Manitowoc

USP0100 Ice Machine

Technician's Handbook

This manual is updated as new information and models are released. Visit our website for the latest manual.
www.manitowocice.com



Part Number STH106 8/20

Safety Notices

Read these precautions to prevent personal injury:

- 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.
- 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.
- As you work on this equipment, be sure to pay close attention to the safety notices in this handbook. Disregarding the notices may lead to serious injury and/or damage to the equipment.

Definitions

⚠ DANGER

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

⚠ Warning

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

⚠ Caution

Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

Important

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

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

⚠ 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.
- For a cord-connected appliance, the following must be included:
    - Do not unplug by pulling on cord. To unplug, grasp the plug, not the cord.
    - Unplug from outlet when not in use and before servicing or cleaning.
    - Do not operate any appliance with a damaged cord or plug, or after the appliance malfunctions or is dropped or damaged in any manner. Contact the nearest authorized service facility for examination, repair, or electrical or mechanical adjustment.

⚠ 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.
- Remove front panel before lifting and installing and use appropriate safety equipment during installation and servicing. Two or more people are required to lift or move this appliance to prevent tipping and/ or injury.
- 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.

⚠ Warning

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

- Legs or casters must be installed and the legs/casters must be screwed in completely. When casters are installed the mass of this unit will allow it to move uncontrolled on an inclined surface. These units must be tethered/secured to comply with all applicable codes. Swivel casters must be mounted on the front and rigid casters must be mounted on the rear. Lock the front casters after installation is complete.
- Only trained and qualified personnel aware of the dangers are allowed to work on the 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.

⚠ Warning

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

- 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

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.

⚠ 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.
- All covers and access panels must be in place and properly secured when operating this equipment.
- 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.

⚠ Warning

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

- It is the responsibility of the site supervisor to ensure that operators fully understand the dangers inherent in operating this equipment.
- Turn off and lockout all utilities (gas, electric, water) according to approved practices during maintenance or servicing.
- Do not operate any equipment with damaged cords or plugs. All repairs must be performed by a qualified service company.
- Moisture collecting on the floor will create a slippery surface. Clean up any water on the floor immediately to prevent a slip hazard.
- Do not use high-pressure water guns to spray or rinse the interior or exterior of the unit. Do not use power cleaning equipment, steel wool, wire brushes, scrapers, etc. to clean the exterior of the equipment.
- To prevent tipping, two or more people are needed to move this appliance.

We reserve the right to make product improvements at any time. Specifications and design are subject to change without notice.

⚠ DANGER

Follow these flammable refrigeration system requirements during installation, use or repair of this equipment.

- To minimize the risk of ignition due to improper installation, replacement parts or service procedures, only refrigeration technicians with flammable refrigerant training who are aware of the dangers of dealing with high voltage electricity and refrigerant under pressure are allowed to work on this equipment.
- Models may contain up to 150 grams of R290 (propane) refrigerant. R290 (propane) is flammable in concentrations of air between approximately 2.1% and 9.5% by volume (LEL lower explosion limit and UEL upper explosion limit). An ignition source at a temperature higher than 470°C is needed for a combustion to occur.
- Refer to nameplate to identify the type of refrigerant in your equipment.
- All replacement parts must be like components obtained from the equipment manufacturers authorized replacement part network.
- All replacement parts must be like components obtained from the equipment manufacturers authorized replacement part network.
- This equipment must be installed in accordance with the ASHRAE 15 Safety Standard for Refrigeration Systems.
- This equipment can not be installed in corridors or hallways of public buildings.

DANGER

Follow these flammable refrigeration system requirements during installation, use or repair of this equipment.

- Installation must comply with all applicable equipment fire and health codes with the authority having jurisdiction.
- All lockout and tag out procedures must be followed when working on this equipment.
- This equipment contains high voltage electricity and refrigerant charge. Shorting electrical wires to refrigeration tubing may result in an explosion. All electrical power must be disconnected from the system before servicing the system. Refrigerant leaks, can result in serious injury or death from explosion, fire, or contact with refrigerant or lubricant mists.
- Do not damage the refrigeration circuit when installing, maintaining or servicing the unit. Never use sharp objects or tools to remove ice or frost. Do not use mechanical devices or other means to accelerate the defrosting process.

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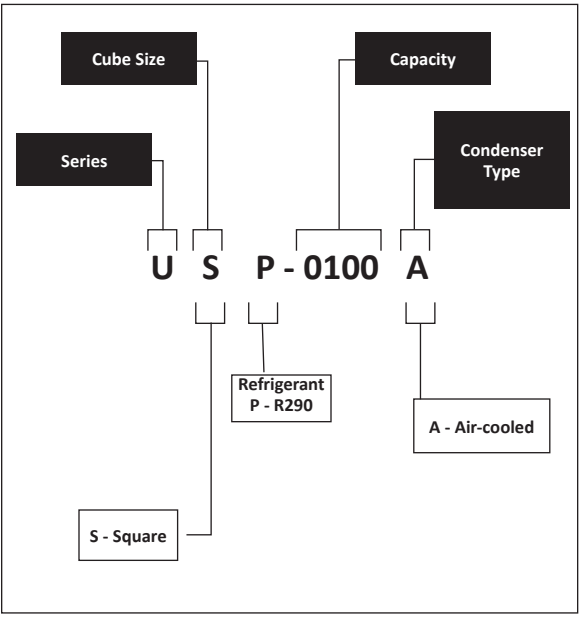
General Information

Model Numbers

This manual covers the following models:

Self-contained Air-cooled
USP0100A

How to Read a Model Number



⚠Warning

An ice machine contains high voltage electricity and refrigerant charge. Repairs are to be performed by properly trained refrigeration technicians aware of the dangers of dealing with high voltage electricity and refrigerant under pressure.

Model/Serial Number Location

These numbers are required when requesting information from your local Manitowoc Distributor, Service Representative, or Manitowoc Ice.

The model/serial number data plate is located in the evaporator compartment and on the back of the ice machine.

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.

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.

- The location must be indoors.
- The location must be free of airborne and other contaminants.
- Air temperature: Must be at least 50°F (10°C) but must not exceed 113°F (43.4°C).
- The location must not be near heat-generating equipment or in direct sunlight.
- The location must be capable of supporting the weight of the ice machine and a full bin of ice.
- The location must allow enough clearance for water, drain, and electrical connections in the **rear of the ice machine**.
- The location must not obstruct airflow through or around the ice machine (condenser airflow is in and out the front). Refer to the chart below for clearance requirements.
- 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.

