Manitowoc®

ST3000W Water-cooled and SF3000C QuietQube® Models

Technician's Handbook

Part Number: STH114_00 01/24

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 uses high voltage electricity and contains 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.
- 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 ensure their ice deflector is compatible.
- Prior to installing a non-OEM ice storage system with this ice machine, follow the manufacturer's installation procedures and verify the location and installation meets the local/national mechanical codes and stability requirements.

⚠ 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 (continued)

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 while operating or maintaining this equipment:

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

⚠ Warning

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

- Objects placed or dropped in the bin can affect human health and safety. Locate and remove any objects immediately.
- Never use sharp objects or tools to remove ice or frost.
- Do not use mechanical devices or other means to accelerate the defrosting process.
- When using cleaning fluids or chemicals, rubber gloves and eye protection (and/or face shield) must be worn.

⚠ DANGER

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

⚠ DANGER

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

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

⚠ 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 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.

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Table of Contents

Model Numbers

SELF-CONTAINED ICE MACHINES

Self-contained Head Section	Condenser Type
SDT3000W-263H	Water-cooled
SYT3000W-263H	Water-cooled

NOTE: Model numbers ending in H indicate High Pressure Water Regulating Valve. High pressure = 20 to 350 psi (1.37 to 24.13 bar)

QUIETQUBE® MODELS

Ice Machine Head Section	CVD® Condensing Unit
SDF3000C-161 SYF3000C-161	CVDF3000-263

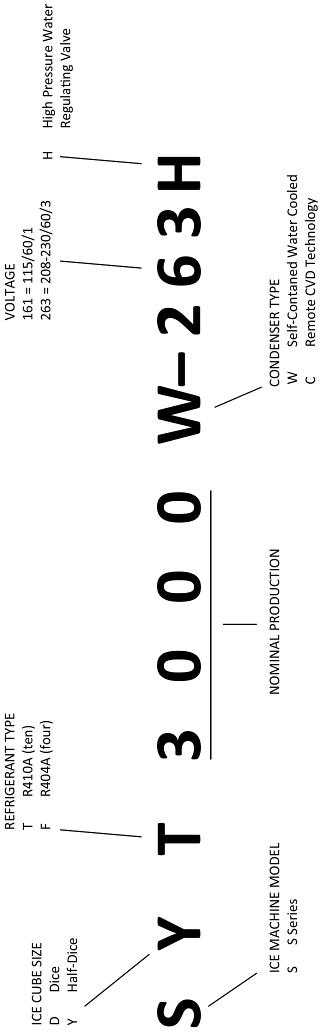
⚠Warning

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 ensure their ice deflector is compatible with Manitowoc ice machines.

How to Read a Model Number

HEAD SECTIONS



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 ensures warranty coverage and streamlines the process if any warranty work is required.

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Installation

Location of Ice Machine

HEAD SECTION

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

- The location must be indoors, and free of airborne and other contaminants.
- The location must not be near heat-generating equipment or in direct sunlight and must be protected from weather.
- The location must allow enough clearance for water, drain, and electrical connections in the rear of the ice machine.
- The location must not obstruct air flow through or around the ice machine. Refer to the chart for clearance requirements.
- The location must be capable of supporting the weight of the ice machine, bin and a full bin of ice.
- Local water conditions may require treatment of the water to inhibit scale formation, filter sediment, and remove chlorine odor and taste.
- The ice machine and bin must be level.

INSTALLATION REQUIREMENTS

Head Sections

- Vent the ice machine and bin drains separately.
- The ice machine and bin must be de-scaled and sanitized after installation.
- The drain line must contain a union or other suitable means of disconnection at the ice machine.

QuietQube® Models Only

- The ice machine top panel can be trimmed with an aviator snips to allow the line set, water line and electrical connections to exit the top. Only cut out what is needed, the back panel must support the top panel.
- The water inlet and electrical connection must contain a service loop to allow future access.

Condensing Unit (CVD)

- The location must not allow exhaust fan heat and/or grease to enter the condenser.
- The location must not obstruct airflow through or around the condensing unit.

BINS

- Bin drain termination must have an air gap.
- All ice machines installed on a bin require an ice deflector and bin adapter.
- Align sides and back of ice machine with sides and back of bin when placing ice machine on bin.
- Optional kits are available to adapt ice machines on large capacity bins.
- S3000 ice machines are not approved for use on Manitowoc B970 or D970 bins.
- Casters are not approved for use on large capacity bins.

Minimum/Maximum Temperatures

Head Sections

Model	Minimum Air Temperature	Maximum Air Temperature
ST3000W **SF3000C**	35°F (2°C)	110°F (43°C)

Condensing Unit

Model	Minimum Air Temperature	Maximum Air Temperature
CVDF3000	-20°F (-29°C)	120°F (49°C)

Clearance Requirements

⚠Caution

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.

