Manitowoc

INDIGO NXT
R290 Refrigerant Ice Machines

Technician's Handbook

Part Number STH097 Rev00 2/19

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, 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 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.

⚠ 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.
- Connect to a potable water supply only.
- 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 all removable panels 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.
- 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.
- Ice machines require a deflector when installed on an ice storage bin. Prior to using a non-OEM ice storage system with this ice machine, contact the bin manufacturer to assure their ice deflector is compatible.
- Prior to installing a non-OEM ice storage system with this ice machine, follow the manufacturers installation procedures and verify the location and installation meets the local/national mechanical codes and stability requirements.

⚠ Warning

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

- Refer to nameplate to identify the type of refrigerant in your equipment.
- 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.
- 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.

⚠ 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.

⚠ Warning

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.
- Turn off and lockout all utilities (gas, electric, water) according to approved practices during maintenance or servicing.

⚠ DANGER

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

- Refer to nameplate - Ice machine 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.
- 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.
- 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.
- Installation must comply with all applicable equipment fire and health codes with the authority having jurisdiction.

⚠ DANGER

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

- 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.

⚠ Warning

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

- Units with two power cords must be plugged into individual branch circuits. During movement, cleaning or repair it is necessary to unplug both power cords.
- 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.
- Two or more people are required to move this equipment to prevent tipping.
- Locking the front casters after moving is the owner's and operator's responsibility. 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.
- 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.

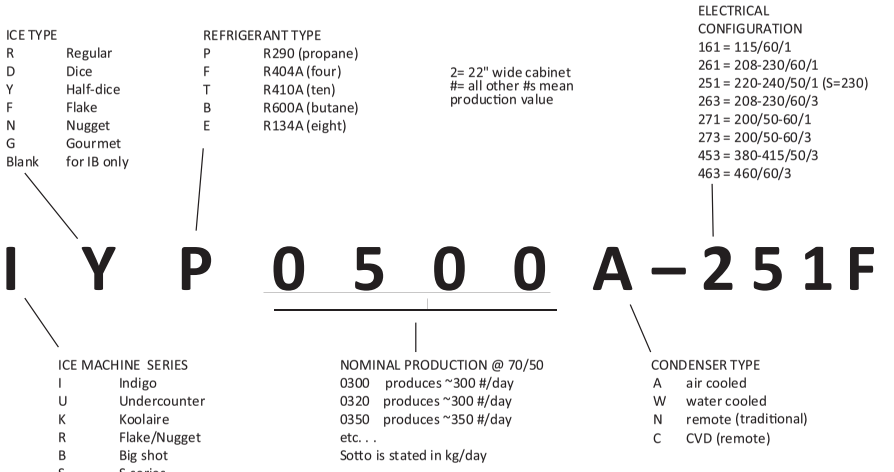
Table of Contents

Model Numbers

Self-Contained Air-Cooled
IYP0320A
IDP0500A IYP0500A

NOTE: Additional designators are used to identify Voltage, Specials or Country specific models - See “Model Nomenclature” on page 18

Model Nomenclature



POWER CORD OPTION

Blank	junction box
Z	cord without plug
B	NEMA plug (USA)
F	schuko plug (EU)
G	13A blade (GBR)
I	oblique V blades
(AUS)	Australia

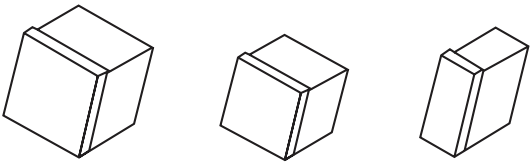
SPECIAL USE

A	Alternate Compressor
Blank	general use
Q	coated condenser
H	high pressure
M	marine
P	correctional
T	top air discharge
X	Luminice/Sanitation
L	lever
V	space maker

MARKET IDENTIFIER

Blank	not market specific
S	Saudi Arabia (GCC)
K	Korea (KC)
C	China (CCC)
D	Germany (GS)
N	Brazil (InMetro)

Ice Cube Sizes



Regular	Dice	Half Dice
1-1/8" x 1-1/8" x 7/8"	7/8" x 7/8" x 7/8"	3/8" x 1-1/8" x 7/8"
2.86 x 2.86 x 2.22 cm	2.22 x 2.22 x2.22 cm	0.95 x 2.86 x 2.22 cm

⚠Warning

All Manitowoc ice machines require the ice storage system (bin, dispenser, etc.) to incorporate an ice deflector.

Prior to using a non-Manitowoc ice storage system with other Manitowoc ice machines, contact the manufacturer to assure their ice deflector is compatible with Manitowoc ice machines.

Model/Serial Number Location

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

• The model and serial number can be viewed by pressing the information icon on the touchscreen.

• The owner warranty registration card.

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

The model and serial number displayed on the touchscreen must match the data plate for proper operation.

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.

LuminIce® II

The LuminIce® growth inhibitor recirculates the air in the ice machine foodzone over a UV bulb. This process will inhibit the growth of common micro-organisms on all exposed foodzone surfaces.

- LuminIce® bulbs require replacement on a yearly basis.
- The control board can be set to automatically display a reminder after 12 months.

NOTE: LuminIce® and LuminIce® II bulbs are not interchangeable; verify your model before ordering a replacement bulb.

Cleanup Procedure for Accidental Bulb Breakage

The cleanup procedure is identical to the procedure used to clean up compact fluorescent (CFL) or fluorescent tube lights. These lights contain a small amount of mercury sealed within a glass tube. Breaking these types of lights will release mercury and mercury vapor. The broken bulb can continue to release mercury vapor until it is cleaned up and removed.

The latest EPA procedures can be viewed on their website at www.epa.gov/cfl/cflcleanup.html.

NOTE: LuminIce® and LuminIce® II bulbs are not interchangeable; verify your model before ordering a replacement bulb. LuminIce® bulbs have a white base and LuminIce® II bulbs have a blue base.

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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 free of airborne and other contaminants.
- The air temperature must be at least 35°F (1.6°C), but must not exceed 110°F (43.4°C).
- Ice Making Water Inlet - Water Pressure must be at least 20 psi (1.38 bar), but must not exceed 80 psi (5.52 bar).
- The location must not be near heat-generating equipment or in direct sunlight and protected from weather.
- The location must not obstruct air flow through or around the ice machine. Refer to 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. See “Removal from Service/ Winterization”

Clearance Requirements

IP0320	Self-Contained Air-Cooled
Top/Sides	**16” (40 cm)**
Back	**5” (13 cm)**

IP0500	Self-Contained Air-Cooled
Top/Sides	12" (30.5 cm)
Back	5" (12.7 cm)

Ice Machine Heat of Rejection

Series Ice Machine	Heat of Rejection	
	Air Conditioning*	Peak
IP0320	3800	6000
IP0500	6100[1]	6900[1]

*BTU/Hour
Because the heat of rejection varies during the ice making cycle, the figure shown is an average.
[1] Indicates preliminary data

Installation on a Bin

An ice deflector is required for all bin installations and is included with all Manitowoc bins. Order the appropriate deflector kit (30" or 48") for any bin without a deflector.

NOTE: An optional safety kit is available to attach the ice machine to D model bins. Contact your local distributor for details.

⚠Warning

PERSONAL INJURY POTENTIAL

Do not operate any ice machine with the deflector removed.

Ice Machine on a Dispenser Installation

Observe following recommendations unless required by the dispenser manufacturer.

- An adapter is not required for ice machines that match the dispenser size.
- A deflector is not required.
- Ice level management is recommended to prevent water leakage or movement of ice machine during agitation. A dispenser baffle is required to prevent ice from contacting the ice machine door and prevent possible water leakage.
- Align sides and back of ice machine with sides and back of dispenser when placing ice machine.
- Follow ice machine installation procedures in this manual and any additional installation requirements specified by the dispenser manufacturer.

Water Supply and Drains

Potable Water

- Water temperature must be between 40°F (4.4°C) and 90°F (32°C).
- Water pressure must be between 20 psi (140 kPa) and 80 psi (550 kPa).
- Minimum internal diameter of tubing 3/8” (10mm).

Drain Connections

- Drain lines must have a 1.5 inch drop per 5 feet (2.5 cm per meter) of run and must not create traps.
- The floor drain must be large enough to accommodate drainage from all drains.
- Run separate bin and ice machine drain lines.
- Insulate drain lines to prevent condensation.
- Vent the ice machine drain to the atmosphere.
- Drain termination must have an air gap that meets local code.

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.

Clean and sanitize the ice machine a minimum of once every six 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. An extremely dirty ice machine must be taken apart for cleaning and sanitizing.

Manitowoc Ice Machine Cleaner and Sanitizer are the only products approved for use in Manitowoc ice machines.

⚠ Caution

Use only Manitowoc approved Ice Machine Cleaner and Sanitizer for this application (Manitowoc Cleaner part number 9405463 and Manitowoc Sanitizer part number 9405653). 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 Cleaner and Sanitizer solutions together. It is a violation of Federal law to use these solutions in a manner inconsistent with their labeling.

⚠ Warning

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

Cleaning/Sanitizing Procedure

This procedure must be performed a minimum of once every six months.

- The ice machine and bin must be disassembled cleaned and sanitized.
- All ice produced during the cleaning and sanitizing procedures must be discarded.
- Removes mineral deposits from areas or surfaces that are in direct contact with water.

Preventative Maintenance Cleaning Procedure

- This procedure cleans all components in the water flow path, and is used to clean the ice machine between the bi-yearly cleaning/sanitizing procedure.

IAUCS®

iAuCS® does not operate when the Clean button is used to start a clean cycle. To prime the hose, activation is required through the Service Menu/iAuCS® icon.

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.

The exterior panels have a clear coating that is stain resistant and easy to clean. Products containing abrasives will damage the coating and scratch the panels.

- Never use steel wool or abrasive pads for cleaning.
- Never use chlorinated, citrus based or abrasive cleaners on exterior panels and plastic trim pieces.

Touchscreen Operation For The Clean Cycle

STARTING A CLEAN CYCLE

Pressing the clean icon will display a Continue/Abort screen, and a warning that pressing Continue will result in a clean cycle that can last up to 35 minutes.

WATER CURTAIN/DAMPER OPERATION DURING THE CLEAN CYCLE

The water curtain/damper must remain closed during the clean sequence. When the curtain/damper is open for more than 3 seconds the clean cycle stops and a message is displayed on the touchscreen with a choice to continue or stop the clean cycle. Stopping the clean cycle will result in a series of rinse and dump cycles to verify cleaner or sanitizer has been removed before ice making.

PAUSING A CLEAN CYCLE

The clean cycle can be paused and resumed at any time by pressing the on/off button. The clean cycle will resume from the beginning of either the wash or rinse cycle depending on the point of interruption.

POWER INTERRUPTION DURING CLEAN CYCLE

If the power supply is interrupted during the clean cycle the state is retained in the circuit board. When power is reapplied the clean cycle will resume from the beginning of either the wash or rinse cycle depending on the point of interruption

ABORTING A CLEAN CYCLE

Verify cleaner/sanitizer is not present in the water system before aborting a clean cycle.

1. Press and hold the Clean button, then press and release the On/Off button.
2. Release the Clean button and select abort from the touchscreen.

Cleaning / Sanitizing Procedure

⚠ Caution

Use only Manitowoc approved Ice Machine Cleaner and Sanitizer for this application (Manitowoc Cleaner part number 9405463 and Manitowoc Sanitizer part number 9405653). 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.

CLEANING PROCEDURE

⚠ Caution

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

⚠ Warning

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

Ice machine cleaner is used to remove lime scale and mineral deposits. Ice machine sanitizer disinfects and removes algae and slime.

NOTE: Although not required and dependent on your installation, removing the ice machine top cover may allow easier access.

Step 1 Open the front door to access the evaporator compartment. Ice must not be on the evaporator during the clean/sanitize cycle. 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
- Use the touchpad to initiate a manual harvest cycle.

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

Step 2 Remove all ice from the bin/dispenser.

Step 3 Press the Clean button and select "Turn off when complete". Water will flow through the water dump valve and down the drain. Wait approximately 1 minute until the water trough refills and the display indicates Add Chemical. Add the proper amount of ice machine cleaner to the water trough by pouring between the water curtain and evaporator, then confirm the chemical was added.

NOTE: There is a 10 minute time limit to confirm chemical was added.

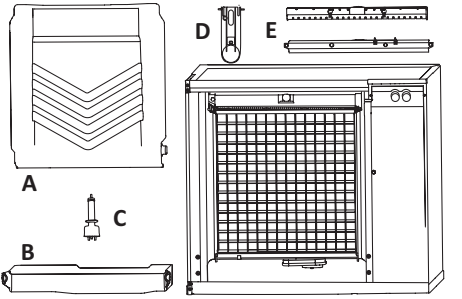
- Confirmation is pushed within 10 minutes - The ice machine will start a 10 minute wash cycle, followed by 6 rinse and flush cycles.
- Confirmation is not pushed within 10 minutes - The ice machine will skip the 10 minute wash cycle and start 6 rinse and flush cycles.

Model	Amount of Cleaner
IP0320	3 ounces (90 ml)
IP0500	5 ounces (150 ml)

Step 4 Wait until the clean cycle is complete, then disconnect power to the ice machine (and dispenser when used).

> **⚠Warning**
>
> Disconnect the electric power to the ice machine at the electric service switch box.

Step 5 Remove parts for cleaning.



A. Remove the water curtain

- Gently flex the curtain in the center and remove it from the right side.
- Slide the left pin out.

B. Remove the water trough

- Depress tabs on right and left side of the water trough.
- Allow front of water trough to drop as you pull forward to disengage the rear pins.

C. Remove the water level probe

- Pull the water level probe straight down to disengage.
- Lower the water level probe until the wiring connector is visible.
- Disconnect the wire lead from the water level probe.
- Remove the water level probe from the ice machine.

D. Remove the ice thickness probe

- Compress the hinge pin on the top of the ice thickness probe.
- Pivot the ice thickness probe to disengage one pin then the other. The ice thickness probe can be cleaned at this point without complete removal. If complete removal is desired, disconnect the ice thickness control wiring from the control board.

E. Remove the water distribution tube

NOTE: Distribution tube thumbscrews are retained to prevent loss. Loosen thumbscrews but do not pull thumbscrews out of distribution tube.

- Loosen the two outer screws (do not remove screws completely they are retained to prevent loss) and pull forward on the distribution tube to release from slip joint.