Ice Machine Clearance Requirements

Self-contained Air-cooled	
Top/Sides	5" (127 mm)*
Back	5" (127 mm)*

*The ice machine may be built into a cabinet.

Ice Machine Heat of Rejection

Series Ice Machine	Heat of Rejection*	
	Air Conditioning**	Peak
USP0100A	2350 Btu/h	3637 Btu/h

* B.T.U./Hour

** Because the heat of rejection varies during the ice making cycle, the figure shown is an average.

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

1. Screw the 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.
4. Level the ice machine to ensure that the drain system functions correctly. Use a level on top of the ice machine. Turn each foot as necessary to level the ice machine from front to back and side to side.

Electrical Requirements

Voltage

The maximum allowable voltage variation is ±10% of the rated voltage on the ice machine model/serial number plate at start-up (when the electrical load is highest).

Fuse/Circuit Breaker

A separate fuse/circuit breaker must be provided for each ice machine.

Total Circuit Ampacity

The total circuit ampacity is used to help select the wire size of the electrical supply.

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

Electrical Specifications

Air-cooled Ice Machine

Ice Machine	Voltage Phase Cycle	Max. Fuse/ Circuit Breaker	Total Amps
USP0100A	115/1/60	15 amp	10 amp
NOTE: Model/serial plate information overrides all data listed in this chart.			

⚠Warning

All wiring must conform to local, and national codes.

⚠Warning

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

Water Service/Drains

WATER SUPPLY

Local water conditions may require treatment of the water to inhibit scale formation, filter sediment, and remove chlorine odor and taste.

Important

If you are installing a Manitowoc water filter system, refer to the Installation Instructions supplied with the filter system for ice making water inlet connections.

⚠Warning

For ice making, connect to a potable water supply only.

Water Inlet Lines

Follow these guidelines to install water inlet lines:

- 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.).
- If water pressure exceeds the maximum recommended pressure, 80 psig (5.5 bar) obtain a water pressure regulator from your Manitowoc distributor.
- Install a water shut-off valve for ice making potable water.
- Insulate water inlet lines to prevent condensation.

Drain Connections

Follow these guidelines when installing drain lines to prevent drain water from flowing back into the ice machine and storage bin:

- Drain lines must have a 1.5-inch drop per 5 feet of run (2.5 cm per meter), and must not create traps.
- The floor drain must be large enough to accommodate drainage from all drains.
- Install a tee to vent the ice machine drain to the atmosphere.
- Insulate drain lines to prevent condensation.

⚠ Caution

Plumbing must conform to state and local codes.

Water Supply and Drain Line Sizing/Connections

Location	Water Temperature	Water Pressure	Ice Machine Fitting	Tubing Size Up to Ice Machine Fitting
Ice Making Water Inlet	40°F (4°C) min. 90°F (32°C) max.	20 psi (138 kPa) min. 80 psi (550 kPa) max.	3/8" Female Pipe Thread	3/8" (9.5 mm) min. inside diameter
Bin Drain	---	---	1/2" Female Pipe thread	1/2" (12.7 mm) min. inside diameter

Detailed Cleaning and Sanitizing

GENERAL

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

Descale and sanitize the ice machine every 12 months for efficient operation. If the ice machine requires more frequent cleaning and sanitizing, consult a qualified service company to test the water quality and recommend appropriate water treatment. The ice machine must be taken apart for cleaning and sanitizing.

⚠ Caution

Damage to the ice machine evaporator caused by incorrect chemical usage is not covered by the warranty.

⚠ Warning

Wear rubber gloves and safety goggles (and/or face shield) when handling vinegar and bleach.

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.

Products containing abrasives may damage/scratch the panels. Never use steel wool or abrasive pads for cleaning.

DETAILED DESCALING/SANITIZING PROCEDURE

This procedure must be performed every twelve months.

- The ice machine and bin must be disassembled descaled and sanitized.

Step 1 Open the bin door to access the evaporator compartment. Ice must not be on the evaporator during cleaning and sanitizing. Follow one of the methods below:

- Press the power switch at the end of a harvest cycle after ice falls from the evaporator(s).
- Press the defrost switch to initiate a harvest. (See Step 3 for front panel removal).
- Press the power switch and allow the ice to melt.

⚠ Caution

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

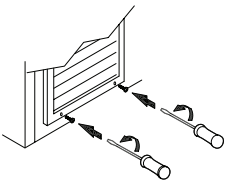
Step 2 Remove all ice from the bin and remove top cover of ice machine.

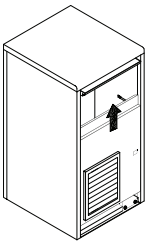
⚠Warning

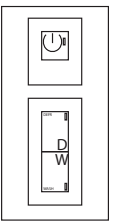
Risk of electrical shock or burns. Do not touch electrical wiring or insert hands into the area the front panel covered while performing the following step.

Step 3 Remove front panel to access Wash/Defrost button:

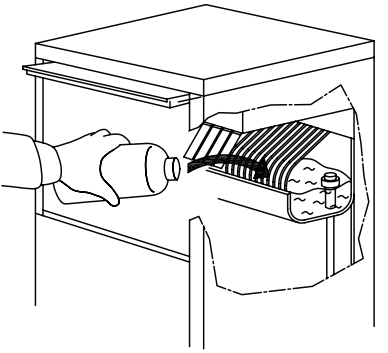
- Using a small Philips screwdriver, loosen the 2 lower screws behind the grill of the front panel, then lift up on the front panel and remove.
- Press the Power button and then press the Wash button.
- While the ice machine is going through the Harvest cycle, replace the front panel without tightening the screws.







Step 4 After the harvest cycle is complete (the compressor will stop and the pump will start spraying water), lift some of the shutters and pour in 1 quart (4 cups) of white vinegar.



Step 5 When the 90 minute wash cycle is complete (compressor energizes and starts a freeze cycle), press the Power button to stop the ice machine.

Step 6 Disconnect electrical power and water.

Step 7 Remove parts for cleaning.