Head Sections

Model	Top/Sides	Sides
ST3000W **SF3000C**	8" (20 cm)	24" (61 cm)

Condensing Unit

Model	Top/Sides	Front/Back
CVDF3000	6" (15 cm*)	24" (61 cm)

NOTE: 24" (61.0 cm) on all sides is recommended to allow access for maintenance and service.

Ice Machine Heat of Rejection

Model	Heat of Rejection	
	Air Conditioning	Peak
ST3000W	45,000	51,000
BTU/Hour		

Use this information when:

- Sizing air conditioning equipment where self-contained ice machines are installed.
- Determining the load on a cooling tower. Use the peak figure for sizing the load.

Bin Installation

1. Remove threaded plug from drain fitting.
2. Screw the leveling legs onto the bottom of the bin.
3. Screw the foot of each leg in as far as possible.
4. Move the bin into its final position.
5. Level the bin to ensure that the bin door closes and seals properly. Use a level on top of the bin. Turn the base of each foot as necessary to level the bin.
6. Inspect bin gasket prior to ice machine installation. Manitowoc bins come with a closed cell foam gasket installed along the top surface of the bin.

⚠Warning

Remove all panels from ice machine before lifting and installing on bin. Remove front panel, top cover, left and right side panels.

Electrical Requirements

All electrical work, including wire routing and grounding, must conform to local, state and national electrical codes. The following precautions must be observed:

- The ice machine must be grounded.
- A separate fuse/circuit breaker (dedicated circuit) must be provided for each ice machine head section, or condensing unit.
- A qualified electrician must determine proper wire size dependent upon location, materials used and length of run (minimum circuit ampacity can be used to help select the wire size).

⚠Warning

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

VOLTAGE

The maximum allowable voltage variation is +10%/-5% of the rated voltage at ice machine start-up (when the electrical load is highest).

⚠Warning

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

FUSE/CIRCUIT BREAKER

A separate electrical disconnect, which disconnects all poles and has 1/8" (3 mm) contact separation, must be provided for fixed wiring. Circuit breakers must be H.A.C.R. rated in USA.

MINIMUM CIRCUIT AMPACITY

- The minimum circuit ampacity is used to help select the wire size of the electrical supply. (Minimum circuit ampacity is not the ice machine's running amp load.)
- The wire size (or gauge) also depends on location, materials used, length of run, etc., so it must be determined by a qualified electrician.

GROUND FAULT CIRCUIT INTERRUPTER

We do not recommend the use of a GFCI/GFI circuit protection with our equipment. If a GFCI/GFI is required by code, use a GFCI/GFI breaker rather than an outlet, which is more prone to intermittent nuisance trips than panel circuit breakers.

MAXIMUM AND MINIMUM CIRCUIT AMPERAGE

Due to continuous product improvements, this information is for reference only. Please refer to the ice machine data plate to verify electrical data. Model/Serial data plate information overrides information listed on this page.

Unit	Voltage/ Phase/ Cycle	Maximum Fuse/ Circuit Breaker	Minimum Circuit Amps	Minimum Wire Size Required by Manitowoc
ST3000W Head Section	208-230/3/60	30 amp	30.0	N/A
SF3000C QuietQube Head Section	115/1/60	15 amp	2.0	#14 Solid Copper Conductor
CVDF3000 Condensing Unit	208-230/3/60	35 amp	30.0	#8 Solid Copper Conductor

Minimum Power Cord Specifications

Maximum Breaker Size	Minimum Wire Size	Maximum Length of Power Cord
15 amp	14 gauge	6 feet (1.83 m)
30 amp	10 gauge	6 feet (1.83 m)

If a power cord is used, the wire size to the receptacle is dependent upon location, materials used, length of run, etc., so it must be determined by a qualified electrician. Local, state or national requirements will supersede our minimum requirements.

Water Supply and Drains

WATER SUPPLY AND DRAIN LINE SIZING/ CONNECTIONS

Location	Water Temperature	Water Pressure	Ice Machine Fitting	Tubing Size up to Ice Machine Fitting
Ice Making Water Inlet	35°F (4.4°C) Min. 90°F (32°C) Max.	20 psi Min. (1.37 bar) 80 psi Max. (5.5 bar)	0.375" (10 mm) NPT	0.375" (10 mm) ID
Ice Making Water Drain	—	—	1.0" (25 mm) NPT	1.0" (25 mm) ID
Condenser Water Inlet	35°F (4.4°C) Min. 90°F (32°C) Max.	**Standard** 20 psi Min. (1.37 bar) 150 psi Max (10.3 bar) **High Pressure Option** 20 psi Min. (1.37 bar) 350 psi Max (24.1 bar)	0.75" (19 mm) NPT	0.75" (19 mm) ID
Condenser Water Drain	—	—	0.75" (19 mm) NPT	1.0" (25 mm) ID
Bin Drain	—	—	1.0" (25 mm) NPT	1.0" (25 mm) ID

