Manitowoc®



BG0260
Spray Cube
Technician's Handbook

This manual is updated as new information and models are released.
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America's #1 Selling Ice Machine

Part Number STH48 6/15

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General Information

MODEL NUMBERS

BG0260A

MODEL/SERIAL NUMBER

These numbers are required when requesting information from your local Manitowoc Distributor, or Manitowoc Ice. The model and serial number are listed on the MODEL/SERIAL NUMBER DECAL affixed to the ice machine.

MANITOWOC CLEANER AND SANITIZER

Manitowoc Ice Machine Cleaner and Sanitizer are available in 16 oz. (473 ml) bottles. These are the only cleaners and sanitizer approved for use with Manitowoc products.

Cleaner Part Number		Sanitizer Part Number	
16 oz.	000000084	16 oz.	9405653
1 gal	N/A	1 gal.	9405813

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Installation

LOCATION OF ICE MACHINE

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

- The location must be free of airborne and other contaminants.
- The location must not be near heat-generating equipment or in direct sunlight.
- The location must be capable of supporting the weight of the ice machine and a full bin of ice.
- The location must allow enough clearance for water, drain and electrical connections in the rear of the ice machine.
- The location must not obstruct airflow through or around the ice machine.

INSTALLATION REQUIREMENTS

- The air temperature must be at least 50°F (10°C), but must not exceed 110°F (43°C).
- The water temperature must be at least 50°F (10°C), but must not exceed 100°F (38°C).
- The ice machine and bin must be level
- Vent the ice machine and bin drains separately
- Bin drain termination must have an air gap
- A back flow preventer is required on water inlet lines
- Routine adjustments and maintenance procedures outlined in this manual are not covered by the warranty.

POTABLE WATER REQUIREMENTS

- Plumbing must conform to local codes
- Do not connect the ice machine to a hot water supply. Be sure all hot water restrictors installed for other equipment are working. (Check valves on sink faucets, dishwashers, etc.)
- If water pressure exceeds maximum pressure (6 bar) obtain a water pressure regulator from your Manitowoc distributor.
- A union for both the ice making and condenser water lines is required
- Water inlet lines require insulation to prevent condensation.

DRAIN CONNECTIONS

- Drain lines must have a 1.5 inch drop per 5 feet of run (2.5 cm per meter), and must not create traps
- The floor drain must be large enough to accommodate drainage from all drains.
- Separate insulated bin and water-cooled condenser drain lines are required
- The bin and ice machine drains require a vent.

ICE MACHINE CLEARANCE REQUIREMENTS

	Air-Cooled	Water-Cooled
Top/Sides	5" (13 cm)	5" (13 cm)
Back	8" (20 cm)	8" (20 cm)

ELECTRICAL SERVICE

⚠ Warning

All wiring must conform to local and national codes.

Voltage

The maximum allowable voltage variation is ± 10% of the rated voltage on the ice machine model/serial number plate at compressor start-up.

Fuse/Circuit Breaker

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

⚠ Warning

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

Ground Fault Interrupter Circuit (GFIC)

A GFCI/GFI circuit protection is not recommended with our equipment. If a GFCI/GFI is required by code a GFCI/GFI breaker rather than outlet must be used to avoid intermittent nuisance trips.

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Ice Making Sequence of Operation

Priming the Water system

The water inlet valve on this machine energizes in the harvest sequence, therefore priming the system with water will allow the system to start up with a full reservoir of water. To prime system add 2 liters of water into the water trough.

1. **Freeze Cycle**

Turn the toggle switch to ON. The compressor, and water pump will energize, starting the freeze cycle. The pump sprays water into the inverted cups. The water freezes layer by layer, until an ice cube forms in each cup.

The freeze cycle continues and the evaporator thermostat reaches the adjusted set point.

The thermostat energizes the timer motor and the cam starts to turn. When the cam cycles through the preset freeze time the relays change position and the harvest cycle starts.

2. **Harvest Cycle**

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

The ice falls from the cups and drops into the bin. The harvest cycle continues until the preset harvest time expires.