Disassemble distribution tube by loosening the two (2) middle thumbscrews and dividing the distribution tube into two pieces. Please refer to the proper parts removal for your ice machine. Continue with step 6 when the parts have been removed.

Step 6 Mix a solution of cleaner and lukewarm water. Depending upon the amount of mineral buildup, a larger quantity of solution may be required. Use the ratio in the table below to mix enough solution to thoroughly clean all parts.

Solution Type	Water	Mixed With
Cleaner	1 gal. (4 L)	16 oz (500 ml) cleaner

Step 7 Use 1/2 of the cleaner/water mixture to clean all components. The cleaner solution will foam when it contacts lime scale and mineral deposits; once the foaming stops use a soft-bristle nylon brush, sponge or cloth (NOT a wire brush) to carefully clean the parts. Soak parts for 5 minutes (15 - 20 minutes for heavily scaled parts). Rinse all components with clean water.

⚠ Caution

Do not clean the ice thickness probe in a dishwasher. Permanent damage to the ice thickness probe will occur.

Ice Thickness Probe & Water Level Probe

Clean the probes using the following procedure.

NOTE: Do not soak electrical connectors in cleaner or sanitizer solution.

1. Mix a solution of Manitowoc ice machine cleaner and water (2 ounces of cleaner to 16 ounces of water) in a container.
2. Clean all probe surfaces including all plastic parts (do not use abrasives). Verify all surfaces are clean. Thoroughly rinse probes with clean water.
3. Reinstall probe, then sanitize the ice machine and bin/dispenser interior surfaces.

Step 8 While components are soaking, use 1/2 of the cleaner/water solution to clean all food zone surfaces of the ice machine and bin (or dispenser). Use a nylon brush or cloth to thoroughly clean the following ice machine areas:

- Side walls
- Base (area above water trough)
- Evaporator plastic parts - including top, bottom, and sides
- Bin or dispenser

Rinse all areas thoroughly with clean water.

SANITIZING PROCEDURE

Step 9 Mix a solution of sanitizer and lukewarm water.

Solution Type	Water	Mixed With
Sanitizer	3 gal. (12 L)	2 oz (60 ml) sanitizer

Step 10 Use 1/2 of the sanitizer/water solution to sanitize all removed components. Use a spray bottle to liberally apply the solution to all surfaces of the removed parts or soak the removed parts in the sanitizer/water solution. Do not rinse parts after sanitizing.

Step 11 Use 1/2 of the sanitizer/water solution to sanitize all food zone surfaces of the ice machine and bin (or dispenser). Use a spray bottle to liberally apply the solution. When sanitizing, pay particular attention to the following areas:

- Side walls
- Base (area above water trough)
- Evaporator plastic parts - including top, bottom and sides
- Bin or dispenser

Do not rinse the sanitized areas.

Step 12 Replace all removed components.

Step 13 Wait 20 minutes.

Step 14 Reapply power to the ice machine and press the Clean button.

Step 15 Press the Clean button and select "Make ice when complete". Water will flow through the water dump valve and down the drain. Wait approximately 1 minute until the water trough refills and the display indicates Add Chemical. Add the proper amount of ice machine sanitizer to the water trough by pouring between the water curtain and evaporator, then confirm the chemical was added.

Model	Amount of Sanitizer
IP0320	3 ounces (90 ml)
IP0500	3 ounces (90 ml)

Step 16 The ice machine will automatically start ice making after the sanitize cycle is complete.

Water Inlet Valve

The water inlet valve normally does not require removal for cleaning. Refer to “Water System Checklist” page 84, if you are troubleshooting water related problems.

1. When the ice machine is off, the water inlet valve must completely stop water flow into the machine. Watch for water flow.

When the ice machine is on, the water inlet valve must allow the proper water flow through it. Press the Power button to energize the ice machine. Watch for water flow into the ice machine. If the water flow is slow or only trickles into the ice machine, refer to water system checklist.

NOTE: The valve can also be energized by navigating to the service diagnostic menu, selecting control board, then selecting “enable all relays”.

⚠Warning

Disconnect the electric power to the ice machine and dispenser at the electric service switch box and turn off the water supply before proceeding.

Water Dump Valve

The water dump valve normally does not require removal for cleaning. To determine if removal is necessary:

1. Locate the water dump valve.
2. While the ice machine is in the freeze mode, check the drain to determine if the dump valve is leaking. If there is no or little water in the water trough (during the freeze cycle) the dump valve is leaking.
    A. If the dump valve is leaking, remove, disassemble and clean it.
    B. If the dump valve is not leaking, do not remove it. Instead, follow the “Ice Machine Cleaning Procedure”.

Preventative Maintenance Cleaning Procedure

This procedure cleans all components in the water flow path, and is used to clean the ice machine between the bi-yearly cleaning/sanitizing procedure.

Ice machine cleaner is used to remove lime scale and mineral deposits. Ice machine sanitizer disinfects and removes algae and slime.

NOTE: Although not required and dependent on your installation, removing the ice machine top cover may allow easier access.

1. Ice must not be on the evaporator during the clean/ sanitize cycle. 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.

2. Open the front door to access the evaporator.

3. Press the Clean button and select "Make ice when complete". Water will flow through the water dump valve and down the drain. Wait approximately 1 minute until the water trough refills and the display indicates Add Chemical. Add the proper amount of ice machine cleaner to the water trough by pouring between the water curtain and evaporator, then confirm the chemical was added.

Model	Amount of Cleaner
IP0320	3 ounces (90 ml)
IP0500	5 ounces (150 ml)

4. Close and secure the front door. The ice machine will automatically start ice making after the clean cycle is complete (approximately 24 minutes).

NOTE: Once the cycle has started it must complete before the ice machine can make ice again. Returning it to ice making mode will not cancel a clean cycle.

Removal from Service/Winterization

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.

> **⚠ Caution**
>
> If water is allowed to remain in the ice machine in freezing temperatures, severe damage to some components could result. Damage of this nature is not covered by the warranty.

Follow the applicable procedure below.

AIR-COOLED ICE MACHINES

1. Press the power button.
2. Turn off the water supply.
3. Remove the water from the water trough.
4. Disconnect and drain the incoming ice-making water line at the rear of the ice machine.
5. Energize the ice machine and wait one minute for the water inlet valve to open - or - Energize all relays in the touchscreen service menu.
6. Blow compressed air in both the incoming water and the drain openings in the rear of the ice machine until no more water comes out of the water inlet lines or the drain.
7. Disconnect the electric power at the circuit breaker or the electric service switch.
8. Make sure water is not trapped in any of the water lines, drain lines, distribution tubes, etc.

Touch Screen Features

The Indigo® control panel offers a series of pressure-sensitive buttons and an interactive touchscreen.

Buttons

Power Button: Provides On/Off functions for the ice machine.

Lock/Unlock Button: Allows or prevents touchscreen navigation.

Cleaning Button: Initiates a cleaning cycle. Refer to “Cleaning and Sanitizing” on page 27 for details.

Touchscreen

Home screen allows viewing of ice machine status, alerts and messages. Navigation with the touchscreen provides access to menu items,machine information, settings and event logs. Setup and Energy Saver settings can be adjusted along with access to service and troubleshooting information.

Icons: Provide status indication and allow navigation by pressing the icon.

HOME SCREEN ICON DESCRIPTIONS

Icon	Description
Home Screen 	Pressing this icon at any time will return the display to the home screen. State of ice Machine is the center portion of the screen which displays the current condition of the ice machine - Making ice, bin full, program mode or machine off
Alert 	Alert icon with number of messages. Pressing this icon will display the alert log which will allow viewing and resetting of alerts
Message 	Message icon with umber of messages. Pressing this icon will display the routine maintenance reminder screen which will allow viewing and resetting of the reminder
Menu 	Menu icon will take you to the main menu
Information 	Information icon provides model and serial number, installation date and other information specific to the ice machine
Service Locater 	Provides contact information for your local service support - Default is the Manitowoc Ice website service locater
Lock/Unlock 	Indicates if screen is locked or unlocked
LuminIce 	Only visible when a LuminIce II accessory is connected. Blue S - Normal operation Red S - Replace bulb Red/Blue alternating - Incorrect bulb installed

Setup Wizard

Screens will automatically advance after a selection is made or press the arrows to advance/go back one screen. All settings can be accessed and changed without the wizard by using menu screen navigation.

Setup	Description
Press ON/OFF Button	On/Off button is used to start/stop ice making.
Select Language	Default is English. Scroll to select a different language.
Start Wizard	Setup wizard will guide ice machine programming.
Date and Time Configuration	Select Month/Day/Year or Day/Month/Year. Select 12 hour or 24 hour time format.
Set Local Time	Use arrows to set local time.
Verify Date	Use arrows to set date for your location.
Accessory Detection	Detects if Ice Level Sensor, LuminIce II or AuCS are connected. Checkmark = yes - X = no
Optional USB Settings Download	Only used when setup features have been transferred to a USB drive. Skip screen by selecting right arrow.
Configure Units	Select standard or metric.
Set Brightness	Configure screen brightness during normal operation.
Optional Ice Program	Program ice machine run times or press right arrow to skip this setup.
Optional Cleaning Reminder	Set clean and sanitize reminder or press right arrow to skip.
Optional Clean Air Filter Air-cooled models only	Set to ON for self-contained air cooled models.
Optional Water Filter Reminder	Select Yes or No.
Water Usage Option	Factory default - or - Use less water for reverse osmosis systems (see “Reverse Osmosis or Deionized Water Usage” on page 115) - or - Use more water to improve clarity for unfiltered water
Congratulations	Setup wizard is complete
Turn On Ice Machine	Turn on ice machine by pressing the On/Off button.

Menu Navigation Overview

SETTINGS MENU SCREEN NAVIGATION

Select SETTINGS Icon from the Home Screen to access Main Menu screen. The main menu screen contains four main headings, which allow access to subheadings under each main heading.

	**Energy**
	**Ice Program**
	Continuous Mode - Default, No Program
	Time Program - Select Daily On/Off times
	Weight Program - Select Daily Production Weight
	**Water Usage**
	Use Factory Default
	Use Less Water With Reverse Osmosis
	Use More Water To Improve Ice Clarity
	**Statistics**
	Ice Production - Previous 7 Days
	Water Usage - Previous 7 Days
	Energy Usage - Previous 7 Days

NOTE: The performance statistics are calculated based on the performance of the ice machine at 90ºF (32ºC) ambient temperature and 70ºF (21ºC) water temperature. The actual statistics will vary dependent on your environmental conditions.

	**Service**
	**Data**
	Real Time Data
	Time and Temperature
	Inputs
	Outputs
	Data History for 5 Previous Days Minimum and Maximum Freeze (Length, Time of day, Thermistor Temperatures) Minimum and Maximum Harvest (Length, Time of day, Thermistor Temperatures)
	Lifetime Data History Installation Date Control Board Replacement Date Control Board Manufacture Date Runtime Cycle Count Potable Water Clean Cycles
	**Alert Log**
	Lists/Clears Alerts
	**Manual Harvest**
	Off or On
	**Control Board Replacement**
	Manual Replacement Manually enter model number Manually enter serial number Manually enter condenser serial number (optional) Verification
	USB Replacement Import to ice machine Export to USB

	Service
	Diagnostics
	Control board
	Enable All Relays
	Self Check
	Temperature Sensors
	Lists Sensor Temperatures
	Inputs
	Lists Control Board Input Information
	User Interface Screen Calibration Button Diagnostics Screen Diagnostics
	Screen Calibration
	Contact information
	Factory defaults to QR code and website address to Manitowoc Ice's Global Locater. Edit Contact Information Button.
	USB
	Upgrade Firmware
	Export Data
	iAuCS
	Manually initiate the iAuCS pump for pump/hose priming. NOTE The clean button does not initiate the iAuCS pump.

	**Settings**
	**Language**
	Select Language
	**Reminders**
	Clean Reminder
	Set Month Interval
	Air Filter
	Set On/Off/Interval
	Water Filter
	Set Reminder
	**Configure Date & Time**
	Configure Date & Time Set Time Set Date
	**Units**
	Standard or Metric
	**Brightness**
	Adjust Touch Screen Brightness For Sleep Mode or Inactivity. NOTE: 100% brightness is activated by touching the screen when the lock feature is off.
	**USB**
	Import Settings To Ice Machine
	Export Settings To USB
	**IAuCs**
	When the iAuCS is detected, the icon will appear in the settings menu to set frequency of cleanings with iAuCS

	**Reset Defaults**
	Require Setup Wizard Optional Setup Wizard restart for training purposes or resale of equipment.
	Backup Current Settings
	Import To Ice Machine
	Export To USB
	Reset Factory Defaults

EVENT LOG

Refer to Event Log Detail For Code descriptions.

Displayed Text	Code	Description
Long Freeze	E01	Long Freeze Cycle
Long Harvest	E02	Long Harvest Cycle
Power Loss	E03	Input Power Loss
Hi cnd Temp or Wtr Cnd Fault	E04	High Condenser Temperature
HPC Fault	E05	High Pressure Control Opened
	E06	Spare
Starving TXV	E07	Starving TXV Single Evaporator or Low On Charge
TXV Fault	E08	TXV Fault Single or Dual Circuit Evaporators
Flood Evap1	E09	Flooding Evaporator Fault Single Evaporator, Single Circuit
Flood Evap2	E10	Flooding Evaporator Fault Dual TXV, Dual Circuit
Refrig Fault	E11	Refrigeration Fault
Curtain Fault	E12	Curtain Switch Fault - Open more than 24 hours
	E13	Spare
	E14	Spare
Low liq temp	E15	Fan Cycle Control Fault - Low Liquid Line Temperature
Rmt Cnd Fault	E16	Not used on R290 models
	E17	Spare
	E18	Spare
ITP Fault	E19	Ice Thickness Probe Fault
WTR Fault	E20	Water System Fault
T1 Fault	E21	T1 Temperature Sensor Issue
T2 Fault	E22	T2 Temperature Sensor Issue
T3 Fault	E23	T3 Temperature Sensor Issue
T4 Fault	E24	T4 Temperature Sensor Issue
Bin Probe Fault	E25	Bin Level Probe Low Sensor Fault
AUCS	E26	T6 or T7 Temperature Sensor Issue
USB COMM	E27	T6 or T7 Temperature Sensor Issue
USB DNLD	E28	iAuCS
	E29	USB Communication Fault
	E30	USB Download Fault
Safe Mode	E31	Safe Mode
RS485 COMM	E32	RS485 Communication Fault
Keyboard	E33	Touchscreen Fault
Display	E34	Display Fault

Displayed Text	Code	Description
Checksum	E36	Check Sum Error
WatchDog	E37	Watch Dog Event
UI Comm	E38	UI Comm Event

EVENT LOG DETAIL

E01 Long Freeze

6 consecutive 35 minute freeze cycles = Ice machine is off.