A. Remove the shutter assembly

B. Remove ice cube slide

C. Remove overflow tube

D. Remove drain water sump

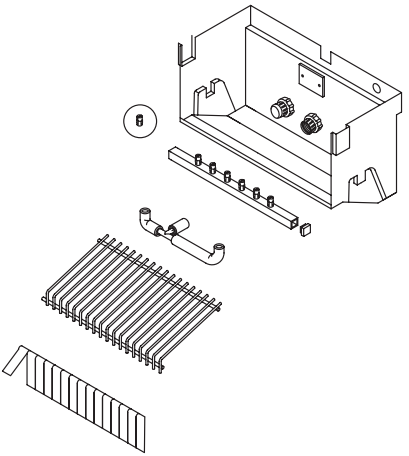
E. Remove spray bar and vinyl tubing

F. Remove pump inlet filter

G. Remove the top panel

H. Remove evaporator shield located on top of the evaporator

NOTE: Disassemble the tubing, spray bar ends and nozzles for easier cleaning.



Step 8 Transfer the removed parts to a sink and clean with a mild dish washing soap and water, then rinse thoroughly with clean water. Mix a 25% solution of white vinegar and lukewarm water. Depending upon the amount of mineral buildup, a larger quantity of solution may be required. Use the ratio in the table below to mix enough solution to remove all lime scale from the removed parts, evaporator, bin and bin door.

Solution Type	Water	White Vinegar
Delimer	1 gal. (4 L)	1 quart (4 cups)

Step 9 Use 1/2 of the vinegar/water mixture to clean all components. Use a soft-bristle nylon brush, sponge or cloth (NOT a wire brush) to carefully clean the parts. Rinse all components with clean water.

Step 10 While components are soaking, use 1/2 of the vinegar/water 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:

- Top of the evaporator
- Water trough interior/exterior
- Evaporator and plastic parts - including top, bottom, and sides
- Bin

Important

Take care to avoid bending evaporator coils or dislodging/disturbing the water inlet or thermostat. The drain holes in the evaporator base must be open to allow water to drain freely.

⚠Caution

Do not use metal objects to clear evaporator drain holes damage will result.

Step 11 Rinse all areas thoroughly with clean water.

Step 12 Mix a solution of bleach and lukewarm water.

Solution Type	Water	Mixed With
Sanitizer	2 gal.	1 oz Bleach

Step 13 Use 1/2 of the sanitizer/water solution to sanitize all removed components. Use a sponge or cloth to liberally apply the solution to all surfaces of the removed parts or soak the removed parts in the sanitizer/water solution. Rinse all areas thoroughly with clean water.

Step 14 Sanitize all foodzone surfaces of the ice machine and bin. Use a sponge or cloth to liberally apply the solution to all surfaces. When sanitizing, pay particular attention to the following areas:

- Top of the evaporator
- Water trough interior/exterior
- Evaporator and plastic parts - including top, bottom, and sides
- Bin

Rinse all areas thoroughly with clean water.

Step 15 Replace all removed components.

NOTE: Spray bar and nozzles.

- If the nozzles were removed from the spray bar, take care to prevent cross threading when reassembling.
- Verify the spray bar is correctly positioned and the nozzles are aligned to the evaporator cups.

Step 16 Reapply power and water to the ice machine.

> **⚠ Warning**
>
> Risk of electrical shock or burns. Do not touch electrical wiring or insert hands into the area the front panel covers while performing the following step.

Step 17 Remove front panel to access Wash button:

- Press the Power button and then press the Wash button.
- While the ice machine is going through the Harvest cycle, replace the front panel and tighten the screws using a small Philips screwdriver.

Step 18 After the harvest cycle is complete (the compressor will stop and the pump will start spraying water), lift some of the shutters and pour in 1/2 oz (.5 oz) of bleach.

Step 19 When the 90 minute sanitize cycle is complete the compressor energizes and starts a freeze cycle.

Step 20 Discard the first two batches of ice to remove any flavor transmission from the cleaning/sanitizing process.

Remedial Cleaning Procedure

This procedure must be performed every six months between the yearly Detailed Descaling/Sanitizing Procedure.

Step 1 Open the bin door to access the evaporator compartment. Ice must not be on the evaporator during cleaning and sanitizing. Follow one of the methods below:

- Press the power switch at the end of a harvest cycle after ice falls from the evaporator(s).
- Press the power switch and allow the ice to melt.

> **⚠ Caution**
>
> Never use anything to force ice from the evaporator. Damage may result.

Step 2 Remove all ice from the bin and remove top cover of ice machine.

> **⚠ Warning**
>
> Risk of electrical shock or burns. Do not touch electrical wiring or insert hands into the area the front panel covered while performing the following step.

Step 3 Disconnect electrical power and water.

Step 4 Remove parts for cleaning.

A. Remove the shutter assembly

B. Remove ice cube slide

C. Remove overflow tube

D. Remove drain water sump

E. Remove spray bar and vinyl tubing

F. Remove pump inlet filter

G. Remove the top panel

H. Remove evaporator shield located on top of the evaporator

NOTE: Disassemble the tubing, spray bar ends and nozzles for easier cleaning.

Step 5 Transfer the removed parts to a sink and clean with a mild dish washing soap and water:

Step 6 Rinse all areas thoroughly with clean water.

Step 7 Mix a 25% solution of white vinegar and lukewarm water. Depending upon the amount of mineral buildup, a larger quantity of solution may be required. Use the ratio in the table below to mix enough solution to remove all lime scale from the removed parts, evaporator, bin and bin door.

Solution Type	Water	White Vinegar
Delimer	1 gal. (4 L)	1 quart (4 cups)

Step 8 Use 1/2 of the vinegar/water mixture to clean all components. Use a soft-bristle nylon brush, sponge or cloth (NOT a wire brush) to carefully clean the parts. Rinse all components with clean water.

Step 9 While components are soaking, use 1/2 of the vinegar/water 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:

- Top of the evaporator
- Water trough interior/exterior
- Evaporator and plastic parts - including top, bottom, and sides
- Bin

Important

Take care to avoid bending evaporator coils or dislodging/disturbing the water inlet or thermostat. The drain holes in the evaporator base must be open to allow water to drain freely.

⚠ Caution

Do not use metal objects to clear evaporator drain holes damage will result.

Step 10 Rinse all areas thoroughly with clean water.

Step 11 Mix a solution of bleach and lukewarm water.