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

3. **Automatic Shut-Off**

When the storage bin is full, ice will contact the bin thermostat inside the bin. If the bin thermostat opens during a freeze cycle the ice machine will finish the freeze cycle and stop when it enters the harvest cycle.

The ice machine remains off until enough ice has been removed from the storage bin to allow the ice to fall clear of the bin thermostat probe. As the ice clears the probe, the bin thermostat warms up and the machine starts another freeze cycle.

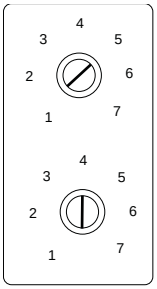
THERMOSTAT SETTINGS

Bin Thermostat:

The bin thermostat sensing bulb is located in holder on the right side of the bin on self storage models. The bin thermostat turns the ice machine on and off as the level of ice in the bin changes. Use the initial setting from the chart and adjust as required.

Evaporator Thermostat:

The evaporator thermostat energizes the timer motor. After the preset time on the timer expires the harvest cycle begins. Refer to chart for correct setting.



Bin Thermostat
Small Numbers = Less ice in bin
Large Numbers = More ice in bin
Start at Chart Setting, then adjust as required

Evaporator Thermostat
Small Numbers = Large dimple & lighter cubes
Large Numbers = Small Dimple & heavier cubes
Refer to chart for initial setting

Thermostat Setting Chart

Model	Bin Thermostat Setting	Evaporator Thermostat Setting
BG0260	5	4

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Maintenance

Clean and sanitize the ice machine 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.

⚠ Caution

Use only approved Ice Machine Cleaner and Sanitizer. Read and understand all labels printed on bottles before use. Do not mix Ice Machine Cleaner and Sanitizer solutions together.

⚠ Warning

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

CLEANING & SANITIZING PROCEDURE

Ice machine cleaner is used to remove lime scale or other mineral deposits. Sanitizer is used to remove algae or slime.

Mix 4 liters of water with 500 ml of cleaner in a plastic or stainless container.

Cleaner	Water
16 oz (500 ml)	1 gal (4L)

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

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

⚠ Caution

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

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

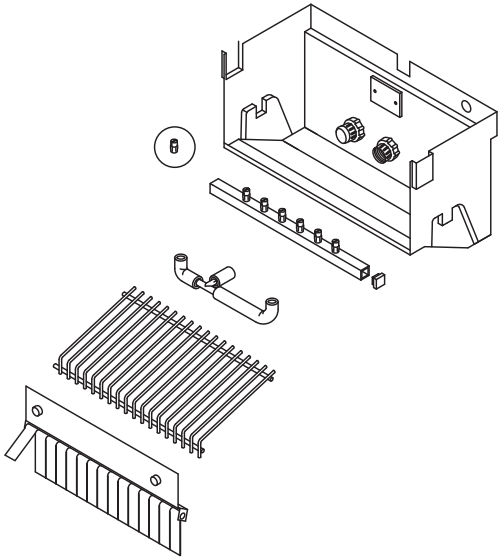
Step 3 Remove overflow tube and drain water sump.

Step 4 Remove all parts for cleaning.

A. Remove two thumbscrews and shutter assembly
B. Remove ice cube slide
C. Remove spray bar and vinyl tubing
D. Evaporator shield on top of evaporator

NOTE: The tubing, spray bar ends and nozzles can be removed when required for easier cleaning.

Mix a solution of cleaner and lukewarm water.



Step 5 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 (4L)	16 oz (500 ml) cleaner

Step 6 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. All parts except the ice thickness probe can be soaked when heavily scaled. Rinse all components with clean water.

Step 7 While components are soaking, use 1/2 of the cleaner/water solution to clean all foodzone surfaces of the ice machine and bin. Use a nylon brush or cloth to thoroughly clean the following ice machine areas:

- Evaporator top panel
- Side walls
- Water trough interior / exterior
- Evaporator and plastic parts - including top, bottom, and sides bin

Step 8 Rinse all areas thoroughly with clean water.

Step 9 Mix a solution of sanitizer and lukewarm water.