E02 Long Harvest

3 consecutive 7minute harvest cycles = Ice machine is off.

E03 Power Loss

When power is interrupted to the ice machine the control board will log the event in the ELOG and stamp the loss of power on power-up.

E04 High Condenser Temperature

Liquid Line Temperature too High for Self-contained Air Cooled Ice machine = Air Cooled Condenser Fault

E05 High Pressure Control Opened

The high pressure cutout switch (HPCO) opened.

E06 Spare

E07 Starving TXV Single Evaporator or Low On Charge

The difference of the average evaporator inlet (T3) and outlet (T4) is greater than 12°F in the last 1 minute of the freeze cycle.

E08 TXV Fault Single or Dual Circuit Evaporators

The difference of the average evaporator inlet (T3) and outlet (T4) is greater than 12°F in the last 1 minute of the freeze cycle.

E09 Flooding Evaporator Fault Single Evaporator, Single Circuit

Average compressor discharge line temperature during the first 6 minutes of the freeze cycle (T2) compared to the average of the Prechill (T1) +50°F is less than 1.05°F.

E10 Not applicable to these models.

E11 Refrigeration Fault

The compressor discharge temperature did not increase by at least 10° F, and the evaporator temperature did not decreased by at least 10° F - Measured from Refrigeration Start up or Prechill until 2 minutes into the Freeze cycle.

E12 Curtain Switch Fault Open more than 24 hours

The ice machine is set to ice making and remains in bin full condition for more than 24 hours. The curtain switch is open or curtain is off.

E13 Spare

E14 Spare

E15 Fan Cycle Control Fault - Low Liquid Line Temperature

The liquid line temperature dropped below 60° F for more than one continuous minute during the freeze cycle.

E16 Not applicable to these models.

E17 Spare

E18 Spare

E19 Ice Thickness Probe Fault

The monitored Frequencies is out of the appropriate range (Probe unplugged or problem with microphone).

E20 Water System Fault

Any of the following:

1. Sensing high water probe and not low water probe.
2. Evaporator outlet temperature is less than -10°F 6.5 to 7.5 minutes in freeze cycle.
3. Low water probe is satisfied at the end of harvest.
4. Low or high water probe is satisfied at end of freeze cycle.

E21 T1 Temperature Sensor Issue

During Pre-chill the thermistor had an average value reading outside the valid range.

E22 T2 Temperature Sensor Issue

During Pre-chill the thermistor had an average value reading outside the valid range.

E23 T3 Temperature Sensor Issue

During Pre-chill the thermistor had an average value reading outside the valid range.

E24 T4 Temperature Sensor Issue

During Pre-chill the thermistor had an average value reading outside the valid range.

E25 Bin Level Probe Low Sensor Fault

The thermistor had an average value reading outside of the valid range for 10 continuous minutes.

E26 T6 or T7 Temperature Issue

The thermistor had an average value reading outside of the valid range.

E27 T6 or T7 Temperature Issue

The thermistor had an average value reading outside of the valid range.

E28 AuCS

When the AUCS clean option is selected from the menu, the control checks for the presence of the AUCS board. When the AUCS is not connected it will signal an Event which will clear as soon as the hardware is detected.

E29 USB Communication Fault

USB Communication error; No USB drive in port or defective USB drive.

E30 USB Download Fault

USB Download error related to USB drive or a defective USB drive.

E31 Safe Mode

Safe mode allows the ice machine to operate for a period of time in the event of a Water level or ice thickness probe failure. The controller allows the machine to operate based on model data and historical cycle information.

E32 RS485 Communication Fault

The device plugged into the RS485 port is not communicating between the control board and gateway.

E33 Touchscreen Fault

The Touchscreen is not plugged into the control board or is faulty.

E34 Display Fault

The touchscreen is not plugged into the control board or is faulty.

E36 Check Sum Error

Event Log Only: Activates on power loss.

E37 Watch Dog Event

Event Log Only: Micro Process time out, possible electrical noise.

E38 UI Comm Event

Event Log Only: User interface communication error: loose communication cable, power interruption.

USB FLASH DRIVE SPECIFICATIONS AND FORMATTING

Updating firmware on Indigo™ model ice machines requires a properly formatted 32 GB or smaller USB flash drive. All USB flash drives must be formatted before use to remove any software programs or files currently on the flash drive.

USB Flash Drive Specifications:

- USB 2 Version
- 32 GB or less capacity
- Fat32 File System

USB Flash Drive Formatting:

Procedure to format a USB flash drive varies with operating system software. Refer to operating system software manufacturer's website for formatting instructions.

UPGRADING FIRMWARE WITH A FLASH DRIVE

Important

The flash drive must be formatted before using. All files and software on the flash drive are removed during the formatting process.

1. Drag and drop the files from website or email onto a flash drive, insuring they are not in a folder.
2. Ensure that the ice machine's power is on.
3. Navigate to USB - Menu / Service / USB.
4. Insert the flash drive into the USB port on the ice machine control board. Do not remove flash drive until update is complete).

NOTE: See "Electronic Control Board" on page 154 for USB location.

5. Select Upgrade firmware and remove USB drive when the transfer is complete.

EXPORTING DATA TO A FLASH DRIVE

Data can be copied from the control board memory to a flash drive and used to transfer setup and/or cycle data to a replacement control board or to transfer setup information to multiple ice machines. Data may also be requested by service department personnel for analysis or as an aid to troubleshooting. The data files are small and can be attached to an email.

Important

The flash drive must be formatted before using. All files and software on the flash drive are removed during the formatting process.

1. Ensure that the ice machine's power is on.
2. Press the Menu button.
3. Navigate to USB - Menu / Service / USB.
4. Insert the flash drive into the USB port on the ice machine control board. Do not remove flash drive until transfer is complete.
5. Select Export Data (do not remove flash drive until update is complete) and remove USB drive when the transfer is complete.

Operational Checks

GENERAL

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

To ensure proper operation, always follow the Operational Checks:

- when starting the ice machine for the first time
- after a prolonged out of service period
- after cleaning and sanitizing

NOTE: Routine adjustments and maintenance procedures are not covered by the warranty.

Important

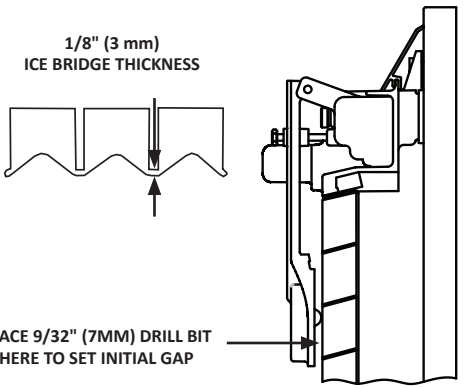
Refrigeration compressors must be operated for a minimum break in period of 24 hours before full ice production will be reached.

ICE THICKNESS CHECK

The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8 in. (3 mm).

NOTE: Make sure the water curtain/splash shields are in place when performing this check. It prevents water from splashing out of the water trough. Remove the curtain to make an adjustment, then replace immediately after the adjustment is made.

1. Inspect the bridge connecting the cubes. It should be 1/8 in. (3 mm) thick.
2. If adjustment is necessary, turn the ice thickness probe adjustment screw clockwise to increase bridge thickness or counterclockwise to decrease bridge thickness. Set a 9/32” gap between the ice thickness probe and evaporator as a starting point. Then adjust to achieve 1/8” ice thickness.
3. Make sure the ice thickness probe wire and the bracket do not restrict movement of the probe.



Ice Thickness Check

NOTE: Turning the adjustment 1/3 of a turn will change the ice thickness about 1/16” (1.5 mm). Make adjustment only when the ice machine is off to prevent initiating a harvest.

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 the ice thickness probe can initiate a harvest cycle.
- The maximum freeze time is 35 minutes at which time the control board automatically initiates a harvest sequence.
- The maximum harvest time is 7 minutes, the control board will preform a remove ice cycle and then return the ice machine to the freeze cycle.
- Maximum water fill time in the freeze cycle is 6 minutes.

Sequence of Operation

SELF CONTAINED MODELS

NOTE: The power button must be depressed and the water curtain/ice dampers must be in place on the evaporator before the ice machine will start.

Initial Start-Up or Start-Up After Automatic Shut-Off

1. Water Purge

Before the compressor starts, the water pump and water dump solenoid energize to purge the ice machine of old water. This feature ensures that the ice making cycle starts with fresh water.

2. Refrigeration System Equalization and Start-Up

The harvest valve and air pump energizes to equalize high and low side refrigeration pressure.

After 5 seconds the contactor energizes the compressor and supplies power to the condenser fan motor. After 5 seconds the harvest valve and air pump de-energize.

NOTE: The fan motor is wired through a fan cycle pressure control. When the discharge pressure exceeds the cut in pressure the fan cycle switch closes and energizes the fan motor.

Freeze Sequence

3. Prechill

The compressor is on for 30 seconds (120 seconds initial cycle) to lower the temperature of the evaporator before the water pump is energized. The water fill valve will energize and remain on until water touches the low and high, water level probes.

4. Freeze

Water Pump

The water pump energizes and water flows over the evaporator. The water pump is energized throughout the freeze cycle.

Water Inlet Valve

The water inlet valve energized in prechill (30 seconds)and will energize one more time in the freeze cycle. The control board will prevent the water fill valve from energizing after a 6 minute water fill time limit.

After water contacts the low and high water probes the water fill valve de-energizes. Ice builds on the evaporator and the water level drops. When water loses contact with the high water probe, the water fill valve energizes until water contacts the high water probe again.

Ice Thickness Probe

The freeze cycle continues until the six minute freeze lock expires and enough ice has formed to send a signal from the ice thickness probe to the control board.

During the first 6 minutes of the freeze cycle the ice thickness probe microphone samples ambient noise. 6 minutes into the freeze cycle baseline readings are recorded. Ice formation on the evaporator will change the readings; when the baseline readings are exceeded a harvest cycle starts.

Harvest Sequence

5. Water Purge

The air pump and harvest valve open at the beginning of the water purge to divert discharge refrigerant gas into the evaporator.

The water pump continues to run, and the water dump valve energizes to purge any remain water in the water trough down the drain.

6. Harvest

The air pump remains energized and the harvest valve remains open. The refrigerant gas warms the evaporator causing the cubes to slide, as a sheet, off the evaporator and into the storage bin. If the damper/curtain does not open within 3.5 minutes in the harvest cycle the following occurs:

- 3.5 minutes - The water inlet valve energizes until water touches the high water level probe.
- 4 minutes - The water pump energizes.
- 6.5 to 7 minutes - The water dump valve energizes.

When the sliding sheet of cubes opens and closes within 30 seconds the bin switch terminates the harvest sequence and returns the ice machine to the freeze sequence (Step 3 - 4.)

NOTE: If bin switch does not open before 7 minutes the ice machine will start a Remove Ice Cycle - Refer to “Remove ice Cycle” on page 67. for details.

7. Automatic Shut-Off

When the storage bin is full at the end of a harvest sequence, the sheet of cubes fails to clear the water curtain/ice damper and will hold it open. After the water curtain/ice damper is held open for 30 seconds, the ice machine shuts off. The ice machine remains off for 3 minutes before it can automatically restart.

The ice machine remains off until enough ice has been removed from the storage bin to allow the ice to fall clear of the water curtain or all of the ice dampers. As the water curtain/ice dampers swing back to the closed position, the bin switch re-closes and the ice machine restarts (steps 1 - 2), provided the 3 minute delay period is complete.

Troubleshooting

LONG FREEZE CYCLE

If the freeze time reaches 35 minutes, the control board automatically initiates a harvest cycle. If 6 consecutive 35-minute freeze cycles occur, the ice machine stops.

LONG HARVEST CYCLE

If the harvest time reaches 7 minutes, the control board will start a remove ice cycle and automatically return the ice machine to the freeze cycle. After 3 consecutive long harvest cycles the ice machine stops.

SAFE OPERATION MODE

Allows the ice machine to operate up to 72 hours if the ice thickness probe (E19 fault) and/or water level probe sensors fail (E20 fault).

- When the control board starts the safe mode an alert is indicated to notify the end-user they have a production problem.
- The control board automatically initiates and monitors the safe mode. The control will automatically exit the safe mode if a normal signal is received from the input.
- After 72 hours the control board will enter a standby mode and turn off.

The control board needs a five cycle history to operate safe mode. If five cycles have never been successfully completed the ice machine will shut-off.

REMOVE ICE CYCLE

When the damper/curtain does not open during the 7 minute harvest cycle the following remove ice cycle occurs:

- 7 minutes - The compressor, harvest solenoid valve and dump valve de-energize.
  The water pump remains energized and the water inlet valve energizes until water touches the high water level probe.
- Water is circulated, dumped and refilled to the high water level probe 18 times (approximately 1 hour).
  At the end of the thaw cycle (approximately 1 - 1.75 hour) the ice machine will start another freeze cycle.

Curtain Operation In Water Assist Harvest

- Open & close damper = Continue Thaw Cycle
- Open damper 30 seconds = Full Bin Shutoff

NOTE: Use the keypad and turn the ice machine off and then on to terminate the cycle. Disconnecting and reconnecting power to end the cycle will result in the ice machine restarting in a harvest cycle.

ANALYZING WHY A SERVICE FAULT (E01 & E02) STOPPED THE ICE MACHINE

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

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

Refrigeration and electrical component failures will cause a Service Fault trip. Eliminate all electrical components and external causes first. If it appears that the refrigeration system is causing the problem, use Manitowoc's Freeze Cycle Refrigeration System Operational Analysis Table, along with detailed charts, checklists, and other references to determine the cause.

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.

E01 LONG FREEZE

Freeze time exceeds 35 minutes for 6 consecutive freeze cycles.