Solution Type	Water	Mixed With
Sanitizer	2 gal.	1 oz Bleach

Step 12 Use 1/2 of the sanitizer/water solution to sanitize all removed components. Use a sponge or cloth to liberally apply the solution to all surfaces of the removed parts or soak the removed parts in the sanitizer/water solution. Rinse all areas thoroughly with clean water.

Step 13 Sanitize all foodzone surfaces of the ice machine and bin. Use a sponge or cloth to liberally apply the solution to all surfaces. When sanitizing, pay particular attention to the following areas:

- Top of the evaporator
- Water trough interior/exterior
- Evaporator and plastic parts - including top, bottom, and sides
- Bin

Step 14 Rinse all areas thoroughly with clean water.

Step 15 Replace all removed components.

NOTE: Spray bar and nozzles.

- If the nozzles were removed from the spray bar, take care to prevent cross threading when reassembling.
- Verify the spray bar is correctly positioned and the nozzles are aligned to the evaporator cups.

Step 16 Reapply power and water to the ice machine and press the power button to start ice making.

Step 17 Discard the first two batches of ice to remove any flavor transmission from the cleaning/sanitizing process.

Cleaning the Condenser

GENERAL

⚠Warning

Disconnect electric power to the ice machine by disconnecting the power cord 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, clean the condenser.

REMOVAL FROM SERVICE/WINTERIZATION

Self-contained Air-cooled ice machines

1. Descale 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.

Special precautions must be taken if the ice machine is to be removed from service for an extended period of time or exposed to ambient temperatures of 32°F (0°C) or below.

1. Disconnect the electric power at the circuit breaker or the electric service switch.
2. Turn off the water supply.
3. Remove the water from the water trough.
4. Disconnect the drain and the incoming ice-making water line at the rear of the ice machine.
5. Make sure no water is trapped inside the ice machine incoming water lines, drain lines, distribution tubes, etc.

Ice Making Sequence of Operation

This ice machine is controlled by an electronic timer module, while there are some mechanical switches, most functions and timers are controlled by the electronic timer module. The electronic timer module retains the power switch position in memory whenever power is disconnected and reconnected at the wall socket.

Power Switch Position When Power Was Disconnected	When Power Is Reconnected The Green LED
On	Flashes
Off	Remains Off

Pre-Freeze

The following occurs whenever power is applied to the ice machine by turning the power button on, or disconnecting/reconnecting power:

A. Pressing the power button energizes the water inlet valve to fill the water sump and the green LED will flash on/off for four minutes. The valve is energized any time the unit is plugged in and the water pump is not running. The condenser fan motor has the potential to run any time the ice machine is plugged in.

B. After 4 minutes the compressor starts, the water inlet valve remains energized and the LED stops flashing and remains solid green.

C. At the end of the cycle the water inlet and harvest valves de-energize.

FREEZE CYCLE

The water pump energizes and the compressor remains energized, starting the freezing cycle. The pump sprays water into the inverted cups. The water freezes layer by layer, until an ice cube forms in each cup.

At the same time the compressor starts, the condenser fan motor is supplied with power throughout the freeze and harvest cycles. The freeze cycle continues until the evaporator thermostat reaches the adjusted set point and an internal timer is satisfied.

HARVEST CYCLE

The compressor continues to operate and the water pump is de-energized. The harvest valve energizes, allowing hot gas from the compressor to enter and warm the evaporator. The water valve is also energized to aiding with harvest and refill the water sump with fresh water for a new freeze cycle.

The ice falls from the cups and is directed into the bin by the ice cube slide. The harvest cycle continues until the evaporator thermostat set point is reached and an internal timer is satisfied.

The harvest valve and water valve de-energize. If ice cubes are not contacting the bin thermostat, a new freeze cycle is initiated as the water pump energizes and sprays water into the cups.

AUTOMATIC SHUT-OFF

When the storage bin is full, the ice will come in contact with the bin thermostat which is located inside the bin. The machine stops when the bin thermostat opens and the LED remains solid green.

The ice machine remains off until enough ice has been removed from the storage bin to allow the bin thermostat to warm and close, starting another freeze cycle.

Important

The coil on the harvest valve is energized whenever the ice machine is shut off on full bin. At times it is possible to hear a hum or slight buzz from the coil which is normal operation.

Electronic Timer, Power, Wash, Defrost Switch

The ice machine switch is used to select and control the ice machine cycles.

⚠Warning

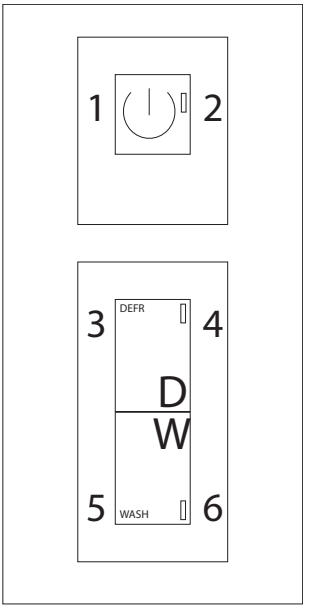
Risk of electrical shock or burns. The ice machine front panel requires removal to access the defrost and wash buttons. Do not touch electrical wiring or insert hands into the area the front panel covered.

ON/OFF Push button (1) Used to turn on and turn off the ice machine - Green LED (2)

DEFR Push button (3) Used to start the defrost cycle - Yellow LED (4)

WASH Push button (5) Push to start and/or finish the washing cycle - Blue LED (6)

Refer to “Service Faults” on page 61 for diagnostics.



1. On/Off Push Button
2. Green Power LED
3. Defrost Push Button
4. Yellow Defrost LED
5. Wash Push Button
6. Blue Wash LED

Ice Cube Thickness Check

The ice cube thickness is factory-set to maintain the ice cube thickness at the proper size and weight.

NOTE: A dimple in the end of each cube is normal. Adjusting to remove the dimple will result in longer freeze cycles and lower production.

1. Allow the ice machine to operate for three complete cycles. The cubes should have a small dimple in the center.
2. Cycle times vary, according to surrounding air and water inlet temperatures.
3. If cubes are not full (large dimple), turn evaporator thermostat one increment towards the right to increase cube size. Allow ice machine to complete three cycles. Check cube.
4. If cubes are too full, (no dimple), turn evaporator thermostat one increment towards the left to decrease cube size. Allow ice machine to operate three complete cycles.