NPT = National Pipe Thread
ID = Minimum Inside Diameter

Water Connections

- Local water conditions may require treatment of the water to inhibit scale formation, filter sediment, and remove chlorine odor and taste.
- Follow these guidelines to install water inlet lines:
- 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.)
- ST3000W - are equipped with a High Pressure Valve rated for water pressure from 20 psi to 350 psi (1.37 bar to 24.1 bar).
- SF3000C - If water pressure exceeds the maximum recommended pressure of 80 psig (1.5 bar), obtain a water pressure regulator from your Manitowoc distributor.
- Install a water shut-off valve and union for potable water and water cooled condenser lines.
- Insulate water inlet lines to prevent condensation.

⚠ Caution

Do not apply heat to water inlet valve or water drain fittings. Heating will damage the nonmetallic connector. Do not over tighten fittings. Two turns after hand tight is the maximum.

⚠ Warning

Connect to a potable water supply only.

Water-Cooled Condenser Water Pressure

ST3000W - Water pressure at the condenser cannot exceed 350 psi (24.1 bar).

Cooling Tower Applications (Water-Cooled Models)

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

- Water entering the condenser must not exceed 90°F (32.2°C).
- Water flow through the condenser must not exceed 5 gallons (19 liters) per minute.
- Allow for a pressure drop of 7 psi (0.5 bar) between the condenser water inlet and the outlet of the ice machine.
- Water exiting the condenser must not exceed 110°F (43.3°C).

Important

The Commonwealth of Massachusetts requires that all water-cooled models must be connected only to a closed loop, cooling tower system.

Drain Connections

- Drain lines must have a 1.5" drop per 5 feet 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 them to prevent condensation.
- Vent the bin and ice machine drain to the atmosphere. The ice machine drain requires an 18" vent. Do not vent the condenser drain on water-cooled models.

Auxiliary Base Drain Installation

- An auxiliary drain is located in the ice machine base to remove moisture in high humidity areas.
- SF3000C requires base drain connection: 1" (25 mm) NPT.
- View the back of the ice machine base on the compressor side and locate and remove the cap plug.
- Route tubing to an open site drain:

1. Use 0.75" (19 mm) CPVC tubing.
2. Apply a bead of silicone around the exterior of the ice machine tubing and insert into ice machine base. The silicone will secure the tubing and provide a watertight seal.
3. Provide support for tubing.

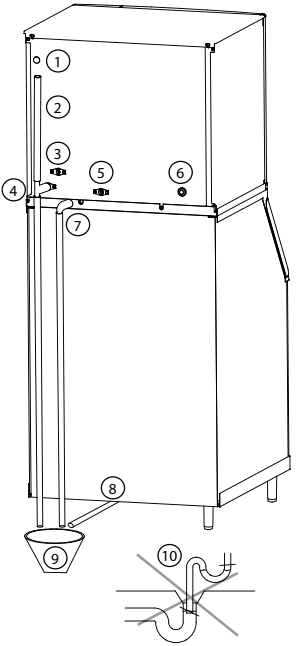
Air Gap

A greater than 1" (25 mm) air gap is built into the ice machine for back-flow prevention. This air gap exceeds NSF 12, AS/NZS 3500.1 and AS/NZS 3500.2 requirements for back-flow prevention.

INSTALLATION NOTE (SWITZERLAND)

The connection to the drinking water network must be made with a certified back flow preventer type EA (EN13959) and with a certified connection hose (EN13618 or EN61770) on site.

Water Supply & Drain Connections



Item	Description
1	Electrical Entrance (2) Options
2	Vent Tube - Minimum Height 18" (46 cm)
3	Ice Making Water Inlet 0.375" (10 mm)
4	Ice Making Water Drain 1.0" (25 mm)
5	Water Condenser Drain 0.75"(19 mm) Install Separate Drain When Used
6	Condenser Water Inlet 0.75" (19 mm)
7	Base Drain 1.0" (25 mm)
8	Bin Drain 1.0" (25 mm)
9	Floor Drain - Open and Trapped
10	**Do Not Trap Drain Line** Leave Air Gap between the Drain Line and Floor Drain

All connections are NPT - National Pipe Thread

Condensing Unit Installation

Each ice machine head section ships from the factory with a refrigerant charge appropriate for the entire system operation. The serial tag on the ice machine indicates the refrigerant charge.

⚠Warning

Installation of a QuietQube® Condensing Unit may require the use of special equipment for placement. Trained and qualified personnel are required for proper rigging and lifting. Holes are provided on the corners of the condensing unit to allow the use of lifting shackles.