Possible cause checklist

Improper Installation

- Refer to "Installation/Visual Inspection Checklist" on page 83

Water System

- Dirty/defective water level probe
- 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 fill valve
- Dirty/defective water dump valve
- Defective water pump
- Loss of water from sump area

Electrical System

- Low incoming voltage
- Ice thickness probe out of adjustment
- Harvest cycle not initiated electrically
- Contactor not energizing
- Compressor electrically non-operational
- Defective fan cycling control
- Defective fan motor

Miscellaneous

- Non-Manitowoc components
- Improper refrigerant charge
- Defective harvest valve
- Defective compressor
- TXV starving or flooding (check bulb mounting)
- Non-condensible in refrigeration system
- Plugged or restricted high side refrigerant lines or component
- Restricted air flow/dirty condenser fins
- High inlet air temperature
- Condenser discharge air recirculation

E02 LONG HARVEST

Harvest time exceeds 7 minutes for 3 consecutive harvest cycles.

Possible Cause Checklist

Improper Installation

- Refer to ”Installation/Visual Inspection Checklist” on page 83

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
- Clogged water distribution tube

Electrical System

- Ice thickness probe out of adjustment
- Bin switch closed/defective
- Premature harvest - The control board initiates a harvest cycle when the high water level probe circuit is complete and the low water level probe is open.

Refrigeration System

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

Troubleshooting By Symptom

The troubleshooting procedures follow diagnostic charts. There are four symptoms, the symptom that you are experiencing will determine which diagnostic chart to use. The chart asks yes and no questions to determine the problem. The diagnostic chart will direct you to a procedure to correct the problem.

SYMPTOM #1

Ice Machine Stops Running

Ice machine is in Ice Making cycle

or

Has a History of Shutting Down

- Refer to Ice Machine Stops Running diagnostic chart

SYMPTOM #2

Ice Machine has a Long Freeze Cycle.

Ice Formation is Thick

or

Thin Ice Fill on Inlet or Outlet of Evaporator

or

Low Production

Service Fault (possible)

- Refer to Freeze Cycle Refrigeration System Operational Analysis Table

SYMPTOM #3

Ice Machine Will Not Harvest - Freeze Cycle is Normal and Ice Cubes are Not Melted After Harvest

Long Harvest (possible)

- Refer to Refrigeration Harvest Flow Chart

SYMPTOM #4

Ice Machine Will Not Harvest - Freeze Cycle is Normal and Ice Cubes are Melted After Harvest

- Refer to Ice Melt out Flow Chart

RESET TO FACTORY DEFAULTS

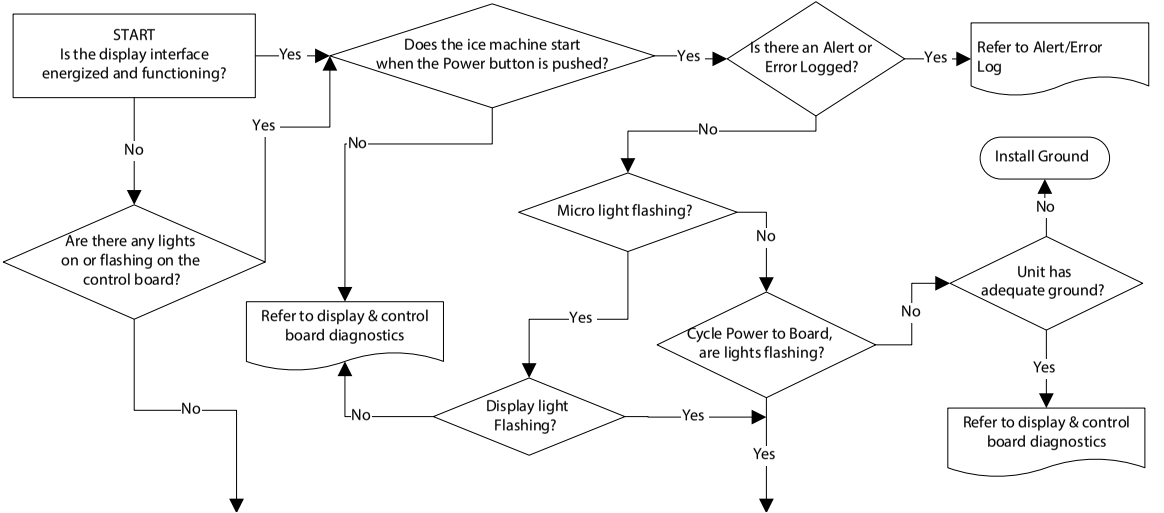
Before starting troubleshooting procedures, reset the control board to factory defaults to prevent mis-diagnosis. Before resetting to factory defaults do one of the following:

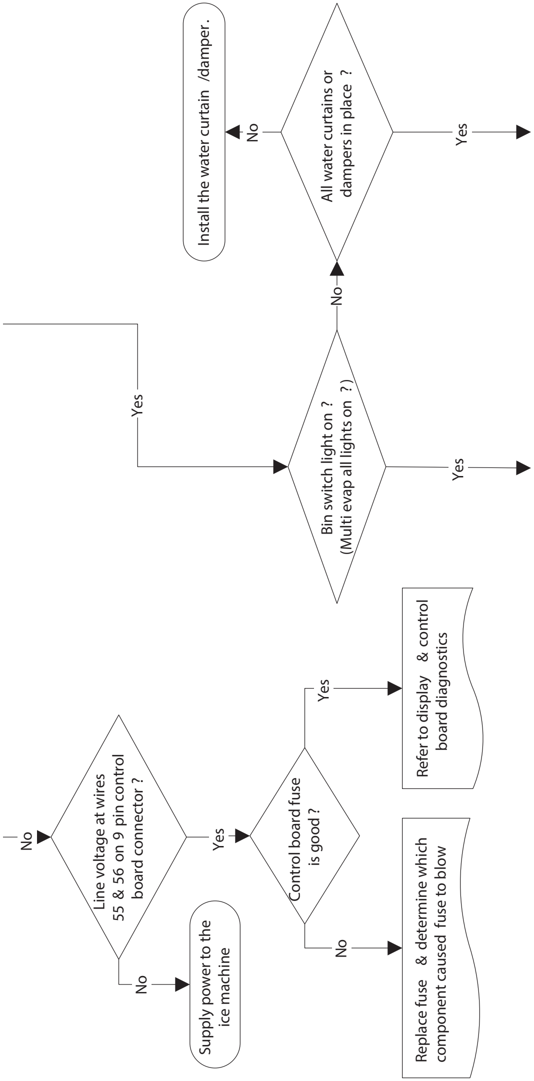
A. Copy settings to a usb device and flash settings into the control board when diagnostics are complete.

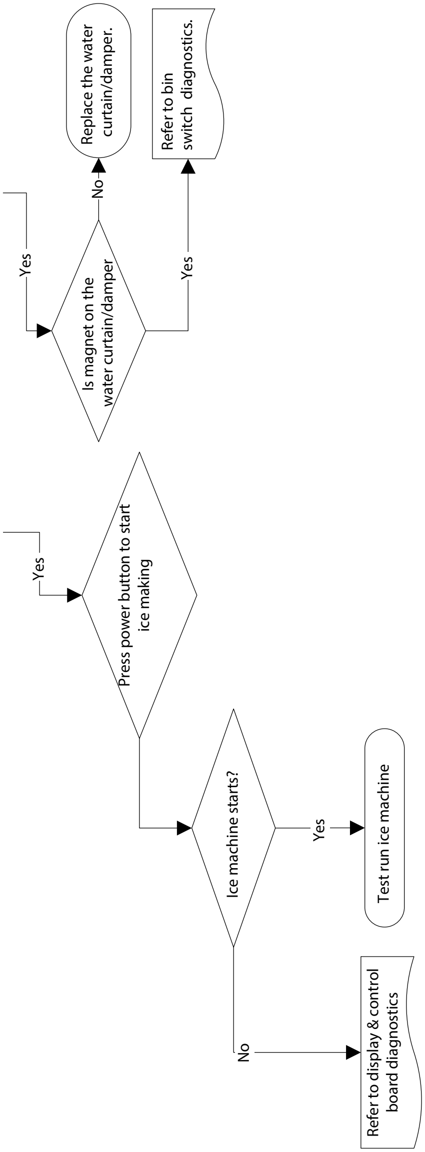
B. Write down any customer settings so they can be re-entered when diagnostics are complete.

To reset the ice machine to factory defaults select Menu then Reset Defaults.

SYMPTOM #1 ICE MACHINE WILL NOT RUN




Install the water curtain /damper.
No
All water curtains or dampers in place ?
Yes
No
Yes
Bin switch light on ? (Multi evap all lights on ?)
Yes
Yes
Refer to display & control board diagnostics
No
Line voltage at wires 55 & 56 on 9 pin control board connector ?
Yes
Control board fuse is good ?
No
Replace fuse & determine which component caused fuse to blow
No
Supply power to the ice machine


Yes
Is magnet on the water curtain/damper
No
Replace the water curtain/damper.
Yes
Refer to bin switch diagnostics.
Yes
Press power button to start ice making
Ice machine starts?
Yes
Test run ice machine
No
Refer to display & control board diagnostics

SYMPTOM #2 - LOW PRODUCTION, LONG FREEZE CYCLE

Ice Machine has a Long Freeze Cycle.
Ice Formation is Thick
or
Thin on Inlet or Outlet of Evaporator
or
Low Production

How to Use the Freeze Cycle Refrigeration System Operational Analysis Table

GENERAL

These tables must be used with charts, checklists and other references to eliminate refrigeration components not listed on the tables and external items and problems which can cause good refrigeration components to appear defective.

The tables list five 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.

NOTE: Before starting, see "Before Beginning Service" for a few questions to ask when talking to the ice machine owner.

PROCEDURE

Step 1 Complete the "Operation Analysis" column.

Read down the left "Operational Analysis" column. Perform all procedures and check all information listed. Each item in this column has supporting reference material to help analyze each step.

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 Enter Checkmarks (√).

Each time the actual findings of an item in the "Operational Analysis" column matches the published findings on the table, enter a Checkmark.

Example: Freeze cycle suction temperature is determined to be low. Enter a Checkmark in the "low" column.

Step 3 Add the Checkmarks 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, supporting material was not analyzed correctly or the problem component is not covered by the analysis table.

Before Beginning Service

Ice machines may experience operational problems only during certain times of the day or night. A machine may function properly while it is being serviced, but malfunctions later. Information provided by the user can help the technician start in the right direction, and may be a determining factor in the final diagnosis.

Ask these questions before beginning service:

- When does the ice machine malfunction? (night, day, all the time, only during the Freeze cycle, etc.)
- When do you notice low ice production? (one day a week, every day, on weekends, etc.)
- Can you describe exactly what the ice machine seems to be doing?
- Has anyone been working on the ice machine?
- During "store shutdown," is the circuit breaker, water supply or air temperature altered?
- Is there any reason why incoming water pressure might rise or drop substantially?

SYMPTOM #2 - FREEZE CYCLE REFRIGERATION SYSTEM OPERATIONAL ANALYSIS TABLES

R290 REFRIGERANT SINGLE EVAPORATOR, SINGLE EXPANSION VALVE
SELF CONTAINED AIR CONDENSER

Operational Analysis	1	2	3	4
Ice Production Reference "Ice Production Check" on page 81	Air-Temperature Entering Condenser_____ Water Temperature Entering Ice Machine _____ Published 24 hour ice production_____ Calculated (actual) ice production _____ NOTE: The ice machine is operating properly if the ice fill patterns is normal and ice production is within 10% of charted capacity.			
Installation and Water System Reference "Water System Checklist" on page 84	All installation and water related problems must be corrected before proceeding with chart.			
Ice Formation Pattern Reference "Ice Formation Pattern" on page 84	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on the entire evaporator	Ice formation is extremely thin on outlet of evaporator -or- No ice formation on entire evaporator	Ice formation normal -or- Ice formation is extremely thin on inlet of evaporator -or- No ice formation on entire evaporator	Ice formation normal -or- No ice formation on entire evaporator

Operational Analysis	1	2	3	4
Suction Line Temperature 3 minutes into the freeze cycle	Normal or High	Normal or High	Low	Normal or High
Freeze Cycle Suction Temperature _____ _____ _____ **1 minute Middle End**	If suction temperature is High or Low refer to freeze cycle high or low temperature or suction temperature problem checklist page 91 to eliminate problems and/or components not listed on this table before proceeding.			
	Suction temperature is **High**	Suction temperature is **Low or Normal**	Suction temperature is **High**	Suction temperature is **High**
Wait 5 minutes into the freeze cycle. Compare temperatures of evaporator inlet and evaporator outlet. Inlet _____°C (F) Outlet _____ °C (F) Difference_____ °C (F)	Inlet and outlet within 4°C of each other	Inlet and outlet not within 4°C of each other -and- Inlet is colder than outlet	Inlet and outlet within 4°C of each other -or- Inlet and outlet not within 4°C of each other -and- Inlet is warmer than outlet	Inlet and outlet within 4°C of each other

Operational Analysis	1	2	3	4
Wait 5 minutes into the freeze cycle. Compare temperatures of compressor discharge line and harvest valve inlet.	The harvest valve inlet is Hot -and Approaches the temperature of a Hot compressor discharge line.	The harvest valve inlet is Cool enough to hold hand on -and The compressor discharge line is Hot.	The harvest valve inlet is Cool enough to hold hand on -and The compressor discharge line is Cool enough to hold hand on.	The harvest valve inlet is Cool enough to hold hand on -and the compressor discharge line is Hot.
Discharge Line Temperature Record freeze cycle discharge line temperature at the end of the freeze cycle _____°C	Discharge line temperature 71°C or higher at the end of the freeze cycle	Discharge line temperature 71°C or higher at the end of the freeze cycle	Discharge line temperature 71°C or Lower at the end of the freeze cycle	Discharge line temperature 71°C or higher at the end of the 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**
The following are the procedures for completing each step of the Freeze Cycle Refrigeration System Operational Analysis Tables. Each procedure must be performed exactly for the table to work correctly.				

Ice Production Check

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

1. Determine the ice machine operating conditions:
   Air temp entering condenser:____°
   Water temp entering sump trough:____°
2. Refer to the appropriate 24-Hour Ice Production Chart (starting on page 147). 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. However, if the ice pattern is normal and the 1/8 in. thickness is maintained, the ice slab weights listed with the 24-Hour Ice Production Charts may be used.