Ice Cube Weight Adjustment

“The factory setting for the evaporator thermostat is 3. The cube weight can be increased or decreased from the factory setting by adjusting the evaporator thermostat. Turn the thermostat to the left to decrease the cube weight or to the right to increase the cube weight.

NOTE: To access the bin thermostat or adjust cube weight, remove the front ice machine panel.

Important

Individual cube weight must be between 21 to 24 grams (.75 - .85 oz) to maximize production and energy efficiency.

Bin Thermostat Adjustment

The bin thermostat stops the ice machine when the bin is full. Turn the thermostat to the left to decrease the level of ice in bin or to the right to increase the level of ice in bin. If the ice machine stops before the bin is full or runs after the bin is full, ambient temperatures are probably high or low and the bin thermostat can be adjusted.

Removal from Service/Long Term Storage

GENERAL

Special precautions must be taken if the ice machine is to be removed from service for an extended period of time or exposed to ambient temperatures of 32°F (0°C) or below.

Step 1 Perform a cleaning and sanitizing procedure to prevent mildew growth.

Step 2 Disconnect the electric power cord.

Step 3 Turn off the water supply.

Step 4 Drain water from sump by opening/removing shutters and ice cube slide and then removing overflow pipe located in the right hand rear corner.

Step 5 Disconnect and drain the incoming ice-making water line at the rear of the ice machine.

Step 6 Disconnect vinyl hose from water pump and allow to drain.

Step 7 Make sure water is not trapped in any of the water or drain lines. Compressed air can be used to blow out the lines.

Step 8 Block the door partially open to provide air exchange and prevent mildew growth.

Electronic Timer Diagnostics

ICE MACHINE IS NOT RUNNING

GREEN LIGHT IS ENERGIZED

- Refer to bin thermostat diagnostics

GREEN LIGHT IS ENERGIZED AND YELLOW DEFROST LIGHT FLASHES ONCE EVERY 4 SECONDS

- Freeze time exceeded 90 minutes
  - Refer to evaporator thermostat diagnostics
  - Refer to refrigeration system diagnostics

GREEN LIGHT IS ENERGIZED AND YELLOW DEFROST LIGHT FLASHES TWICE EVERY 4 SECONDS

- Harvest time exceeded 30 minutes
  - Refer to evaporator thermostat diagnostics

Troubleshooting

DIAGNOSING AN ICE MACHINE THAT WILL NOT RUN

⚠Warning

High (line) voltage is applied to the control board at all times.

1. Verify primary voltage is supplied to ice machine and the fuse/circuit breaker is closed.
2. Verify power button functions properly - Refer to “Electronic Timer” on page 59
3. Verify the bin thermostat is operating correctly - Refer to “Bin Thermostat” on page 62.
4. Verify line voltage is present on electronic timer terminals 8 & 12 four minutes after startup- Refer to “Bin Thermostat” on page 62.

DIAGNOSING AN ICE MACHINE THAT DOES NOT CYCLE INTO HARVEST

1. Verify evaporator temperature is below 7F.
2. Verify the evaporator thermostat is operating correctly - Refer to “Evaporator Thermostat” on page 63
3. Verify line voltage is present on electronic timer terminals 8 & 12 four minutes after startup- Refer to “Bin Thermostat” on page 62.
4. Verify 800 seconds has passed after the evaporator thermostat has closed.
5. Voltage on electronic timer terminals 7 & 12?
    - Yes - Repair wiring
    - No - Replace electronic timer

DIAGNOSING AN ICE MACHINE THAT CYCLES INTO HARVEST PREMATURELY

1. Verify evaporator temperature is below 7°F and before the 800 second finishing timer has expired - If 800 seconds have not passed and a harvest cycle starts, replace the electronic timer.
2. Evaporator temperature is below 7°F and after the 800 second finishing timer has expired - Refer to “Water System Checklist” on page 50 as this is an ice release problem.
3. Adjusting evaporator thermostat keeps the ice machine in the freeze cycle - Refer to “Evaporator Thermostat” on page 63
    - No - Replace thermostat
    - Yes - Adjust thermostat for correct operation

ELIMINATE ALL NON REFRIGERATION PROBLEMS BEFORE DIAGNOSING THE REFRIGERATION SYSTEM.

- Perform a visual inspection for clearances, drains, dirty condenser/filter and water filter replacement.
- Verify water spray is even across the entire evaporator.
- Run an ice production check - Ice production checks within 10% are considered normal.

INSTALLATION/VISUAL INSPECTION CHECKLIST

Ice machine is not level

- Level the ice machine

Condenser is dirty

- Clean the condenser

Water filtration is plugged (if used)

- Install a new water filter

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

- Run and vent drains according to the Installation Manual

WATER SYSTEM CHECKLIST

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

Example: Water loss during the freeze cycle, a system low on charge, and a restricted Capillary tube 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)

- Install a water regulator valve or increase the water pressure

Incoming water temperature is not between 50°F (10°C) and 90°F (32°C)

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

Water filtration is plugged (if used)

- Install a new water filter

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

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 the “Freeze Cycle Analysis Chart” on page 56, it can help diagnose an ice machine malfunction.

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 ice formation at the inlet.

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 inlet of the evaporator already has thick ice.

Possible cause: Water loss, low on refrigerant, restricted capillary tube, hot water supply or leaking water inlet valve.

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: Obstructed nozzles, Insufficient water flow, incorrect refrigerant charge.

Spotty Ice Formation

There are small sections on the evaporator where there is no ice formation. This could be a single corner, or an area of the evaporator.

Possible cause: Obstructed nozzles and the ice machine requires descaling or tubing separation from 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 valve leaking, water pump, capillary tube, low refrigerant charge, compressor, etc.

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 "Cycle Times, 24 Hr. Ice Production and Refrigerant Temperature Charts" on page 79. 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.	1440 Minutes in 24 Hrs.	÷	_____ Total Cycle Time	=	_____ Cycles per Day	
3.	_____ Weight of One Harvest	x	_____ 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 Manitowoc distributor for information on available options and accessories.

Refrigeration System Diagnostics

R290 (Propane) refrigerant ice machines have a minimal refrigerant charge in them. Due to the nature of R290 we recommend diagnosing refrigeration problems by temperature first. For this reason, refrigeration access fittings are not installed during production and the ice machine should be diagnosed with temperatures and then pressure if necessary.