QuietQube Ice Machine	Line Set	Suction Line	Liquid Line	Minimum Insulation Thickness
SF3000C	RC-24 RC-34 RC-54	Two Lines 0.75" (19 mm)	One Line 0.625" (16 mm)	0.75" (19 mm) Suction Line 0.25"(7 mm) Liquid Line
Condensing Unit	**Line Set**	**Suction Line**	**Liquid Line**	**Minimum Insulation Thickness**
CVDF3000	RC-24 RC-34 RC-54	Two Lines 0.75" (19 mm)	One Line 0.625" (16 mm)	0.75" (19 mm) Suction Line 0.25"(7 mm) Liquid Line
*All line sets must be insulated with Armaflex				

Notice

Manitowoc systems are only approved and warranted as a complete new package. Warranty on the refrigeration system will be void if a new ice machine head section is connected to preexisting (used) tubing or condensing units or vice versa.

⚠ Caution

The refrigeration system warranty will not apply if the Manitowoc Ice Machine and Manitowoc CVD Condensing Unit are not installed according to specifications. This warranty also will not apply if the refrigeration system is modified with a condenser, heat reclaim device, or other parts or assemblies not manufactured by Manitowoc.

Calculating Installation Distances

Line Set Length

The maximum tubing length is 100 feet (30 meters).

Line Set Rise/Drop

The maximum rise is 35 feet (10.7 meters).

The maximum drop is 15 feet (4.5 meters).

Notice

If a line set has a rise followed by a drop, another rise cannot be made. Likewise, if a line set has a drop followed by a rise, another drop cannot be made.

QuietQube® Models with CVD

Step 1 Secure the Condensing Unit

Through-holes are provided to secure the condensing unit to a curb, rack or wooden timber.

Step 2 Route the Refrigeration Tubing

Route the refrigeration tubing between the ice machine head section and the condenser or CVD condensing unit.

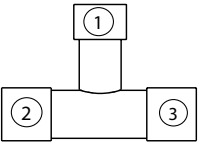
- A suction line oil trap is required when rise is more than 20 feet (6 meters).
- Only one trap is allowed in the line set.
- Shorten the line set as required, do not coil line set.

Manitowoc S-Trap Kit

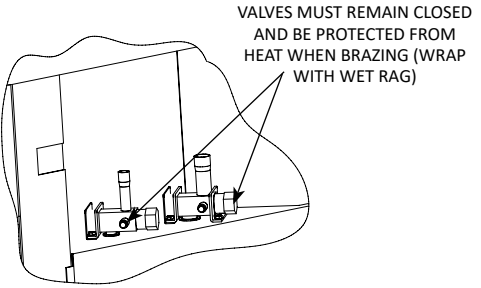
Model	S-Trap Kit Number	Tubing Size
SF3000C	K00166	0.75" (19 mm)

- Requires two S-Trap kits, one for each suction line.
- Maximum amount of time the refrigeration system can be exposed to the atmosphere is 15 minutes.
- Purge line set with dry nitrogen while brazing.
- Shutoff valves for the line set on the ice machine must remain closed and be protected from heat during brazing.
- The condensing unit ships with a 50/50 mixture of nitrogen/helium.

SF3000C has 2 suction lines and requires installation of a tee at the condensing unit.



Item	Description
1	Suction Line on Condensing Unit
2	Suction Line from Head Section
3	Suction Line from Head Section



Step 3 Pressure Test and Evacuate Line Set and CVD Condensing Unit

- Shutoff valves for the line set must remain closed until pressure testing and evacuation are complete.
- Valve core removal tools that allow for removal and installation of the valve cores without removing hoses for the manifold gauge set are recommended to decrease the evacuation time.
- Pressure test at 150 psi (10.34 bar) for a minimum of 15 minutes.
- Minimum evacuation level is 500 microns.
- Minimize the time the refrigeration system is exposed to the atmosphere (15 minutes maximum)

Pressure test the line sets and CVD Condensing Unit with 150 psi (10.34 bar) of dry nitrogen. Add nitrogen at the shutoff valves for the line set located at the back of the ice machine head section or from the access valves located in the CVD Condensing Unit. Complete the pressure test, verify no leaks are present and remove the nitrogen from the system before connecting the vacuum pump. Connect vacuum pump and evacuate system to 500 microns.

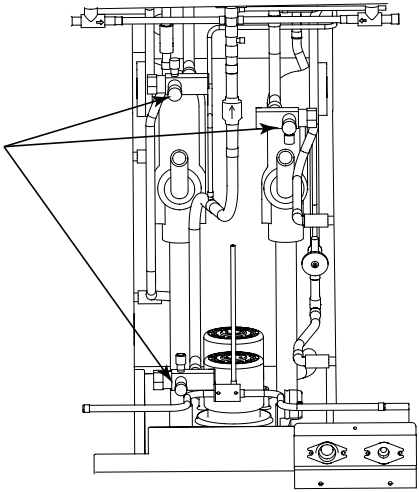
Notice

After opening suction, discharge and receiver service valves, refrigerant pressure will not be detected until the ice machine starts a freeze cycle and the solenoid valves energize.