4. Compare the results of step 3 with step 2. Ice production checks that are within 10% of the chart are considered normal. If they match closely, determine if:
    - Another ice machine is required.
    - More storage capacity 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.

Installation/Visual Inspection Checklist

Inadequate Clearances

- Check all clearances on sides, back and top. Reference ”Clearance Requirements” on page 24

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
- Floor drain must have an air gap
- Install condensation drain in the ice machine base

Water System Checklist

A water-related problem often causes the same symptoms as a refrigeration system component malfunction. Water system problems must be identified and eliminated prior to replacing refrigeration components.

Water area (evaporator) is dirty

- Clean as needed

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

- Install water regulator or increase water pressure

Incoming water temperature is not between 35°F (2°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

Water dump valve leaking during the Freeze cycle

- Clean/replace dump valve as needed

Vent tube is not installed on water outlet drain

- See Installation Instructions

Hoses, fittings, etc., are leaking water

- Repair/replace as needed

Water fill valve is stuck open or closed

- Clean/replace as needed

Water is leaking out of the sump trough area

- Stop the water loss

Uneven water flow across the evaporator

- Clean the ice machine

Plastic extrusions and gaskets are not secured to the evaporator

- Remount/replace as needed

Ice Formation Pattern

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

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

Any number of problems can cause improper ice formation.

> Keep the water curtain/ice dampers in place while checking the ice formation pattern to ensure no water is lost.

1. 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 on 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 on the inlet. This is normal.

It is normal for ice thickness to vary up to 1/16" across the surface of the evaporator. The ice bridge thickness at the ice thickness control probe should be at least 1/8".

The ice thickness probe must be set to maintain the ice bridge thickness at approximately 1/8 in. If ice forms uniformly across the evaporator surface, but does not reach 1/8 in. in the proper amount of time, this is still considered a normal ice fill pattern.

2. Extremely Thin at Evaporator Outlet

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

Examples: No ice at all on the outlet half of the evaporator, but ice forms on the inlet half of the evaporator. Or, the ice at the outlet of the evaporator reaches 1/8 in. to initiate a harvest, but the inlet of the evaporator already has 1/2 in. to 1 in. of ice formation.

3. 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 1/8 in. to initiate a harvest, but there is no ice formation at all on the inlet of the evaporator.

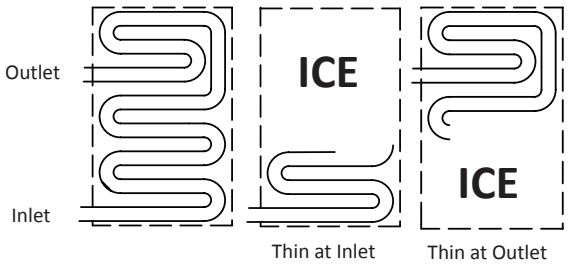
4. No Ice Formation

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

Evaporator Tubing Routing

Routing of the tubing on the back of the evaporator determines the ice fill pattern failure mode.

The evaporator outlet tubing does not exit directly at the top of the evaporator, but exits several inches below the top of the evaporator. Extremely Thin at the Evaporator Outlet will first be visible several inches below the top of the evaporator. Extremely Thin at Evaporator Inlet will first be visible at the bottom of the evaporator.



Analyzing Discharge temperature in the Freeze Cycle

1. Determine the ice machine operating conditions:
   Air temp. entering condenser _____
   Water temp. entering sump trough _____
2. Refer to Operating temperature table (starting on page 147) for ice machine being checked.

   Use the operating conditions determined in step 1 to find the published normal discharge temperature or temperatures.
   Freeze Cycle _____
   Harvest Cycle _____
3. Perform an actual discharge temperature check.

	Freeze Cycle psig (kPa)
3 Minutes into the Freeze Cycle	_____
Middle of Freeze Cycle	_____
End of Freeze Cycle	_____

4. Compare the actual discharge temperature (step 3) with the published discharge temperature (step 2).

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

Freeze Cycle Discharge Temperature High Checklist

Improper Installation

- Refer to "Installation/Visual Inspection Checklist" on page 83

Air Condenser

- Dirty condenser filter
- Dirty condenser fins
- High inlet air temperature
- Condenser discharge air recirculation
- Defective fan cycling control
- Defective fan motor

Other

- Overcharged
- Non-condensible (air) in system
- Wrong type of refrigerant
- Non-Manitowoc components in system
- High side refrigerant lines/component restricted

Freeze Cycle Discharge Temperature Low Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 83

Air Cooled Condensers

- Defective fan cycle control, stuck closed
  “Fan Cycle Control” on page 129

Other

- Undercharged
- Wrong type of refrigerant
- Non-Manitowoc components in system
- Liquid line/component restricted

Analyzing Suction Temperature

The suction temperature gradually drops throughout the freeze cycle. The actual suction temperature (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 temperature drop throughout the freeze cycle, compare the published suction temperature to the published freeze cycle time.

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

1. Determine the ice machine operating conditions:
   Air temp. entering condenser _____
   Water temp. entering sump trough _____

Refer to Operating temperature table (starting on page 147) for ice machine being checked.

Use the operating conditions determined in step 1 to find the published normal discharge temperature.
Freeze Cycle _____
Harvest Cycle _____

2. Perform an actual suction temperature check.

	Freeze Cycle Temperature
3 Minutes into the Freeze Cycle	_____
Middle of Freeze Cycle	_____
End of Freeze Cycle	_____

3. Compare the actual suction temperature (step 3) with the published suction temperature (step 2).

   NOTE: The suction temperature is normal when the actual temperature falls within the published temperature range for the ice machine's operating conditions. It is normal for the suction temperature to be higher at the beginning of the Freeze cycle (when load is greatest), then drop throughout the Freeze cycle.

Suction Temperature High Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 83

Discharge Temperature

- Discharge temperature is too high and is affecting suction temperature – refer to “Freeze Cycle Discharge Temperature High Checklist” on page 88

Improper Refrigerant Charge

- Overcharged (also see “Freeze Cycle Discharge Temperature High Checklist” on page 88)
- Wrong type of refrigerant
- Non condensible in system

Components

- Harvest valve leaking
- TXV flooding
- Defective compressor

Other

- Non-Manitowoc components in system

Suction Temperature Low Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 83

Discharge Temperature

- Discharge temperature is too low and is affecting low side – refer to “Freeze Cycle Discharge Temperature Low Checklist” on page 89

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- Non-Manitowoc components in system
- Improper water supply over evaporator – refer to “Water System Checklist” on page 84
- Restricted/plugged liquid line drier
- Restricted/plugged tubing in suction side or liquid line of refrigeration system
- TXV starving

Comparing Evaporator Inlet and Outlet Temperatures

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 Manitowoc's Freeze Cycle 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 should be within 7° of each other.

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

1. Navigate to Service / Diagnostics / Temperature Sensors.
2. Wait five minutes into the freeze cycle.
3. Record the evaporator inlet (T3) and outlet (T4) temperatures at 5 minutes into the freeze cycle. Determine the difference.
4. Record the information on the table.

Harvest Valve Analysis

Symptoms of a harvest valve remaining partially open during the freeze cycle can be similar to symptoms of either an expansion valve or compressor problem. The best way to diagnose a harvest valve is by using Manitowoc's Ice Machine Freeze Cycle Refrigeration System Operational Analysis Table.

Use the following procedures to 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.
4. Compare the temperature of the inlet of the harvest valves to the temperature of 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.

Findings	Comments
The inlet of the harvest valve is cool enough to touch and the compressor discharge line is hot. **Cool & Hot**	**Normal Operation** 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**	**Leaking Harvest Valve** The harvest valve inlet did not cool down during the freeze cycle due to continual leakage of compressor discharge gas through the valve.
Both the inlet of the harvest valve and the compressor discharge line are cool enough to touch. **Cool & Cool**	**Harvest Valve Not Leaking** The compressor discharge line should not be cool to the touch 5 minutes into the freeze cycle. This symptom would not be caused by a harvest valve leaking.

5. Record your findings on the table.

Discharge Line Temperature Analysis

GENERAL

Knowing if the discharge line temperature is increasing, decreasing or remaining constant can be an important diagnostic tool. Compressor discharge line temperature on a normally operating ice machine steadily increases throughout the freeze cycle.

Ambient air temperatures affect the discharge line temperature.

Higher ambient air temperatures at the condenser and/ or higher inlet water temperature = higher discharge line temperatures at the compressor.

Lower ambient air temperatures at the condenser and/ or lower supply water temperature= lower discharge line temperatures at the compressor.

Regardless of ambient and water temperatures, the freeze cycle discharge line temperature should be higher than 66°C (150°F) at the end of the freeze cycle.

PROCEDURE

1. Navigate to Service / Diagnostics / Temperature Sensors / T2 Thermistor.
2. Observe the discharge line temperature (T2) for the last three minutes of the freeze cycle and record on the table.

Discharge Line Temperature Above 71°C (150°) At The End Of Freeze Cycle:

Ice machines that are operating normally will have consistent minimum discharge line temperature of 71°C.

Final Analysis

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

COLUMN 1 - HARVEST VALVE LEAKING

Replace the valve as required.

COLUMN 2 - LOW CHARGE/TXV STARVING

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

1. Add refrigerant charge to verify a low charge (air and water self-contained only). Do not add more than 30% of nameplate refrigerant charge. If the problem is corrected, the ice machine is low on charge.
2. Find the refrigerant leak. The ice machine must operate with the nameplate charge. Change the liquid line drier. Then, evacuate and weigh in the proper charge.
3. If the problem is not corrected by adding charge, the expansion valve is faulty.

COLUMN 3 - TXV FLOODING OR REFRIGERANT OVERCHARGE

A loose or improperly mounted expansion valve bulb causes the expansion valve to flood. Check bulb mounting, insulation, etc, before changing the valve. Verify refrigerant amount is correct by weighing recovered refrigerant before replacing a TXV.

COLUMN 4 - COMPRESSOR

Replace the compressor. To receive warranty credit, the compressor ports must be properly sealed by crimping and soldering them closed.

SYMPTOM #3 & #4 HARVEST PROBLEMS

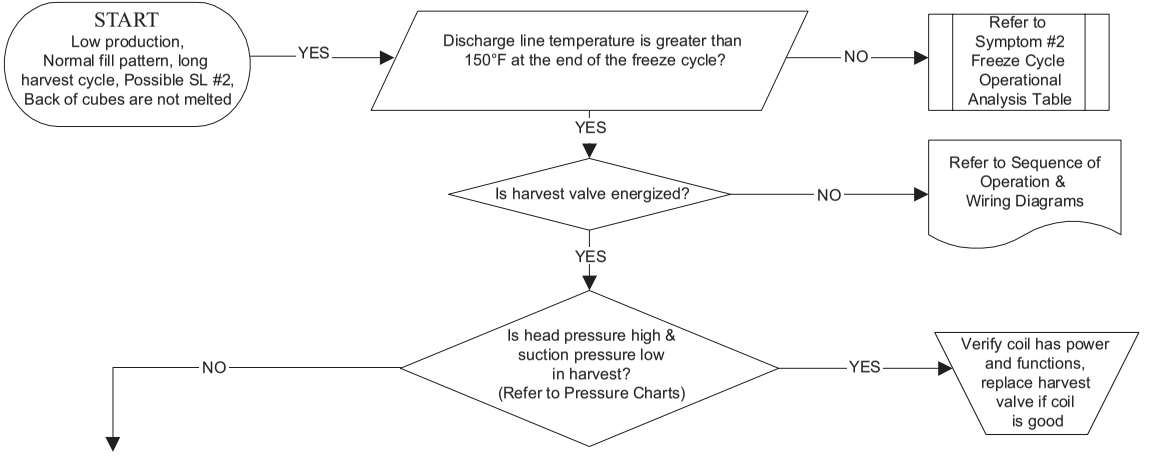
Definition of a harvest problem; At the end of a 3.5 minute harvest cycle the slab of ice is still contacting the evaporator. The slab of ice may or may not be removable by hand.

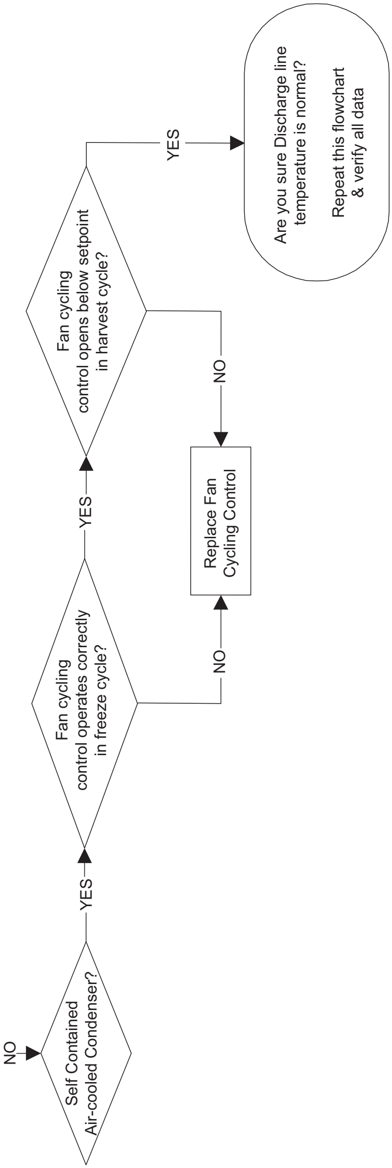
Harvest problems can be split into two symptoms.

- Symptom 3 - Normal sheet of cubes at the end of the harvest cycle. Ice is difficult to remove from the evaporator by hand. Once removed the back of the cubes are square and show no signs of melting. This indicates a refrigeration problem. The source of the problem could be in the freeze or harvest cycle. Use the appropriate flow chart (in Troubleshooting) to determine the cause of the problem.
- Symptom 4 - Melted sheet of cubes at the end of the harvest cycle. Ice can be removed rather easily by hand. The back of the cubes are misshapen and melted. This indicates something is preventing the ice slab from releasing. Follow the appropriate flow chart (in Troubleshooting) to determine the cause of the problem. A manual cleaning procedure must always be performed when this problem is encountered.