REFRIGERATION DIAGNOSTIC PROCEDURE

1. Verify that your water spray pattern covers the entire evaporator before diagnosing the refrigeration system. Mineral buildup can cause nozzle blockage, water tracking and an erratic ice fill pattern. Descale with Manitowoc Ice Machine cleaner to remove any mineral buildup before diagnosing the refrigeration system.
2. Install and insulate temperature leads: Digital thermometers with remote insulated thermocouples must be used to obtain temperatures.
   - Suction line within 4" of the compressor.
   - Discharge line within 4" of the compressor.
   - Harvest valve within 4" of the inlet.
3. All doors and panels must be in place during the diagnostic procedure.
4. Refer to the "Cycle Times, 24 Hr. Ice Production and Refrigerant Temperature Charts" on page 79 to determine the correct operating temperature range for your air and water temperature. Normal operating temperatures will be within 10% of the data in the charts.
5. The first cycle is not used for refrigeration system diagnostics. Start monitoring temperatures 3 minutes into the second freeze cycle and record the temperatures throughout the freeze and harvest cycles.

FREEZE CYCLE ANALYSIS CHART

Discharge Temperature	Evaporator Outlet Temperature	Freeze Time	Harvest Valve Inlet Temperature	Evaporator Ice Formation	Evaporator Inlet Colder Than Outlet	Final Analysis Enter number of boxes checked in each row
Lower Than Normal	Higher Than Normal	Longer Than Normal	Higher Than Normal	Thin on Inlet or Normal	No	Harvest Valve Leaking
Lower Than Normal	Lower Than Normal	Shorter Than Normal	Normal	Normal or Thick On Outlet	No	Overcharged
Normal	Higher Than Normal	Longer Than Normal	Normal	Thin On Outlet or No Ice	Yes	Restricted Capillary Tube Or Low On Charge
Normal	Higher Than Normal	Longer Than Normal	Normal	Normal or No Ice	Yes	Compressor
Restricted Capillary/Low on Charge and Compressor diagnostics should be verified by pressure prior to replacement. See“Cycle Times, 24 Hr. Ice Production and Refrigerant Temperature Charts” on page 79						

DISCHARGE LINE TEMPERATURE

Maximum compressor discharge line temperature on a normally operating ice machine steadily increases throughout the freeze cycle. Compare the maximum discharge line temperature with the published discharge line temperature. Discharge line temperature must be equal or higher than the published temperature.

SUCTION LINE TEMPERATURE

The actual suction temperature changes throughout the freeze cycle. Determine if the suction line temperature is within the range listed in “Cycle Times, 24 Hr. Ice Production and Refrigerant Temperature Charts” on page 79.

LEAKING HARVEST VALVE

The inlet to the harvest valve temperature will be the same temperature as the discharge line after 8 minutes into the freeze cycle.

OVERCHARGED SYSTEM SYMPTOMS

Suction and discharge line temperature will be low during the freeze cycle. Overcharge diagnosis can be difficult. R290 ice machines ship without access valves; Look for signs that an access valve has previously been added. When an overcharge is suspected remove the refrigerant and weigh in the correct refrigerant amount.

RESTRICTED CAPILLARY TUBE/LOW REFRIGERANT CHARGE SYMPTOMS

- A failed capillary tube or low refrigerant charge will have a suction line temperature higher than normal and a normal discharge line temperature.
- A failed capillary tube will not effect the discharge line temperature during the harvest cycle. A low freeze and discharge line temperature in the freeze cycle with a normal harvest cycle discharge line temperature indicates a failed capillary tube.
- Low refrigerant charge will have both the suction and discharge line temperatures lower than normal in the freeze and harvest cycles.

Diagnosis can be confirmed by installing a temporary access valve and adding 2 oz (57 g) of refrigerant: If the suction line temperature drops or the ice fill pattern on the top two rows fills in, the ice machine is low on refrigerant. Refer to charging procedures for access valve installation/ removal procedure.

HIGHER THAN NORMAL FREEZE CYCLE TEMPERATURES

- A dirty filter or condenser will result in higher than normal temperatures. Always clean the filter and condenser before diagnosing the refrigeration system.
- Hot water entering the ice machine will result in high suction and discharge line temperatures in the freeze cycle.
- Inefficient Compressor
  Suction and discharge temperatures will be slightly high to high during the freeze cycle. Remove refrigerant and weigh in the correct refrigerant amount. If the ice machine continues to exhibit symptoms, monitor the discharge line temperature for a continued increase of temperature. When the ice machine continues to make ice slowly (or makes little to no ice and trips the internal compressor overload) the compressor will require replacement.

Electronic Timer

POWER, WASH, DEFROST SWITCH

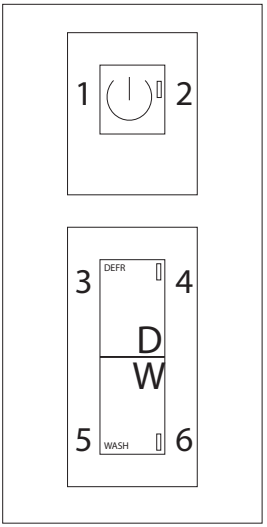
Function

The electronic timer is used to select and control the ice machine cycles.

ON/OFF Push button (1) Used to turn on and turn off the ice machine - Green LED (2)

DEFR Push button (3) Used to start the defrost cycle - Yellow LED (4)

WASH Push button (5) Push to start and/or finish the washing cycle - Blue LED (6)



1. On/Off Push Button
2. Green Power LED
3. Defrost Push Button
4. Yellow Defrost LED
5. Wash Push Button
6. Blue Wash LED

Check For Normal Operation

Start the ice machine using the following procedure:

1. Press the power button, the Green LED will go out.
2. Press the power button, the Green LED will illuminate and the ice machine will perform:
    A. Pre-Freeze - Refilling of water sump, harvest cycle
    B. Freeze cycle - Compressor starts and water pump sprays water onto the evaporator
    C. Harvest cycle - Harvest valve opens and ice releases from the evaporator
    D. Full bin or Pre-Freeze - Bin Thermostat stops the ice machine with ice contact or starts another Freeze cycle

Service Faults

Re-start the ice machine using the following procedure and allow the ice machine to run to determine if the condition repeats.