Solution Type	Water	Mixed With
Sanitizer	1 gal (4 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 Sanitize all foodzone surfaces of the ice machine and bin. Use a spray bottle to liberally apply the solution. When sanitizing, pay particular attention to the following areas:

- Evaporator top panel
- Side walls
- Water trough interior / exterior
- Evaporator and plastic parts - including top, bottom, and sides
- Bin

Do not rinse the sanitized areas.

Step 12 Replace all removed components.

NOTE: Spray bar and nozzles.

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

Step 13 Reapply power to the ice machine and move the toggle switch to the on position.

Step 14 Discard first batch of ice to remove any flavor transmission from the cleaning process.

CLEANING THE CONDENSER

⚠ Warning

Disconnect electric power to the ice machine at the electric service switch before cleaning the condenser. The condenser fins are sharp. Use care when cleaning them.

Air-Cooled Condenser

Clean the condenser at least every six months. Follow the steps below.

1. Shine a flashlight through the condenser to check for dirt between the fins. Blow compressed air through the condenser fins from the inside or use a commercial condenser coil cleaner. Follow the directions and cautions supplied with the cleaner.
2. Straighten any bent condenser fins with a fin comb.
3. Carefully wipe off the fan blades and motor with a soft cloth. Do not bend the fan blades. If the fan blades are excessively dirty, wash with warm, soapy water and rinse thoroughly.

⚠ Warning

If you are cleaning the condenser fan blades with water, cover the fan motor to prevent water damage.

REMOVAL FROM SERVICE/WINTERIZATION

⚠ 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 procedure below.

1. Disconnect the electric power at the circuit breaker or the electric service switch.
2. Turn off the water supply.
3. Disconnect and drain the incoming ice-making water line at the rear of the ice machine.
4. Disconnect drain tubing and drain water into container and discard.
5. Make sure water is not trapped in any of the water or drain lines.

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Troubleshooting

Electrical Flowcharts

Diagnostic troubleshooting for the ice machine involves following flowcharts that are dependant on symptoms of the failed machine.

Follow the flowcharts for the failure symptom and model you are working on.

NOTE: Refer to the sequence of operation to determine where in the sequence the ice machine has failed. An example would be an ice machine that energizes the gear motor, but the compressor does not energize. Following the electrical flowchart will quickly and easily eliminate non issues.

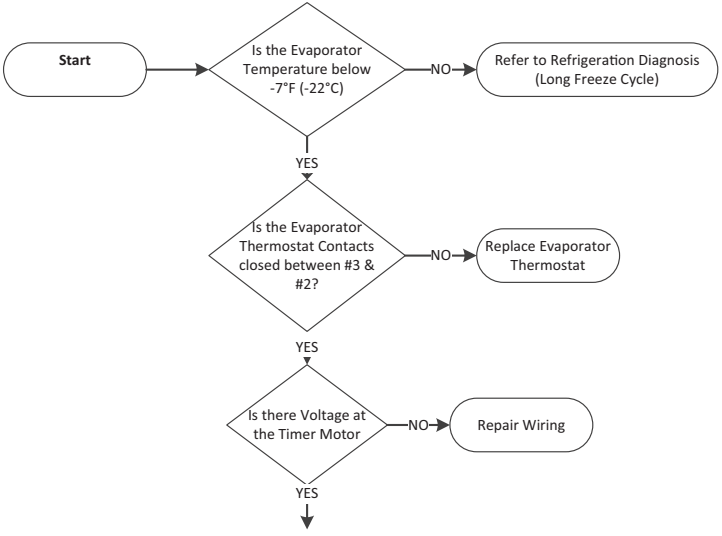
ELECTRICAL FLOWCHART ICE MACHINE WILL NOT RUN

YES
Switch Illuminated?
NO
Replace Switch
YES
Bin Thermostat Closed?
NO
Ice Contacting Thermostat?
NO
Adjusting Closes Thermostat?
NO
Replace Thermostat
YES
Remove Ice – Allow to warm and retest
YES
Verify New Setting Cycles Machine On/ Off
YES