Step 4 Open Valves for the Line Set and Receiver

You will not hear refrigerant flow when the valves are opened. Refrigerant will not flow until the ice machine is started and the solenoid valve opens.

- All valve caps must be reinstalled, tightened and leak-checked to ensure no refrigerant leakage exists.
- Counterclockwise opens all valves (3). Open the shutoff valves for the suction (2) and liquid lines (1).



Step 5 Leak-Check the Refrigeration System

A. Connect power to the ice machine head section - Do not connect power to the CVD condensing unit.

B. Place the ICE/OFF/CLEAN toggle switch in the ICE position for 60 seconds to equalize pressures.

C. Disconnect power to the ice machine head section.

D. Leak-check line set connections, S-trap and all factory joints in head section and condensing unit.

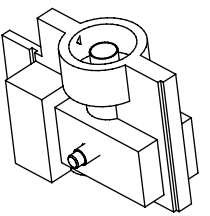
E. Connect power to the CVD condensing unit and allow system to pump down.

Step 6 Insulation Requirements

- To prevent condensation, the entire suction line, including the shutoff valve, must be insulated.
- All insulation must be airtight and sealed at both ends.

The following insulation requirements prevent condensation at 90° F (32°C) ambient temperature and 90% relative humidity. If higher humidity is expected, increase insulation thickness:

Suction Line	Liquid Line	Min. Insulation Thickness
Two Lines 0.75" (19 mm)	One Line 0.625" (16 mm)	0.75" (19 mm) Suction Line 0.25" (7 mm) Liquid Line



Shutoff Valve with Insulation

Ice Machine Refrigerant Amounts

Ice Machine Head Section

Each ice machine head section ships from the factory with a R-404A or R-410A refrigerant charge appropriate for the entire system operation. The serial tag on the ice machine indicates the refrigerant charge. The refrigerant charge is sufficient to operate the ice machine at all ambients with line set lengths up to 100 feet (30 m).

⚠Warning

Potential Personal Injury Situation

The ice machine head section contains the refrigerant charge. Installation and brazing 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.

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De-scaling 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.

Sanitizing for Exterior, Remedial, and Detailed procedures can be performed independently and more frequently than De-scaling when needed.

De-scale and sanitize the ice machine every six months for efficient operation. If the ice machine requires more frequent De-scaling 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 De-scaling and sanitizing.

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

Using non-Manitowoc de-scalers, sanitizers, cleaners or solutions may result in bodily harm and/or cause damage to the ice machine that is not covered under the warranty.

ICE MACHINE INSPECTION

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

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

EXTERIOR CLEANING

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

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

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.

DETAILED DE-SCALING & SANITIZING PROCEDURE

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

- The ice machine and bin must be disassembled, de-scaled and sanitized.
- All ice produced during the de-scaling and sanitizing procedures must be discarded.

REMEDIAL DE-SCALING/SANITIZING PROCEDURE

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

Detailed De-scaling and Sanitizing

Ice Machine De-scaler is used to remove lime scale and mineral deposits. Ice Machine Sanitizer disinfects and removes algae and slime.

- The ice machine must be taken apart for detailed de-scaling and sanitizing.
- Ice machines that are heavily scaled or have not been cleaned on a regular basis will need to run this procedure.

⚠ Caution

Use only Manitowoc approved Ice Machine De-scaler and Sanitizer for this application (Manitowoc De-scaler 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 De-scaler 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 De-scaler or Sanitizer.

DETAILED DE-SCALING PROCEDURE

Step 1 Set the toggle switch to the OFF position after ice falls from the evaporator at the end of a Harvest cycle. Or, set the switch to the OFF position and allow the ice to melt off the evaporator.

Step 2 Remove top cover. This will allow easiest access for adding De-scaler and Sanitizer.

Remove all ice from the bin/dispenser.

Notice

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

Step 3 Place the toggle switch in the CLEAN position. The water will flow through the water dump valve and down the drain. Wait until the water trough refills and water flows over the evaporator, then add the proper amount of ice machine De-scaler.

Amount of De-scaler (#9405463)
16 oz (475 ml)

Step 4 Wait until the clean cycle is complete (approximately 80 minutes). Then place the toggle switch in the OFF position and disconnect power to the ice machine.

⚠Warning

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

Step 5 Remove parts for cleaning. Please refer to “Parts Removal for Detailed De-scaling & Sanitizing” on page 53. Continue with Step 6 when the parts have been removed.

Step 6 Mix a solution of de-scaler and warm 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
De-scaler	1 gal (4 L)	16 oz (475 ml) De-scaler

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

Step 8 While components are soaking, use half of the de-scaler/water solution to de-scale all foodzone surfaces of the ice machine and bin. Use a nylon brush or cloth to thoroughly de-scale the following ice machine areas:

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

Step 9 Rinse all areas thoroughly with clean water.