SYMPTOM #3 WILL NOT HARVEST ICE FILL NORMAL, CUBES NOT MELTED

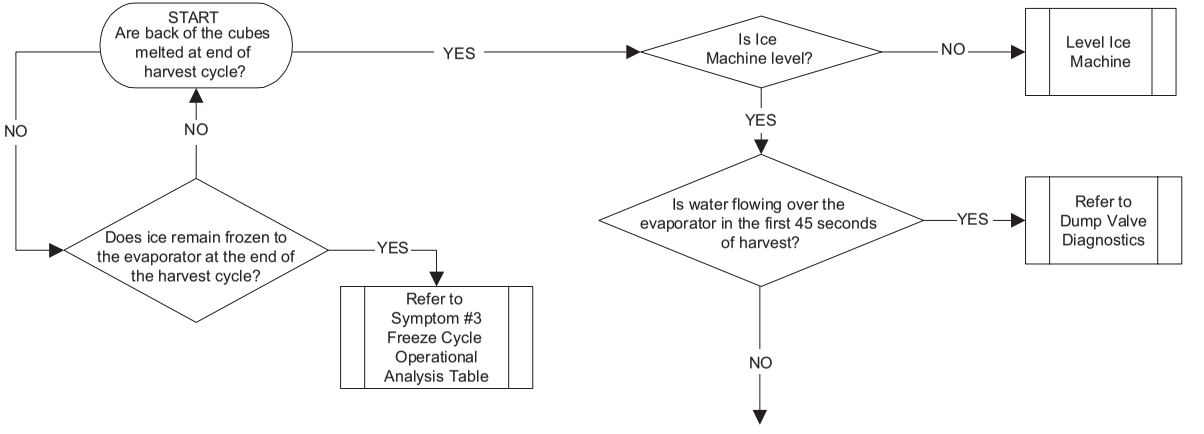
Ice Machine Will Not Harvest - Normal Ice Fill and Ice Cubes are Not Melted After Harvest

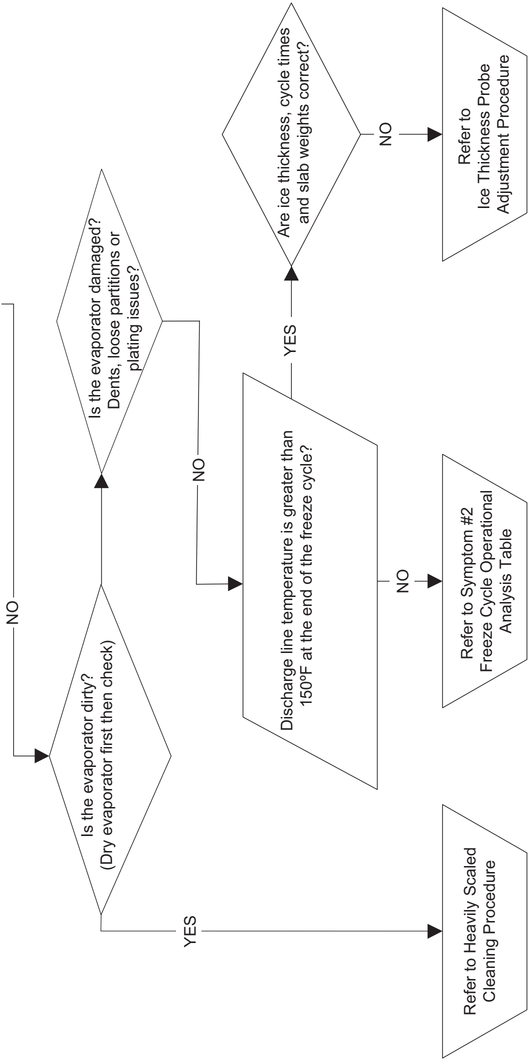



NO
Self Contained Air-cooled Condenser?
YES
Fan cycling control operates correctly in freeze cycle?
NO
Replace Fan Cycling Control
YES
Fan cycling control opens below setpoint in harvest cycle?
NO
YES
Are you sure Discharge line temperature is normal?
Repeat this flowchart & verify all data

SYMPTOM # 4 WILL NOT HARVEST, ICE FILL NORMAL, CUBES MELTED

Ice Machine Will Not Harvest - Freeze Cycle is Normal and Ice Cubes are Melted After Harvest




Is the evaporator dirty?
(Dry evaporator first then check)
YES
Refer to Heavily Scaled Cleaning Procedure
NO
Is the evaporator damaged? Dents, loose partitions or plating issues?
NO
Discharge line temperature is greater than 150°F at the end of the freeze cycle?
NO
Refer to Symptom #2 Freeze Cycle Operational Analysis Table
YES
Are ice thickness, cycle times and slab weights correct?
NO
Refer to Ice Thickness Probe Adjustment Procedure

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Electrical Components

CONTROL BOARD, DISPLAY AND TOUCHSCREEN

FUNCTION

The control board, display and touch screen provide user input and control the ice machine sequence of operation.

NOTE: Anytime power is supplied to wires #55 & #56 on the control board, the “Display” and “Micro” lights will flash on and off. The two green lights are located on the top corner of the control board.

Display Diagnostics

Symptom - Micro light flashes and display light is off.

1. Reboot ice machine by disconnecting power for a minimum of 15 seconds, reapplying power and checking micro light for normal flashing.
2. Disconnect the display module communication cable from the control board and inspect for damaged or corroded pins. Reconnect after inspection
3. Press the power button on the display and watch the green Display light on the control board.
   A. Display light flashes- Test run ice machine.
   B. Display light is off - Replace display/touch pad assembly.

Control Board Diagnostics

1. Micro light is not flashing.
2. Disconnect line voltage power supply to the ice machine and wait a minimum of 15 seconds, then reapply power.
    A. Micro light flashes - continue with step 3.
    B. Micro light is off - Test fuse for continuity. If fuse tests good replace control board.
3. Perform a control board self-test.

- Menu / Service / Diagnostics / Control Board / Self Check

The control board performs a self test. As the test progresses the display will show pass or fail as the tests are completed.

- Status passed -The control board is functioning normally, continue with touch pad diagnostics on next page.
- Status failed - Replace control board.

Touchscreen Diagnostics

Verify touchscreen is unlocked prior to performing diagnostics.

1. Navigate to User Interface on the display and perform the on-screen instructions.

- Menu / Service / Diagnostics / User Interface.

NOTE: During screen calibration it is important to touch and hold down the cross hairs for three seconds at a time.

2. The calibration will either pass or fail. If the touchscreen fails calibration and will not function correctly in other menu functions replace the touchscreen module.

NOTE: Verify you have followed all of the instructions for screen calibration. Skipping steps will result in a failed calibration message.

Important

The ice machine can be run without a touchscreen by pressing the test button on the control board.

CONTROL BOARD RELAY TEST

The control board can be set to energize all relays for 3.5 minutes. This allows testing to verify control board relays are closed and line voltage is available for ice machine components - Water pump, dump valve, water inlet valve, harvest valve(s), air compressor(s), contactor/compressor/ fan motor - The fan cycle control must close to energize the fan motor.

1. Press power button to turn off ice machine and navigate in menu to enable all relays.

- Menu / Service / Diagnostics / Control Board / Enable All Relays

2. The control board will energize all relays and the red light next to the relay. The red light indicates the relay coil is energized.
3. Test for line voltage at the individual components.
    A. Line voltage is present and the component is non functional - Replace component
    B. Voltage is not present at the component - Proceed to step 5
4. Refer to wiring diagram and determine wire location on the 9 pin molex connector for the component you are testing.
5. Check for line voltage at the control board 9 pin molex connector.
    A. Line voltage at 9 pin connector - Repair wiring to component
    B. No power at 9 pin connector - Replace control board

PROGRAMMING A REPLACEMENT CONTROL BOARD

Indigo™ replacement control boards require the Model number to be entered to activate the appropriate look up tables for operation and diagnostic. This can be done two different ways, USB Setup or Manual Setup.

USB Setup - Applicable when the control board is operational and has a mechanical issue such as a sticking relay. The asset data is transferred to the replacement control board from the faulty control board. Refer to page 57 “Exporting Data To A Flash Drive” before installing the replacement board.

Manual Setup - Applicable when the control board is non-operational or data from the faulty board is suspect.

1. Install replacement control board and reapply power.
2. Navigate to control board replacement and follow the on screen prompts:

   Menu / Service / Control Board Replacement.

NOTE: If a replacement control board is installed into the ice machine without a display and model number. The “Test/Display Bypass Button” push button can still activate the ice making mode without the display. This will allow the ice machine to temporary run until a new display can be installed. Once a new display is installed the correct model number will have to be entered into the ice machine.

MAIN FUSE

FUNCTION

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

SPECIFICATIONS

The main fuse is 250 Volt, 6.3 amp.

> **⚠ Warning**
>
> High (line) voltage is applied to the control board (terminals #55 and #56) at all times. Removing the control board fuse or pressing the On/Off button will not remove the power supplied to the control board.

CHECK PROCEDURE

1. If the display is energized or the bin switch light is on with the water curtain/ice dampers closed, the fuse is good.

> **⚠ Warning**
>
> Disconnect electrical power to the entire ice machine before proceeding.

2. Remove the fuse. Check for continuity across the fuse with an ohmmeter.

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

BIN SWITCH

FUNCTION

Movement of the water curtain/ice dampers control bin switch operation. 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 30 seconds 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 water curtain/ice dampers and holds it open. After the water curtain/ice dampers are held open for 30 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 water curtain/ice dampers. As the water curtain/ice dampers swing back to the operating position, the bin switch closes and the ice machine restarts, provide the 3-minute delay has expired.

Important

The water curtain/ice dampers must be ON (bin switch closed) to start ice making.

SPECIFICATIONS

The bin switch is a magnetically operated reed switch. The magnet is attached to the lower right corner of the water curtain and both ends of ice dampers.

The bin switch is connected to a varying D.C. voltage circuit. (Voltage does not remain constant.)

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

Diagnostics

SYMPTOMS

Bin Switch Fails Open

- The ice machine will not start an ice making cycle and the display indicates “Full Bin”.
- The ice machine displays “Full Bin Remove Ice” in the clean cycle.

Bin Switch Fails Closed

- When running a “Long Harvest” alert is displayed.
- May be off on a E02 Long Harvest.
- The harvest cycle continues after ice opens and closes the ice damper (harvest cycle is 3.5 minutes).
- A curtain fault is displayed in the event log.

DIAGNOSTICS

1. Verify bin switch, curtain/damper and curtain/damper magnet are in place and navigate to Inputs.

- Menu / Service / Diagnostics / Inputs

2. Open and close the ice damper(s) repeatedly while observing the display and control board lights.
    A. Curtain switch cycles open/closed - The display indicates open/closed and the control board light energizes/de-energizes - Bin switch is operating normally
    B. Curtain switch remains closed, the display indicates closed and control board light remains on - Go to step 3
    C. Curtain switch remains open, display indicates open and control board light remains off - Go to step 3
3. Disconnect bin switch wire from control board.
4. Jumper control board bin switch wire to ground, press the power button and observe the display and control board lights.
    A. Curtain switch closes, display indicates closed, control board light energizes and the ice machine starts - Replace bin switch
    B. Curtain switch remains open, display indicates open and the control board light is off - Verify procedure was correctly followed - Replace control board.

WATER LEVEL CONTROL CIRCUITRY

FUNCTION

The water level probe controls the water level by sensing whether water is or is not contacting the water level probe. The water level probe has three sensing probes. Two probes are equal in length and are used to measures conductivity for diagnostics, ice clarity and water miser options. Factory default settings measure resistance from both long probes to the short probe.

SPECIFICATIONS

Freeze Cycle Water Level Setting

The water level is not adjustable. If the water level is incorrect, check the water level probe position. Reposition or clean the probe as necessary.

Water Inlet Valve Safety Shut-Off

In the event of a water level probe failure, this feature limits the maximum amount of time the water inlet valve can remain. Regardless of the water level probe input, the control board automatically shuts off the water inlet valve if it remains on for 6 continuous minutes.

Prechill & Freeze Cycle Operation

The water inlet valve energizes and de-energizes in conjunction with the water level probe located in the water trough.

- The water inlet valve is ON when there is no water in contact with the water level probes.
- The water inlet valve turns OFF after water contacts the water level probes for 6 continuous seconds.
- The water inlet valve can cycle ON and OFF once in the prechill and up to two times in the freeze cycle.
- Maximum fill time is 6 minutes.

The water inlet valve energizes in the Prechill cycle and will de-energize if water touches the high level probe (in most instances the water trough can't fill in the prechill cycle and the water inlet valve will remain energized into the freeze cycle). The water inlet valve will remain energized until water contacts the high water probe. The water inlet valve will cycle ON, and then OFF one more time to refill the water trough. The water inlet valve is now OFF for the duration of the freeze cycle.

REVERSE OSMOSIS OR DEIONIZED WATER USAGE

When using water with low total dissolved solid content (low TDS) the water level probe sensitivity can be increased by moving the jumper over one pin (refer to "Electronic Control Board" on page 154 for location.

The Electronic Control Board diagrams shows the default position of the jumper covering the left and center pins. Moving the jumper to the center and right pins and enabling R.O. menu "Use less water with reverse osmosis" will increase the sensitivity of the water level probe

Diagnostics

Check real time data

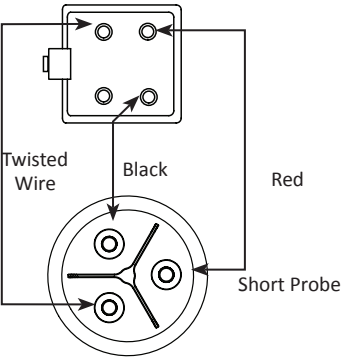
1. Navigate to Menu/Service/Diagnostics/Inputs
2. Focus on Water LVL Low and Water LVL High display

• Not sensing displayed: indicates not touching water.

• Sensing displayed: Indicates touching water.

NOTE: If using reverse osmosis or deionized water, increase sensitivity by moving the jumper over one pin (refer to “Electronic Control Board” on page 154) and enabling R.O. menu “Use less water with reverse osmosis”.

3. Disconnect the water level probe wiring harness from the control board and ohm harness and water level probe. Normal readings will show no resistance.



Ohm Water Level Probe and Wiring Harness

WATER LEVEL PROBE CIRCUIT CHECK AT CONTROL BOARD

Wait until prechill cycle starts, then jumper water level probe connections (Red/Black) on the control board.