YES
Line Voltage to Compressor Contactor?
NO
Repair Wiring
YES
Contacts Closed?
NO
Replace Contactor
YES

YES
Line Voltage to Compressor?
NO
Repair Wiring
YES
Verify:
Compressor Overload is Closed, Start Components Function

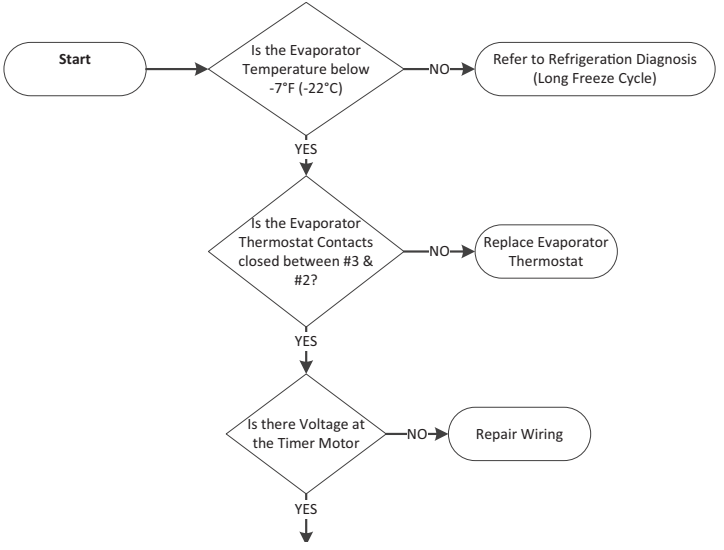
WILL NOT CYCLE INTO HARVEST



YES
Is the timer motor turning the cams?
NO
Replace the Timer
YES
After 25 Minutes of the Timer turning Cams
YES
Do the Cam Switches Switch and send voltage to Water Inlet valve and Hot Gas Solenoid Valve?
NO
YES

YES
Is the Water inlet Valve and Hot Gas Solenoid Valve Energized?
YES
Refer to: Ice Machine will not Harvest.
NO
Repair Wiring

PREMATURELY CYCLES INTO HARVEST



YES
Is the timer motor turning the cams?
NO
Replace the Timer
YES
After 25 Minutes of the Timer turning Cams
YES
Do the Cam Switches Switch and send voltage to Water Inlet valve and Hot Gas Solenoid Valve?
NO
YES

YES
Is the Water inlet Valve and Hot Gas Solenoid Valve Energized?
YES
Refer to: Ice Machine will not Harvest.
NO
Repair Wiring

Refrigeration Troubleshooting

If the compressor is not energized refer to Electrical Troubleshooting Refer to Operational Pressure Charts for normal pressures and temperatures				
	Low on Refrigerant	Overcharge of Refrigerant	Non Condensible in System	Restricted Capillary Tube
Discharge Pressure	Low	High	High	Low
Suction Pressure	Low	High	High	Low
Evaporator Inlet Temperature	Normal	Low	High	Low
Evaporator Outlet Temperature	High	Normal	High	Low
Compressor Discharge Line Temperature Normal Range = > 158°F (70°C) @ 70°F (21°C) >210°F (99°C) @ 110°F (43°C)	High Increases with run time	Normal	High Increases with run time	High Increases with run time

ICE PRODUCTION/QUALITY CHECK

The amount of ice a machine produces directly relates to the operating water and air temperatures. This means an ice machine with a 68°F (20°C) outdoor ambient temperature and 50°F (10.0°C) water produces more ice than the same model ice machine with a 90°F (32°C) outdoor ambient and 70°F (21°C) water.

1. Determine the ice machine operating conditions:

   Air temp entering condenser: ____°

   Air temp around ice machine: ____°

   Water temp entering sump trough: ____°

2. Refer to the appropriate 24-Hour Ice Production Chart.
3. Use the operating conditions determined in Step 1 to find published 24 hr. ice production: ____
   - Times are in minutes.
     Example: 1 min., 15 sec. converts to 1.25 min. (15 seconds ÷ 60 seconds = .25 minutes)
   - Weights are in grams.
4. 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	×	_____ Cycles per Day	=	_____ Actual 24-Hour Production	

Weighing the ice is the only 100% accurate check.