DETAILED SANITIZING PROCEDURE

Step 1 Mix a solution of sanitizer and warm water.

Solution Type	Water	Mixed With
Sanitizer	6 gal (22 L)	4 oz (120 ml) Sanitizer

Step 2 Use half of the sanitizer/water solution to sanitize all removed components. Use a spray bottle, cloth, or sponge 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 3 Use half of the sanitizer/water solution to sanitize all foodzone surfaces of the ice machine and bin (or dispenser). Use a spray bottle, cloth, or sponge 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

Do not rinse sanitized areas.

Step 4 Replace all removed components.

Step 5 Wait 20 minutes.

Step 6 Reapply power to the ice machine and place the toggle switch in the CLEAN position.

Step 7 Wait until the water trough refills and water flows over each evaporator (approximately 3 minutes). Add the proper amount of Manitowoc Ice Machine Sanitizer to the water trough by pouring between the water curtain and evaporator.

Amount of Sanitizer (#9405453)
25 oz (740 ml)

Step 8 Move the toggle switch to the ICE position and replace the front panel. The ice machine will automatically start ice making after the sanitize cycle is complete (approximately 80 minutes)

Parts Removal for Detailed De-scaling & Sanitizing

Notice

Electrical connector must never be exposed to any liquids.

A. Remove front evaporator shield

- Remove four quarter turn connectors.
- Remove front evaporator shield.

B. Remove left and right evaporator top covers

- Remove two thumbscrews from the front of each evaporator top cover.
- Lift front of cover, pull forward to remove.

C. Remove splash shields

NOTE: Each evaporator has a splash shield that must be removed - total of four splash shields.

- Grasp the top center of splash shields.
- Lift up and then out.

D. Remove ice thickness probes

- Compress the hinge pin on the top of each 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 pump assembly

- Disconnect the vinyl distribution tube from both water pumps.
- Disconnect the water pump and water level probe electrical connections.
- After the wires are disconnected, remove the two thumbscrews and lift the water pump assembly out of the ice machine.
- Remove the thumbscrews securing the water pumps (2 each pump) and remove water pumps. Do not immerse the water pump motor in cleaner or sanitizer solutions. Remove the water level probe from the assembly housing.

F. Remove the water trough

- Pull forward on the water trough to remove.

G. Remove distribution tubes

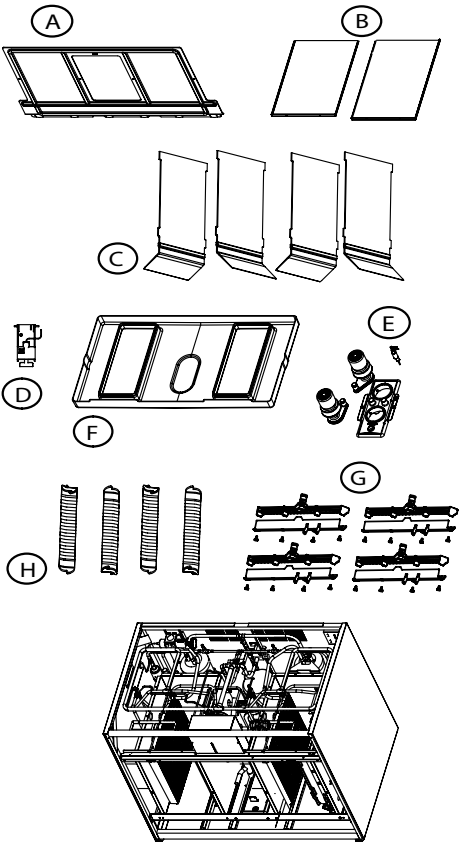
NOTE: Each evaporator has a distribution tube that must be removed - total of four distribution tubes.

- Distribution tube thumbscrews are retained to prevent loss. Loosen thumbscrews but do not pull thumbscrews out of distribution tube.
- Loosen the two outer screws 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.

H. Remove ice dampers

NOTE: Each evaporator has an ice damper that must be removed - total of four ice dampers.

- Grasp ice damper and apply pressure toward the back mounting bracket.
- Apply pressure to the front mounting bracket with thumb.
- Pull ice damper downward when the front ice damper pin disengages.



Remedial De-scaling & Sanitizing Procedure

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

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

Step 1 Remove front panel and top cover. This will allow easiest access for adding De-scaler and Sanitizer.

Step 2 Ice must not be on the evaporator during the de-scale/sanitize cycle. Use one of these methods:

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

Notice

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

Step 3 Remove all ice from the bin.

Step 4 Place the toggle switch in the CLEAN position. The water will flow through the water dump valve and down the drain. Wait until the water trough refills and water flows over the evaporator, then add the proper amount of ice machine de-scaler or sanitizer.