A. Sensing displays and the water stops. Repair wire or replace water level probe.

B. Not Sensing displays and the water continues to flow. Replace control board.

ICE THICKNESS PROBE (INITIATES HARVEST)

FUNCTION

The ice thickness probe senses ice on the evaporator and signals the control board to start a harvest cycle.

SPECIFICATIONS

Freeze Time Lock-In Feature

The ice machine control system incorporates a 6 minute freeze time lock-in feature. This prevents the ice machine from short cycling in and out of harvest.

Maximum Freeze Time

The maximum freeze time is 35 minutes at which time the control board automatically initiates a harvest sequence.

Maximum Temperature

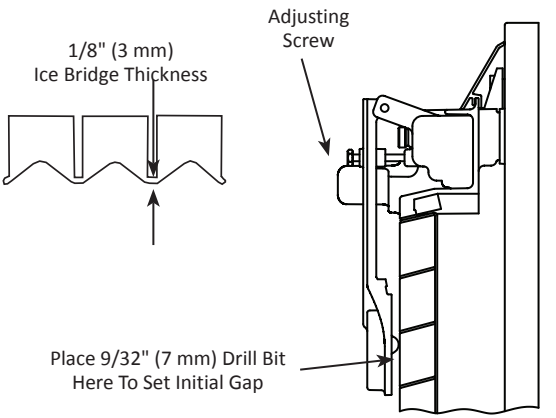
Maximum temperature for the ice thickness probe is 120°F (49°C). Do not clean probe in a dishwasher or expose to temperatures above the maximum.

Ice Thickness Check

The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8 in. (3 mm).

NOTE: Initial gap should be set with the ice machine off. Verify the water curtain/splash shields are in place when performing this check. It prevents water from splashing out of the water trough. Remove the curtain to make an adjustment, then replace immediately after the adjustment is made.

1. Inspect the bridge connecting the cubes. It should be about 1/8 in. (3 mm) thick.
2. If adjustment is necessary, turn the ice thickness probe adjustment screw clockwise to increase bridge thickness or counterclockwise to decrease bridge thickness. Set a 9/32" gap between the ice thickness probe and evaporator as a starting point. Then adjust to achieve 1/8" ice thickness.
3. Make sure the ice thickness probe wire and the bracket do not restrict movement of the probe.



ICE THICKNESS ADJUSTMENT

Ice Thickness Probe Diagnostics

1. Perform Control Board Self Check and insure the internal ITP circuit passes before proceeding.

(Menu/Service/Diagnostics/Control Board/Self Check)

- Ice Thickness Circuit: Pass = Continue with step #2.
- Ice Thickness Circuit: Fail = Change control board.

2. Remove all ice from the evaporator when present.
3. Press the power button and turn off the ice machine.
4. Disconnect power to the ice machine at the main disconnect.
5. Inspect the ice thickness probe for physical damage. On the face of the probe look for bulging, cracks around the nipple and deformed pivot pins or pivot pin arms.
6. Verify the ice thickness probe gap is approximately 9/32" (7 mm) and the ice thickness probe wire and bracket do not restrict movement of the probe. See "Ice Thickness Check" on page 118.
7. Reapply power to the ice machine at the main disconnect and confirm the ice machine is off.
8. Navigate to Real Time data (Menu / Service / Data / Real Time data / Inputs and observe ITP FFT 100Hz & 120 Hz.
9. Observe the initial number range and perform a tap test.

- Remove the water curtain or splash shield if present.
- Lift the ice thickness probe and carefully tap the nipple on the face of the probe for at least 10 seconds.

NOTE: When performing tap test:

- Pass = ITP is not the problem
- Fail = Check DC Voltage on the control board

The initial numbers displayed are constantly changing and are greater than 3000.

When the initial reading is 300 or lower and the tap test reading exceeds the initial reading by 3000 or more, the ice thickness probe and control board are both operating correctly.

The initial numbers displayed do not change or initial numbers did not increase by 3000 during tap test.

- Verify the ice thickness probe connector is properly plugged into the board and the ice thickness probe wiring is correct. If the wiring is incorrect replace the ice thickness probe..

Ice Probe Connector On Control Board	
Pin 1 (+)	Red
Pin 2 (-)	Black
Pin 3	Twisted Wire

10. Unplug the ice thickness probe and set a VOM to DC voltage scale - Measure voltage across Pin 1 (+) Red Wire and Pin 2 (-) Black Wire. Refer to “Electronic Control Board” on page 154.
    A. Voltage measures 3.25 to 3.35 VDC = Replace ice thickness probe.
    B. Voltage does not measure 3.25 to 3.35 VDC = Replace the control board.

BIN LEVEL PROBE

The bin level probe accessory will place the ice machine in a full bin cycle when ice lowers the temperature to 36º F or less. A lower ice level in dispensers will prevent overfilling or dispense wheel or motor damage.

- The bin probe reads actual temperature and must be connected to the T5 terminal on the control board.
- The control board recognizes the bin level probe automatically when installed. If the bin level probe has not been recognized by the control board, restore factory defaults and run the startup wizard.

Normal Operation

The control board will initiate a full bin cycle and a 3 minute time delay when both of the following occur:

1. The control board receives a temperature input of 36º F or less from the bin probe (T5 thermistor) at the end of the freeze cycle.
2. The temperature reading remains at or below 36º F throughout the entire harvest cycle.

The ice machine will restart when the delay period ends and the bin probe reads 37º F or higher. Ice making will resume at the Initial Start-Up or Start-Up After Automatic Shut-Off (See Sequence of Operation page 61).

Troubleshooting:

Refer to normal operation before troubleshooting - The T5 thermistor reading must indicate 36º F or less in the freeze cycle and throughout the harvest cycle to shutoff on full bin at the end of the harvest cycle.

View the T5 thermistor temperature on the touch screen (menu/service/diagnostics/temperatures).

Probe shorted - Temperature displayed is above 400º F:

A shorted bin level probe wire/thermistor will indicate a temperature higher than 400º F. This issues will result in the ice machine only stopping on full bin when the bin switch (curtain) is open at the end of a harvest cycle. The ice machine will restart when the curtain closes.

Probe open - Temperature displayed reads -14º F

A shorted bin level probe wire/thermistor will indicate a temperature lower than -10º F. This issue will result in the ice machine only stopping on full bin when the bin switch (curtain) is open at the end of a harvest cycle. The ice machine will restart when the curtain closes.

Probe out of range - Temperature reads lower or higher than the actual temperature at the bin level probe

An out of range thermistor can indicate a temperature higher or lower than the actual temperature at the bin level probe location.

1. Verify actual temperature at the bin level probe location with a thermometer.
2. Refer to “” on page 124.

THERMISTORS

FUNCTION

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

SPECIFICATIONS

Temperature of Thermistor		Resistance
°C	°F	K Ohms (x 1000)
-30° - -20°	-22° - -4°	820.85 - 466.35
-20° - -10°	-4° - 14°	466.35 - 269.05
-10° - 0°	14° - 32°	269.05 - 160.70
0° - 10°	32° - 50°	160.70 - 98.930
10° - 20°	50° - 68°	98.930 - 62.015
20° - 30°	68° - 86°	62.015 - 39.695
30° - 40°	86° - 104°	39.695 - 25.070
40° - 50°	104° - 122°	25.070 - 17.481
50° - 60°	122° - 140°	17.481 - 11.860
60° - 70°	140° - 158°	11.860 - 8.1900
70° - 80°	158° - 176°	8.1900 - 5.7530
80° - 90°	176° - 194°	5.7530 - 4.1015
90° - 100°	194° - 212°	4.1015 - 2.9735
100° - 110°	212° -230°	2.9735 - 2.1885
110° - 120°	230° - 248°	2.1885 - 1.6290
120° - 130°	248° - 266°	1.6290 - 1.2245
130° - 140°	266° - 284°	1.2245 - 0.9319
140° - 150°	284° - 302°	0.9319 - 0.7183
150° - 160°	302° - 320°	0.7183 - 0.5624
160° - 170°	320° - 338°	0.5624 - 0.4448
170° - 180°	338° - 356°	0.4448 - 0.3530
180° - 190°	356° - 374°	0.3530 - 0.2831
190° - 200°	374° - 392°	0.2831 - 0.2273

Thermistor Matrix

Four thermistors are standard on the ice machine. They are labeled T1, T2, T3, T4.

TEMPERATURE SENSOR LOCATION SELF CONTAINED AIR OR WATER COOLED MODELS

22" & 30" Models with 1 evaporator, 1 evaporator circuit and an air or water cooled condenser

T1 - Condenser Liquid Line

T2 - Compressor Discharge

T3 - Evaporator Inlet

T4 - Evaporator Outlet

SYMPTOM

Alert icon on the display and the alert indicates a T1, T2, T3, or T4 Fault.

CHECK PROCEDURE

Navigate to Menu / Service / Data / Real Time data / Time & Temperature

NOTE: An open thermistor will display less than -10°F (-23°C) and a shorted thermistor will display higher than 400°F (204°C).

Thermistor Test

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 Test

1. Disconnect thermistor from control board - The display temperature reading, dropping below -10°F (-23°C) indicates the control board is good.
2. Short thermistor pins - The display temperature reading, climbing higher than 400°F (204°C) indicates the control board is good.

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

Specifications		
Refrigerant	**Cut-Out**	**Cut-In**
R290	2413 kPa ±24.13 bar ±.69 350 psig ±10	1723 kPa 17.23 bar ±69 (250 psig ±10)
Automatic Reset must be below cut-in setting		

SYMPTOM

Opening the HPCO will cause the control board to initiate a 10 minute delay after which the ice machine attempts a restart. If the HPCO is closed the ice machine will continue to run. If the HPCO remains open after the 10 minute delay or reopens when the compressor starts, the ice machine will start another 10 minute delay period.

1. Machine is off and the Alert Log indicates E5 HPC Trip, the number of trips and the time and date of the last trip.
2. Machine is running and the display has an alert notification - Select the Alert Log to display the fault.

CHECK PROCEDURE

Symptom #1 Machine is off and the display indicates an E5 HPC Trip in the Alert Log.

1. Install a manifold gauge set.
2. Start a new freeze cycle by cycling the power button.
3. Run the system to see if the control trips at the rated pressure. If HPCO opens at a pressure significantly lower or higher than the control setting replace the HPCO.
4. If the control opens at the correct pressure find the root cause - Fan motor, dirty condenser, refrigeration system issue, etc. The ice machine will go to an initial start sequence if the HPCO is closed. If the HPCO is open, another 10 minute delay period starts. When the compressor relay closes the control board checks the HPCO.

Symptom #2 Machine is running and the display has an alert indication.

1. **The display indicates an E5 HPC Trip in the Alert Log**. Open the event and view when and how often HPCO Fault has occurred.
2. If this is a one time event it may be intermittent and caused by conditions around the unit changing. For example: High ambient temperature, water turned off to condenser (water cooled unit) etc.
3. Run the system to see if the control trips at the rated pressure. If HPCO opens at a pressure significantly lower than the control setting replace the HPCO.
4. If the control opens at the correct pressure find the root cause - Fan motor, dirty condenser, refrigeration system issue, etc.

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

Specifications		
Model	**Cut-In (Close)**	**Cut-Out (Open)**
IP0320 IP0500	250 ±5 (1723 kPa ±.34)	200 ±5 (1517 kPa ±.34)

CHECK PROCEDURE

1. Verify fan motor windings are not open or grounded, and fan spins freely.
2. Connect manifold gauge to ice machine.
3. Hook voltmeter in parallel across the fan cycle control, leaving wires attached.
4. Refer to chart below.

FCC Set-point:	Reading Should Be:	Fan Should Be:
Above Cut-In	0 Volts	Running
Below Cut-Out	Line Voltage	Off

HARVEST ASSIST AIR PUMP

FUNCTION

The air pump helps break the vacuum between the sheet of ice and the evaporator which results in shorter harvest cycles.

SPECIFICATIONS

115 Volt or 230 Volt - matches the ice machine voltage.

CHECK PROCEDURE

1. The air pump is wired in parallel with the harvest valve - Verify the ice machine is in the harvest cycle and the harvest valve is energized.
2. If there is voltage at the air pump connector, use a volt ohm meter to verify there is no continuity through the motor windings then replace motor.

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 assure that the overload is closed and the resistance readings will be accurate.

SINGLE PHASE COMPRESSORS

1. Disconnect power then 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.

THREE PHASE COMPRESSORS

1. Disconnect power and remove the wires from the compressor terminals.
2. The resistance values between L1 and L2, between L2 and L3, and between L3 and L1 should all be equal.
3. If the overload is open, there will be open readings between L1 and L2, between L2 and L3, and between L3 and L1. 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.

COMPRESSOR DRAWING LOCKED ROTOR

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

The two likely causes of this are a defective starting component or a 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.
    A. If the pressures do not move, the compressor is seized. Replace the compressor.
    B. 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.

DIAGNOSING START COMPONENTS

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

Capacitor

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

Relay

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

RELAY OPERATION CHECK

1. Disconnect wires from relay terminals.
2. Verify the contacts are closed.
   Measure the resistance between terminals 1 and 2. No continuity indicates open contacts. Replace the relay.
3. Check the relay coil.
   Measure the resistance between terminals 2 and 5. No resistance indicates an open coil. Replace the relay.

Flammable Refrigerant System Procedures

SERVICING REQUIREMENTS

- 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. Installation must comply with all applicable fire and health codes with the authority having jurisdiction.
- To minimize the risk of ignition due to improper parts or service procedures, only refrigeration technicians with flammable refrigerant training are allowed to service or dispose of equipment containing hydrocarbon refrigerants.
- All replacement parts must be like components obtained from the equipment manufacturers authorized replacement part network.
- An accessible Class B 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 operate per detector manufacturers instruction.
- Color-coded red process tubes indicate use of a flammable refrigerant - Process tube color coding must be maintained and visible after brazing or other service procedures.
- 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.
- The filter drier must be replaced whenever the system is opened to the atmosphere.
- All lockout and tag out procedures must be followed when working on this equipment.

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 flammable refrigerants.

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).
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.

FLAMMABLE REFRIGERANT CHARGING

Due to the small refrigerant quantities, a cap tube in the 1.37 to 2.24 mm ID range (.050 to .085) 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.

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 Clean-Up

General

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. Manitowoc 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

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

If harmful levels of contamination are suspected, perform the following procedure.