Service Fault	LED	Solution
The ice machine remains in the freeze cycle for more than 90 minutes.	Yellow light flashes once every 4 seconds	Verify evaporator thermostat is operating correctly. Refer to refrigeration diagnostics and check for loss of refrigerant
The ice machine remains in the harvest cycle for more than 30 minutes.	Yellow light flashes twice every 4 seconds	Verify evaporator thermostat is operation correctly.
The ice machine does not run, the bin is empty and the Green LED is energized	Green LED is energized	Verify bin thermostat is operating correctly
Note - Removal of the lower front panel is required to view the yellow LED		

BIN THERMOSTAT

Function

The bin thermostat stops the ice machine when the bin is full. The level of ice in the ice storage bin controls the ice machine shut-off. When the bin is full, ice cubes contact the bin thermostat bulb holder, which cools down and opens the bin thermostat to stop the ice machine. The ice machine remains off until enough ice has been removed from the bin. This causes the thermostat bulb holder to warm and closes the bin thermostat, restarting the ice machine.

Check Procedure

⚠Warning

Disconnect electrical power to the entire ice machine before proceeding.

1. Disconnect power to the ice machine.
2. Disconnect both wires from the bin thermostat and check the resistance across the bin thermostat terminals.

No Ice on Bulb	Ice on Bulb	Result
Contacts Closed	Contacts Open	Thermostat is Good
Contacts Open	Contacts Closed	Replace Thermostat

NOTE: After covering/uncovering the bulb holder with ice, wait at least three minutes to allow the thermostat to react (Open/Close).

Adjusting

If the ice machine stops before the bin is full or runs after the bin is full, ambient temperatures are probably high or low and the bin thermostat will need to be adjusted.

Turn the thermostat to the left to decrease the level of ice before automatic shut-off. Turn to the right to increase the level of ice before automatic shut-off.

EVAPORATOR THERMOSTAT

Function

The evaporator thermostat changes position as the ice machine evaporator temperature changes.

Specifications

Constant Cut-In (Close)	Factory Setpoint
39°F- 4° C	#3 7°F - 14° C
SPDT - Contacts 3 & 2 close on drop - Contacts 3 & 4 close on rise Adjusting clockwise increases differential	

Check Procedure

⚠Warning

Disconnect electrical power to the entire ice machine before proceeding.

1. Disconnect power to the ice machine.
2. Disconnect the three wires from the evaporator thermostat and check the resistance across the evaporator thermostat terminals.

No Ice on Bulb	Ice on Bulb	Result
Contacts Closed	Contacts Open	Thermostat is Good
Contacts Open	Contacts Closed	Replace Thermostat

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

Cut-In (Close)	Cut-Out (Open)
230 psig	190 psig

Check Procedure

1. Disconnect electrical power to the ice machine at the electrical service disconnect.
2. Verify fan motor windings are not open or grounded, and fan spins freely.
3. Connect manifold gauge to ice machine.
4. Hook voltmeter in parallel across the fan cycle control, leaving wires attached.
5. Reconnect electrical power to the ice machine and press the power button to ON.
6. 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

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.

Filter-Driers

Liquid Line Filter Drier

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

The difference between a Manitowoc drier and an off-the-shelf drier is in filtration. A Manitowoc 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 Manitowoc 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.

Flammable Refrigerant Procedures

Servicing Requirements

- It is recommended that only technicians specifically trained in handling flammable refrigerants, service or dispose of equipment containing hydrocarbon refrigerants.
- Color-coded red process tubes indicate use of a flammable refrigerant - Process tubes must be replaced after brazing or other service procedures.
- An accessible fire extinguisher is required when brazing.
- A combustible gas leak detector with a minimum sensitivity of 8 grams per cubic meter is required. The meter must be on while servicing the equipment. Place the detector on the floor and set the detector to beep at approximately heart beat rate.
- Equipment using hydrocarbon refrigerants have fittings unique to flammable refrigerants.
- Work in well-ventilated, open spaces - A ventilation fan can be used to disperse any residual refrigerant. Place the fan a minimum of 10' (3m) away from the work area.
- Eliminate all ignition sources.
- The filter drier must be replaced whenever the system is opened to the atmosphere.

Important

- Remove piercing valves after charging.
- Unit is critically charged. Nitrogen must be purged through the system while brazing to prevent build up of copper oxide in the refrigeration system.
- Manifold gauge set must be removed properly to ensure that no refrigerant contamination or loss occurs. A quick disconnect is required for the high side connection.

REFRIGERANT PURGING REQUIREMENTS

NOTE: Country and Local Codes for removal and processing of this refrigerant must always take precedence over these procedures.

- Minimum of 10 feet from building, verify wind direction will not introduce refrigerant into building
- Verify refrigerant does not enter buildings through intake air vents
- Although not required hydrocarbon refrigerants can be recovered, instead of venting to the atmosphere.
- Purge system with dry nitrogen to displace any trapped propane.

DANGER

Disconnect all electric power to the system. Shorting electrical wires to refrigeration tubing may result in an explosion.

REFRIGERANT PURGING PROCEDURE

1. Disconnect all electric power to the system and lockout tag out the power source(s).

NOTE: Some systems may have more than one power supply.

2. Work in well-ventilated, open space and eliminate all ignition sources.
3. Install piercing valves on the high and low side access fittings.
4. Attach manifold gauge set to the low and high side fittings. Hoses need to be as short as practical, due to the small refrigerant charge.
5. Purge refrigerant from both low and high side.
6. Purge the system with dry nitrogen for 3 minutes.
7. Evacuate the system with a vacuum pump
8. Purge the system again with dry nitrogen
9. Open the system by cutting the tubes with a tube cutter. Do not use a torch to open the system.

BRAZING PROCEDURE

10. Always purge nitrogen whenever using a torch. The nitrogen pressure regulator must be equipped with two gauges; One gauge to measure the cylinder pressure, and one to measure the discharge (refrigeration system psig). The pressure regulator must be capable of reducing the pressure to 2 or 3 psig and steadily maintaining this pressure.

PRESSURE TESTING

11. Pressure test with dry nitrogen to detect leaks. Use nitrogen and a trace amount of refrigerant to locate the leak if a pressure test indicates a leak is present.
12. Do not over pressurize the system. Check the name plate for the maximum test pressure.

DANGER

Failure to properly purge or pressure test a system for leaks, can result in serious injury or death from explosion, fire, or contact with refrigerant or lubricant mists.