Amount of Solution
De-scaler (#9405463): 16 oz (475 ml)
Sanitizer (#9405453): 25 oz (740 ml)

Step 5 Wait until the CLEAN cycle is complete (approximately 80 minutes).

Step 6 Move the toggle switch to the ICE position and replace the front panel. The ice machine will automatically start ice making after the cycle is complete.

Exterior Cleaning

Clean the area around the ice machine as often as necessary to maintain cleanliness and efficient operation. Use cleaners designed for use with stainless steel products.

Sponge any dust and dirt off the outside of the ice machine with mild soap and water. Wipe dry with a clean, soft cloth.

Heavy stains should be removed with stainless steel wool. Never use plain steel wool or abrasive pads. They will scratch the panels.

Removal from Service/Winterization

All Models

1. De-scale and sanitize the ice machine.
2. Move the ICE/OFF/CLEAN switch to OFF.
3. Turn off the water supply, disconnect and drain the incoming ice-making water line at the rear of the ice machine and drain the water trough.
4. Energize the ice machine, wait one minute for the water inlet valve to open and blow compressed air in both the incoming water and the drain openings in the rear of the ice machine to remove all water.

Water-cooled models only

- Disconnect the incoming water and drain lines from the water-cooled condenser.
- Insert a large screwdriver between the bottom spring coils of the water regulating valve and pry open the Water Regulating Valve.
- Hold the valve open and blow compressed air through the condenser until no water remains.

All Models

5. Move ICE/OFF/CLEAN switch to OFF and disconnect the electric power at the circuit breaker or the electric service switch.
6. Fill spray bottle with sanitizer and spray all interior food zone surfaces. Do not rinse and allow to air dry.
7. Replace all panels.

Ice Making Sequence of Operation

NOTE: The toggle switch must be in the ice position 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 are energized to purge the ice machine of old water. This feature ensures that the ice making cycle starts with fresh water.

Quad evaporator models energize the harvest valve(s) and air compressor (when used) during the water purge and they remain energized during refrigeration start-up.

CVD Condensing Unit

When the refrigerant pressure is high enough to close the low-pressure control the contactor coil energizes and the compressor starts.

The compressor and fan cycling control* are supplied with power throughout the entire Freeze and Harvest Sequences. When the refrigerant pressure is high enough to close the fan cycling pressure control the condenser fan motor starts.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Dump Valve (red), Water Pump (red)

2. Refrigeration System Start-Up

Ice Machine Head Section

The liquid line solenoid valve and water inlet valve energize. Five seconds later evaporator models de-energize the harvest valve(s) and air compressor (when used).

CVD Condensing Unit

When the refrigerant pressure is high enough to close the low-pressure control the contactor coil energizes and the compressor starts.

The compressor and fan cycling control* are supplied with power throughout the entire Freeze and Harvest Sequences. When the refrigerant pressure is high enough to close the fan cycling pressure control the condenser fan motor starts.

*The IB0680C & S0680C ice machines do not use a fan cycling control. The compressor and the condenser fan motor are wired through the contactor. Any time the contactor coil is energized, these components are supplied with power.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Water Solenoid (red), Liquid Solenoid (red)

FREEZE SEQUENCE

3. Pre chill

The compressor lowers the temperature of the evaporator(s) before the water pump(s) are energized. The water fill valve will remain energized until water contacts the water level probe.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Water Solenoid (red), Liquid Solenoid (red)

4. Freeze

The water pump(s) energizes and water flows over the evaporator. After water contacts the water level probe the water fill valve de-energizes. The water fill valve may cycle on and then off one more time.

The freeze cycle continues until the six minute freeze lock expires and enough ice has formed to allow water to contact the ice thickness probe. After approximately 10 seconds of continual water contact, the harvest sequence is initiated.

NOTE: Freeze lock is bypassed after moving the toggle switch from OFF to ICE position for the first cycle only.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Water Level (green), Water Solenoid (red), Liquid Solenoid (red), Water Pump (red), Harvest (red *when water contacts the ice thickness probe*)

HARVEST SEQUENCE

5. Water Purge

The air compressor (when used) and the harvest valve(s) open at the beginning of the water purge to divert hot refrigerant gas into the evaporator.

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

Evaporator models energize the water fill valve for the last 15 seconds of the water purge cycle.

CVD Condensing Unit

When the refrigerant pressure is low enough to open the fan cycling pressure control the condenser fan motor stops.