Compare the results of Step 3 with Step 2. Ice production is normal when these numbers match closely. If they match closely, determine if:

- Another ice machine is required.
- Relocating the existing equipment to lower the load conditions is required.

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 1.4 and 5.5 bar

- Install a water regulator valve or increase the water pressure

Incoming water temperature is not between 1.7°C and 32.2°C

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

Water filtration is plugged (if used)

- Install a new water filter

Hoses, fittings, etc., are leaking water

- Repair/replace as needed

Water inlet valve is stuck open or closed

- Clean/replace as needed

Water is spraying out of the sump trough area

- Stop the water spray

Uneven water flow across the evaporator

- Clean the ice machine

DISCHARGE PRESSURE HIGH CHECKLIST

Improper Installation

- Refer to Installation section of this manual

Restricted Condenser Air Flow

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

Improper Refrigerant Charge

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

Other

- High side refrigerant lines/component restricted (before mid-condenser)

FREEZE CYCLE DISCHARGE PRESSURE LOW CHECKLIST

Improper Installation

- Refer to Installation section of this manual

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- High side refrigerant lines/component restricted (before mid-condenser)

SUCTION PRESSURE HIGH CHECKLIST

Improper Installation

- Refer to Installation section of this manual

Discharge Pressure

- Discharge pressure is too high, and is affecting suction pressure

Improper Refrigerant Charge

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

Other

- Harvest valve leaking
- Defective compressor

SUCTION PRESSURE LOW CHECKLIST

Discharge Pressure

- Discharge pressure (ambient temperature) is too low, and is affecting suction pressure - Refer to Installation section of this manual

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- Restricted capillary tube
- Collapsed/restricted suction tubing
- Harvest valve not opening in harvest cycle

Component Specifications

THERMOSTAT SETTINGS

Model	Bin Thermostat Setting	Evaporator Thermostat Setting
BG0260A	5	4

FAN CYCLE CONTROL SETTINGS

Model	Cut-In (Close)	Cut-Out (Open)
BG0260A	215 psi 1482 kPa	230 psi 1586 kPa

TOTAL SYSTEM REFRIGERANT CHARGE

Important

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

Model	R404A Refrigerant Charge
BG0260A	22 oz (620 g)

FILTER-DRIERS

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.

SUCTION CLEANUP FILTER-DRIER

Contaminated systems must have a suction line filter-drier installed to remove contamination. An access valve must be installed on the inlet side of the suction filter to allow pressure drop readings to be obtained.

Charts

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

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

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

- Ice production checks that are within 10% of the chart are considered normal.This is due to three factors:
  1. The data listed is an average obtained from testing a group of ice machines.
  2. Freeze/harvest times have been rounded to the nearest whole number
  3. Air and water temperatures will seldom match the charts exactly.
- Zero out manifold gauge set before obtaining pressure readings to avoid misdiagnosis.
- Discharge and suction pressure are highest at the beginning of the cycle and drop throughout the freeze cycle.
- Water temperature will affect suction and discharge pressure 50°F (10°C) water temperature will result in pressures on the lower end of the ranges specified. 90°F (32°C) water temperatures will result in pressures on the upper end of the range specified.

BG0260A

SELF STORAGE AIR-COOLED

Averages are used for calculations, characteristics will vary depending on your operating conditions.

