs	--	--
80/27	--	--	--
90/32	--	145lbs	--
100/38	--	--	--
110/43	--	--	--

Based on average ice slab weight of 2.26 - 2.93 lb (1025 – 1329 g).Regular cube derate is 7%

Operating Pressure

Ambient Temperature °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG
50/10	220-275	65-32	145-200	85-110
70/21	220-310	75-34	155-210	90-120
80/27	270-330	80-36	175-225	90-140
90/32	290-350	80-38	185-245	90-150
100/38	320-410	85-39	200-260	90-155
110/43	355-430	90-40	220-280	90-160

Suction pressure drops gradually throughout the freeze cycle

HF0300 SELF-CONTAINED AIR-COOLED

NOTE: These characteristics may vary depending on operating conditions.

Total Cycle Time

Freeze Time + Harvest Time = Total Cycle Time

Ambient Temperature °F/°C	Freeze Time Water Temperature °F/°C			Harvest Time
	50/10	70/21	90/32	
70/21	10.0-11.5	11.8-13.4	14.1-16.1	1.0-2.5
80/27	10.4-11.9	12.3-14.0	13.5-15.4	
90/32	11.0-12.6	13.5-15.4	15.2-17.4	
100/38	12.3-14.0	15.2-17.4	17.5-19.9	
110/43	15.6-17.8	19.2-21.8	21.2-24.0	

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	278lbs	--	--
80/27	--	--	--
90/32	--	215lbs	--
100/38	--	--	--
110/43	--	--	--

Based on average ice slab weight of 2.26 - 2.93 lb (1025 – 1329 g).Regular cube derate is 7%

Operating Pressure

Ambient Temperature °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG
50/10	200-250	45-18	130-150	75-105
70/21	200-250	50-18	135-150	75-105
80/27	200-270	55-20	140-175	75-110
90/32	240-300	60-22	165-185	105-125
100/38	275-350	65-23	175-220	130-150
110/43	400-320	70-25	210-240	135-155

Suction pressure drops gradually throughout the freeze cycle

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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)

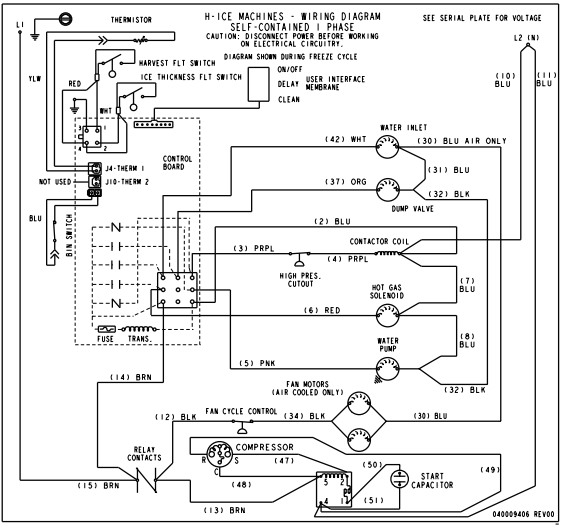
( ) Wire Number Designation
(The number is marked at each end of the wire)

—>>— Multi-pin Connection
(Electrical Box Side) —>>—
(Compressor Compartment Side)

HF0190/HF0240A AIR-COOLED

Self-Contained Air-Cooled

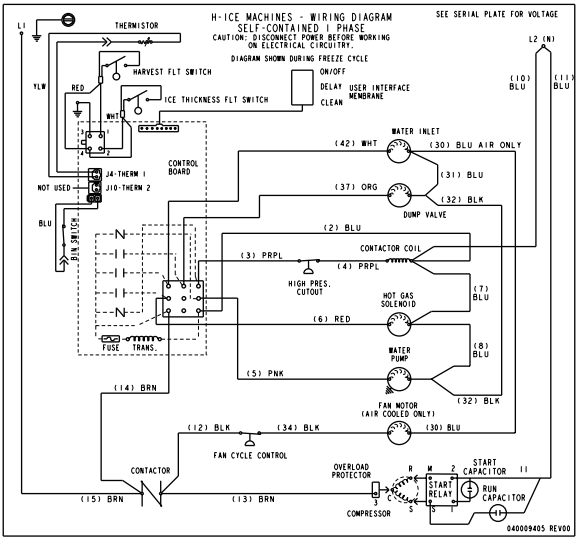
Diagram shown in freeze cycle



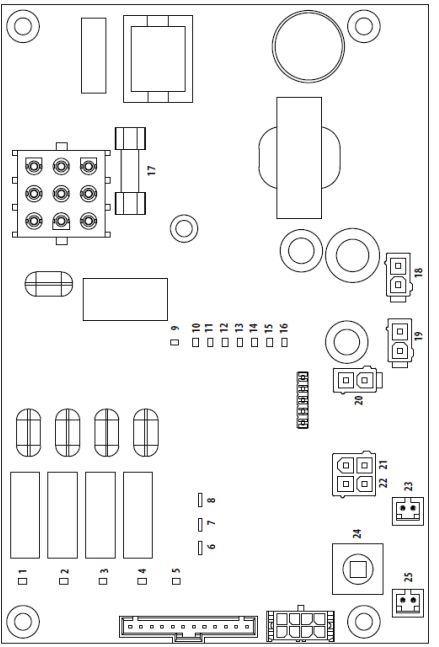
HF0300A AIR-COOLED

Self-Contained Air-Cooled

Diagram shown in freeze cycle

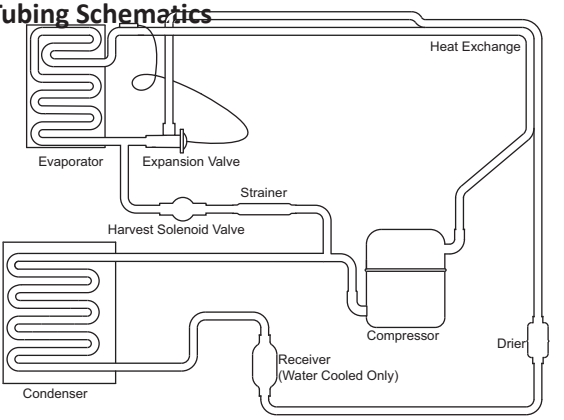


Electronic Control Boards



Number	Component
1	LED Water Pump Relay
2	LED Compressor Relay
3	LED Water Dump Valve Relay
4	LED Harvest Solenoid Valve
5	LED Clean
6	LED Thermistor
7	LED Thermistor
8	LED Thermistor
9	LED Water Fill Valve
10	LED Harvest Float
11	LED Water Level Float
12	LED Bin Switch
13	LED Safety Limit 2
14	LED Safety Limit 1
15	LED Harvest
16	LED Test Mode
17	Fuse
18	Motor Connector 12V - J8
19	EC Fan Motor Connector 12V - J9
20	Bin Switch Connector - J5
21	Float Switch Water Level
22	Float Switch Harvest
23	Thermistor 2 - J10
24	Test Switch
25	Thermistor 1 - J4

Tubing Schematics



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