EVACUATION

13. Slowly release the nitrogen and evacuate to a minimum of 500 microns.

NOTE: Do not start the compressor while it is in a vacuum or energize the compressor with the terminal cover off. Always break a vacuum with refrigerant before energizing (starting) the compressor.

Refrigerant Charging

Due to the small refrigerant quantities, a cap tube in the .50 to .85 ID range with a shutoff valve at the access port can be used to control the flow of refrigerant. The charge accuracy must be within +/- 1% of the nameplate listed charge.

14. Invert the charging bottle, and place on a scale capable of reading grams and ounces.
15. Purge liquid refrigerant to the shutoff valve, then zero out the scale and allow the reading to settle.

NOTE: It is important that the scales and hoses are positioned so that they will not be disturbed when adding refrigerant.

Important

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

16. Add refrigerant through the high side and close the valve just before the nameplate refrigerant amount is reached, then add refrigerant to reach the final charge amount. If all of the refrigerant can not be added to the high side, the remainder can be added as vapor to the low side while the compressor is running.
17. Press the power button.

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

18. Verify all of the vapor in the charging hoses is drawn into the refrigeration system before disconnecting the charging hoses.
    A. Run the ice machine in freeze cycle.
    B. Remove the high side low loss fitting.
    C. 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.
    D. Allow the suction pressures in the refrigeration system and the manifold gauge set to equalize while the ice machine is in the freeze cycle.
    E. Isolate and remove the low side hose.
19. Use a pinch-off tool on the access fitting and remove temporary access valves and seal the refrigeration system.

System Contamination Cleanup

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

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 contamination	Normal evacuation/ recharging procedure
Moisture/Air Contamination symptoms Refrigeration system open to atmosphere for longer than 15 minutes Refrigeration test kit and/or acid oil test shows contamination No burnout deposits in open compressor lines	Mild contamination cleanup procedure
Mild Compressor Burnout symptoms Oil appears clean but smells 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 amount.
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 capillary tube.
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 filter-drier should be adequate for complete cleanup.
    B. If the pressure drop exceeds 2 psig, change the suction line filter-drier and the liquid line drier. Repeat until the pressure drop is acceptable.
12. Operate the ice machine for 48 – 72 hours. Replace the suction line and liquid line drier if necessary.

Total System Refrigerant Charge

Important

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

Model	Air-Cooled	Refrigerant Type
USP0100A	110 grams (3.9 oz)	R290 - Propane

Cycle Times, 24 Hr. Ice Production and Refrigerant Temperature Charts

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

- Accurate collection of data is essential to obtain the correct diagnosis. Eliminate all non refrigeration problems before diagnosing the refrigeration system.
- Perform a visual inspection for clearances, drains, dirty condenser/filter and water filter replacement.
- Verify water flow is even across the entire 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 “Refrigeration diagnostics” for the list of data that must be collected for refrigeration diagnostics.

USP0100A AIR-COOLED

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °F/°C	Freeze Time Water Temperature °F/°C			Harvest Time
	50/10	70/21	90/32	
70°/21°	23-25	26-28	28-30	1.75-3.5
80°/27°	24-26	27-29	30-31	
90°/32°	24-25	25-29	29-31	
100°/38°	26-28	29-31	32-34	
110°/43°	29-31	31-34	35-37	

Times in minutes

24 Hour Ice Production

Air Temp. Entering Condenser °F/°C	Water Temperature °F/°C		
	50/10	70/21	90/32
70°/21°	100	95	90
80°/27°	95	94	85
90°/32°	90	93	80
100°/38°	85	85	75
110°/43°	80	75	70

Based on average ice slab weight of 21 to 24 grams (.75 - .85 oz)

Pressure Chart

Air Temperature Entering Condenser °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG
50°/10°	190-230	38-15	90-115	60-110
70°/21°	190-237	45-15	90-118	60-118
80°/27°	190-238	45-15	90-120	62-120
90°/32°	190-240	45-15	94-135	62-122
100°/38°	210-280	50-17	100-160	65-135
110°/43°	235-310	53-18	110-170	70-138

Temperature Chart

Air Temp. Entering Condenser °F/°C	Freeze Cycle				Harvest Cycle	
	Discharge Temperature	Suction Temperature	Harvest Valve Inlet	Liquid Line Temperature	Discharge Temperature	Evaporator Outlet Temperature
50°/10°	150-175	55-65	75-80	100-115	100-130	35-55
70°/21°	165-181	58-70	95-100	105-118	105-145	40-60
80°/27°	168-183	58-72	100-105	105-120	110-150	42-80
90°/32°	170-184	62-73	105-110	105-121	112-154	43-88
100°/38°	195-202	72-85	102-130	122-140	120-160	50-97

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Diagrams

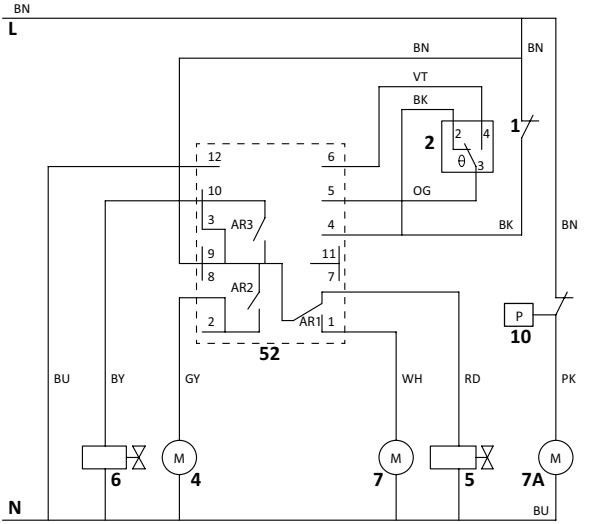
Wiring Diagrams

The following pages contain electrical wiring diagrams.

⚠Warning

Always disconnect power before working on electrical circuitry.

USP0100A 1PH AIR-COOLED



1Ph Air-cooled

Number	Component
1	Bin Thermostat
2	Evaporator Thermostat
4	Compressor
5	Harvest Valve
6	Water Inlet Valve
7	Water Pump
7a	Condenser Fan Motor
10	Fan Cycle Control
52	Electronic Timer
Wire Colors	
BK	Black
BN	Brown
BU	Blue
GY	Grey
OG	Orange
PK	Pink
RD	Red
VT	Violet
RD	Red
WH	White

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