CYCLE TIMES

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser	Freeze Time			Harvest Time[1]
	Water Temperature F°/°C			
	50/10	70/21	90/32	
70°F/21°C	30-32	31-38	34-45	2:45 to 4:00
90°F/32°C	33-42	40-50	37-60	
100°F/38°C	38-44	40-56	42-70	
110°F/43°C	40-46	49-60	65-75	

1 Times in minutes

NOTE: In addition to air/water temperatures, freeze cycle times will increase/decrease significantly depending on cube weight

24 HOUR ICE PRODUCTION

Air Temp. Entering Condenser F°/°C	Water Temperature F°/°C[1]		
	50/10	70/21	90/32
70°F 21°C	315 lbs 143 kgs	290 lbs 132 kgs	270 lbs 122 kgs
90°F 32°C	260 lbs 118 kgs	255 lbs 116 kgs	230 lbs 104 kgs
100°F 38°C	250 lbs 113 kgs	230 lbs 104 kgs	200 lbs 91 kgs
110°F 43°C	240 lbs 109 kgs	200 lbs 91 kgs	150 lbs 68 kgs

1 Based on average ice weight of one Freeze/Harvest cycle 7.5 lbs (3600 grams) 60 cubes @ 2 oz (60 grams)

OPERATING PRESSURES

Air Temperature Entering Condenser	Freeze Cycle		Harvest Cycle	
	Suction Pressure psig/kPa	Discharge Pressure psig/kPa	Suction Pressure psig/kPa	Discharge Pressure psig/kPa
50°F 10°C	18-48 124-331	215-265 1482-1827	75-145 517-1000	125-150 862-1034
70°F 21°C	20-50 138-345	215-295 1482-2034	75-145 517-1000	125-150 1862-1034
90°F 32°C	25-60 172-414	255-355 1758-2448	80-160 552-1103	140-240 965-1655
100°F 38°C	25-65 172-448	290-400 1999-2758	85-175 586-1207	150-260 1034-1793
110°F 43°C	30-65 207-448	330-440 2275-3034	170-185 1172-1276	170-280 1172-1931

Diagrams

Wiring Diagram

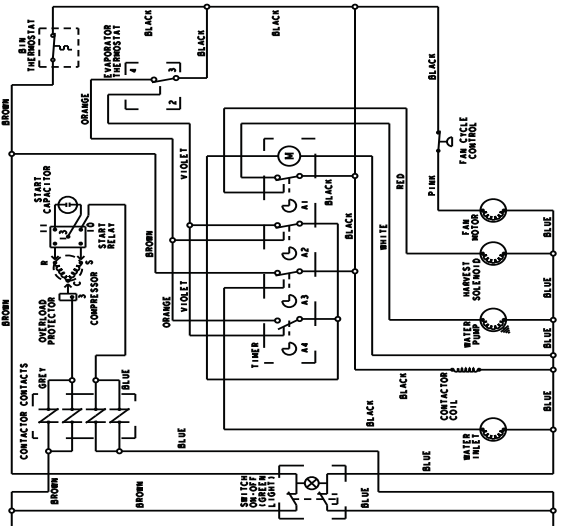
The following pages contain electrical wiring diagrams. Be sure you are referring to the correct diagram for the ice machine you are servicing.

⚠ Warning

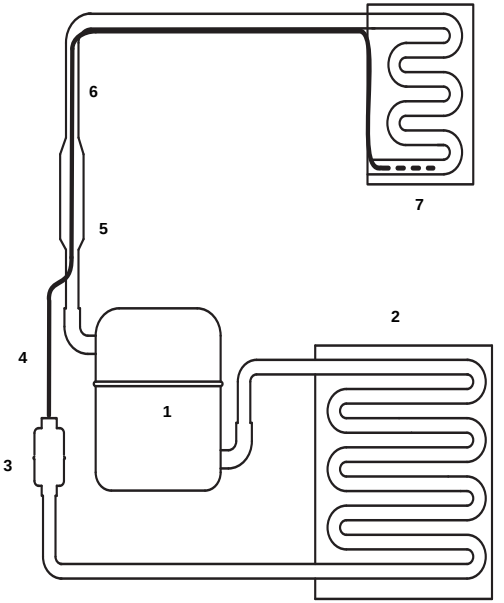
Always disconnect power before working on electrical circuitry.

BG0260

Refer to Nameplate for Voltage Rating



Refrigeration Tubing Schematics



1	Compressor
2	Condenser (air or water cooled)
3	Liquid Line Drier
4	Capillary tube
5	Accumulator
6	Heat Exchanger
7	Evaporator

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