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 Leak in water cooled condenser 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

CLEANUP PROCEDURE

Mild System Contamination

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 (35 kPa,.35 bar).
   B. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of (35 kPa,.35 bar) (5 psig) .
   C. Change the vacuum pump oil.
   D. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour.
   E. Pressure test the system with nitrogen or perform a standing vacuum leak check to ensure no leaks are present.
5. Charge the system with refrigerant to the nameplate charge.
6. Operate the ice machine.

Severe System Contamination

1. Remove the refrigerant charge.
2. Remove the compressor and inspect the refrigeration lines. If burnout deposits are found, install a new harvest valve and TXV.
3. Wipe away any burnout deposits from suction and discharge lines at compressor.
4. Sweep through the open system with dry nitrogen.
5. Install a new compressor and new start components.
6. Install a suction line filter-drier with acid and moisture removal capability. Place the filter drier as close to the compressor as possible.
7. Install an access valve at the inlet of the suction line drier.
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 35 kPa,.35 bar (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 35 kPa,.35 bar (5 psig).
    D. Change the vacuum pump oil.
    E. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour.
    F. Perform a nitrogen pressure or standing vacuum test to verify no leaks are present.

10. Charge the system with refrigerant to the nameplate amount.
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 7 kPa,.7 bar (1 psig), the filter-drier should be adequate for complete cleanup.
    B. If the pressure drop exceeds 7 kPa,.7 bar (1 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. Then remove the suction line drier and change the liquid line drier.
13. Follow normal evacuation procedures.

LIQUID LINE FILTER-DRIERS

The filter-driers used on Manitowoc ice machines are manufactured to Manitowoc specification. A Manitowoc drier also 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 high moisture and acid removal capability.

The size of the filter-drier is important. The refrigerant charge is critical. Using an improperly sized filter-drier will cause the ice machine to be improperly charged with refrigerant.

Important

Driers are covered as a warranty part. The drier must be replaced any time the system is opened for repairs.

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

1. Disconnect power to the ice machine.
2. Follow all manufacturer's instructions supplied with the pinch-off tool. Position the pinch-off tool around the tubing as far from the pressure control as feasible. 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.

Cut the tubing of the defective component with a small tubing cutter.

3. Solder the replacement component in place. Allow the solder joint to cool.
4. Remove the pinch-off tool.
5. Re-round the tubing. The pressure control will operate normally once the tubing is re-rounded. Tubing may not re-round 100%.

TOTAL SYSTEM REFRIGERANT CHARGE

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

Model	Refrigerant Type	Amount
IP0320	R290	130 grams
IP0500	R290	140 grams

Cycle Times/24-Hour Ice Production/ 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.

- Production and cycle times are for 50 Hz half dice cube. Dice cube cycle times can be 2 - 3 minutes slower, depending on model and ambient temperature.
- Regular cube production derate is 7%.
- 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 “Symptom #2 - Freeze Cycle Refrigeration System Operational Analysis Tables” on page 78 for the list of data that must be collected for refrigeration diagnostics.
- Discharge and suction temperature is highest at the beginning of the cycle. Suction temperature will drop throughout the cycle. Verify the temperatures are within the range indicated.
- Record beginning of freeze cycle suction temperature one minute after water pump energizes.

INDIGO NXT R290 REFRIGERANT SERIES

IP0320A

Self-Contained Air-Cooled Model

Characteristics vary depending on operating conditions.

CYCLE TIMES

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °F/°C	Freeze Time			Harvest Time [1]
	Water Temperature °F/°C			
	50/10	70/21	90/32	
70/21	13.1-15.2	15.7-18.2	16.6-19.3	1-2.5
80/27	15.7-18.2	17.3-20.1	18.9-21.9	
90/32	18.1-21.0	20.3-23.5	21.3-24.6	
100/38	21.3-24.6	23.0-26.6	24.3-8.1	
110/43	24.3-8.1	26.5-30.6	28.2-32.5	

1 Times in minutes

24 HOUR ICE PRODUCTION

Air Temp. Entering Condenser °F/°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
70/21	335	285	270
80/27	285	260	240
90/32	270	260	215
100/38	215	200	175
110/43	190	175	165

1 Based on average ice slab weight of 1474-1655 g (3.40-3.90 lb)

OPERATING TEMPERATURES

Air Temp Entering Condenser °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp T2	Suction Temp [1] T4	Discharge Temp T2	Suction Temp T4
50/10	140-155	45-38	100-130	52-42
70/21	145-160	50-42	105-145	52-44
80/27	150-180	60-44	120-150	55-46
90/32	160-190	65-46	138-150	60-48
100/38	180-210	76-53	145-180	68-54
110/43	190-220	78-55	150-185	72-56

1 Suction temperature drops gradually throughout the freeze cycle

IP0500A

Self-Contained Air-Cooled Model

Characteristics vary depending on operating conditions.

CYCLE TIMES

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °F/°C	Freeze Time			Harvest Time [1]
	Water Temperature °F/°C			
	50/10	70/21	90/32	
70/21	13.6-15.5	15.5-17.7	16.4-18.7	1-2.5
80/27	15.5-17.7	16.2-18.5	17.4-19.9	
90/32	16.2-18.5	16.9-19.3	19.2-21.9	
100/38	17.4-19.9	19.2-21.9	21.3-24.3	
110/43	18.9-21.5	21.0-23.9	23.5-26.8	

1 Times in minutes

24 HOUR ICE PRODUCTION

Air Temp. Entering Condenser °F/°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
70/21	440	390	370
80/27	390	375	350
90/32	375	360	320
100/38	350	320	290
110/43	325	295	265

1 Based on average ice slab weight of 1474-1655 g (4.60-5.20 lb)

OPERATING TEMPERATURES

Air Temp Entering Condenser °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Temp T2	Suction Temp [1] T4	Discharge Temp T2	Suction Temp T4
50/10	135-165	48-40	125-100	35-45
70/21	140-170	50-42	130-105	35-45
80/27	150-190	60-50	130-145	38-50
90/32	170-200	65-52	130-150	45-55
100/38	190-225	66-63	140-175	48-65
110/43	200-230	66-64	145-180	50-65

1 Suction temperature drops gradually throughout the freeze cycle

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Diagrams

Wiring Diagrams

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

> **⚠ Warning**
>
> Always disconnect power before working on electrical circuitry.

Some components are wired differently on energy efficient machines. Please verify your model number (page 20) to reference the correct diagrams.

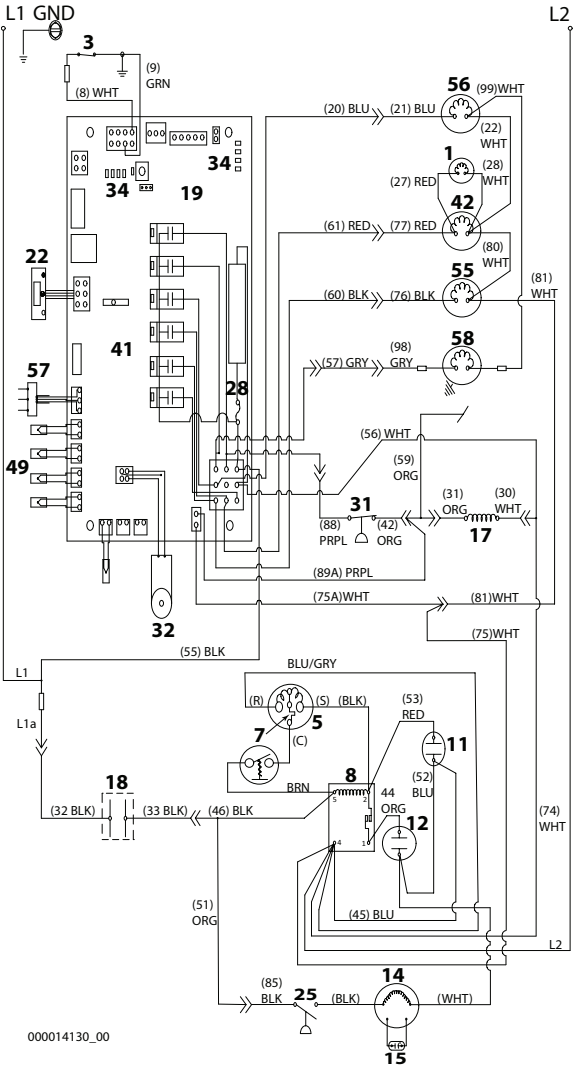
WIRING DIAGRAM LEGEND

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)

IP0320/IP0500 - 1PH

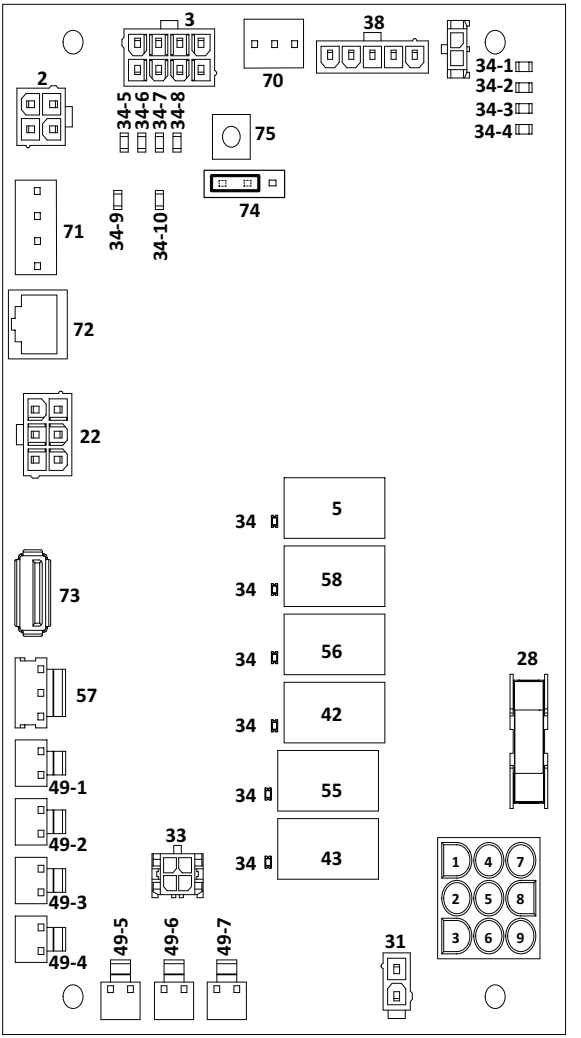
Self Contained Air-cooled



IP0320/IP0500 - 1ph

Number	Component
1	Air Pump Harvest Assist
3	Bin Switch
5	Compressor
7	Compressor Overload (230/50-60/1 is internal)
8	Compressor Potential Relay
11	Compressor Run Capacitor
12	Compressor Start Capacitor
14	Condenser Fan Motor
15	Condenser Fan Motor Run Capacitor
17	Contactor Coil
18	Contactor Contacts Note: Must be enclosed in sealed box)
19	Control Board
22	Touchscreen
25	Fan Cycle Control
28	Fuse
31	High Pressure Cutout
32	Ice Thickness Probe
34	LED
41	See Control Board Schematic For Detail
42	Solenoid Valve - Harvest Left Hand
49	Thermistors
55	Water Dump Valve
56	Water Inlet Valve
57	Water Level Probe
58	Water Pump
Wire Colors	
BLK	Black
BLU	Blue
BRN	Brown
GRY	Grey
ORG	Orange
PRPL	Purple
RED	Red
WHT	White
YEL	Yellow
Refer to control board schematic for control board detail	

Electronic Control Board

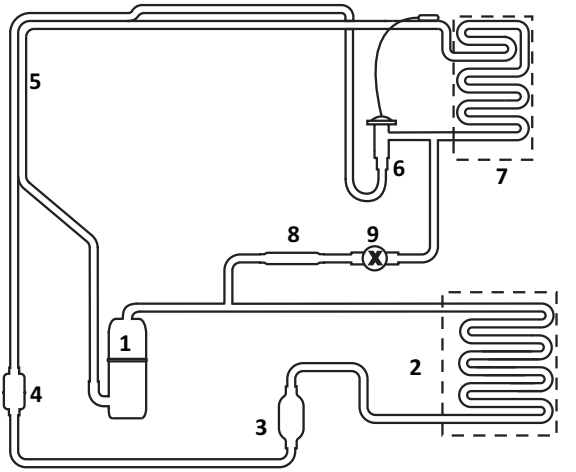


Electronic Control Board Schematic

Number	Description
2	AuCs
3	Bin Switch
5	Compressor Contactor Coil Relay
22	Touchscreen
28	Fuse
31	High Pressure Cutout
33	Ice Thickness Probe
34	LED - Relays
34-1	LED - Display
34-2	LED - Micro
34-2	LED - Clean
34-4	LED - Harvest
34-5	LED - Ice Thickness Probe
34-6	LED - High Water Probe
34-7	LED - Low Water Probe
34-8	LED - Display Bypass Is Active
34-9	LED - Right Bin Switch
34-10	LED - Left Bin Switch
38	LuminIce
42	Relay Solenoid Valve - Harvest Left Hand
43	Relay Solenoid Valve - Harvest Right Hand
49-1	Thermistor T1 Liquid Line Temperature
49-2	Thermistor T2 - Discharge Line Temperature
49-3	Thermistor T3 - Evaporator Inlet Temperature Single Evaporator models - Evaporator Outlet Temperature Dual Evaporator Models
49-4	Thermistor T4 - Evaporator Outlet Temperature
49-5	Thermistor T5 - Bin Level Probe
49-6	Thermistor T6 - Potable water Temperature
49-7	Thermistor T7 - Ambient Air Temperature
55	Relay Water Dump Valve
56	Relay Water Inlet Valve
57	Water Level Probe
58	Relay Water Pump
70	RS232 Communication Port
71	RS485 Communication Port
72	12VDC Power Supply
73	USB Connector
74	Reverse Osmosis/De-ionized Water Usage Jumper
75	Test/Display Bypass Button

Refrigeration Tubing Schematics

IP0320/IP0500 Self-Contained Air-Cooled



Number	Component
1	Compressor
2	Condenser - Air or Water Cooled
3	Receiver - Water Cooled Only
4	Liquid Line Filter Drier
5	Heat Exchanger
6	TXV - Thermostatic Expansion Valve
7	Evaporator
8	Strainer
9	Harvest Solenoid Valve

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Part Number STH097 Rev00 2/19