*The IB0680C & S0680C ice machines do not use a fan cycle control, therefore the condenser fan motor will continue to run in the harvest cycle.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Liquid Solenoid (red), Dump Valve (red), Water Pump (red), Harvest (red), All Harvest Valves (red)

6. Harvest

The air compressor (when used) remains energized and the harvest valve(s) remains open. The refrigerant gas warms the evaporator causing the cubes to slide, as a sheet, off the evaporator and into the storage bin.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = All Curtain Switches (green), Liquid Solenoid (red), Harvest (red), All Harvest Valves (red)

Quad Evaporator Models

The sliding sheet of cubes opens the ice damper and bin switch. The momentary opening and re-closing of the bin switch de-energizes the harvest valve for the evaporator. When all of the bin switches have opened and closed the ice machine will terminate the harvest sequence and return to the freeze sequence (Step 3 - 4.)

ENERGIZED CONTROL BOARD LIGHTS (once ice drops)

Quad Evaporators = All Curtain Switches (green *flashes once*), Liquid Solenoid (red)

Quad Evaporator Models Only

Water Assist Harvest Feature

Typical duration of a Harvest sequence is less than 2.5 minutes. When the Harvest sequence time reaches 4 minutes, the following occurs:

- 4 minutes into a Harvest sequence: The water fill valve will energize to fill the trough with water until reaching the water level probe.
- 5 minutes into a Harvest sequence: The water pump will energize and flow water over the evaporators.
- The water fill valve remains on until water reaches the water level probe, the water pump remains on until all bin switches have been activated, or until the 7-minute Harvest sequence time limit is reached.

AUTOMATIC SHUT-OFF

7. Automatic Shut-Off

Ice Machine Section

Shuts off when:

- The storage bin is full at the end of a harvest sequence.
- The sheet of cubes fails to clear the water curtain and hold it open.
- Ice contacts the bin level thermostat probe (when used).
- Ice damper is held down.

After the water curtain or ice damper are held open for 30 seconds, the ice machine shuts off. The ice machine remains off for 3 minutes before it can automatically restart.

CVD Condensing Unit

The liquid line solenoid valve closes, allowing the refrigeration system to pump down. When the refrigerant pressure is low enough to open the fan cycling pressure control the condenser fan motor stops. When the refrigerant pressure is low enough to open the low pressure control, the contactor coil is de-energized and the compressor stops.

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 ice damper. As the water curtain or ice damper swings back to the operating position, the bin switch re-closes and the ice machine restarts (steps 1 - 2), provided the 3 minute delay period is complete.

*All CVD0675 and early production CVD0685 condensing units were manufactured without a fan cycle control and will not energize and de-energize the fan motor. Current production CVD0685 are manufactured with a fan cycle control.

ENERGIZED CONTROL BOARD LIGHTS

Quad Evaporators = Depending on which damper is open, the closed dampers will be lit (green)

Quad Evaporator Energized Parts Chart								
Ice Making Sequence of Operation	**Water Pump**	**Harvest Valve (s)**	**Air Pumps**	**Water Inlet Valve**	**Water Dump Valve**	**Liquid Line Solenoid Valve**	**Refrigeration Compressor & Condenser Fan Motor**	**Length of Time**
Start-Up - Initial or After Auto Shut Off 1. Water Purge	On	Off	Off	Off	On	Off	Off	45 Seconds
2. Refrigeration System Start-up	Off	Off	Off	On	Off	On	On	5 Seconds
Freeze Sequence 3. Pre chill	Off	Off	Off	On	Off	On	On	30 Seconds
4. Freeze	On	Off	Off	Cycles Off then On/Off one more time	Off	On	On	Until 10 sec. water contact with ice thickness probe

Quad Evaporator Energized Parts Chart								
Ice Making Sequence of Operation	**Water Pump**	**Harvest Valve (s)**	**Air Pumps**	**Water Inlet Valve**	**Water Dump Valve**	**Liquid Line Solenoid Valve**	**Refrigeration Compressor & Condenser Fan Motor**	**Length of Time**
Harvest Sequence **5. Water Purge**	On	On	On	Off	On	On	On	45 Seconds
6. Harvest	Off	On	On	Off	Off	On	On	Bin switch activation
7. Automatic Shut-Off	Off	Off	Off	Off	Off	Off	Off	Until all bin switches re-close & 3 min. delay expires

Safety Timers

The control board has the following non-adjustable safety timers:

- The ice machine is locked into the freeze cycle for 6 minutes before a harvest cycle can be initiated.
- The maximum freeze time is 60 minutes at which time the control board automatically initiates a harvest sequence (steps 5 & 6).
- The maximum harvest time is 3.5 minutes at which time the control board automatically ends the harvest cycle. When the bin switch is closed a freeze sequence initiates (steps 3 & 4). When the bin switch is open an automatic shutoff sequence initiates.
- The maximum water fill is 6 minutes.

Water Assist Harvest Feature

QUAD EVAPORATORS ONLY

Typical duration of a Harvest sequence is less than 2.5 minutes. When the Harvest sequence time reaches 4 minutes, the following occurs:

- 4 minutes into a Harvest sequence: The water fill valve will energize to fill the trough with water.
- 5 minutes into a Harvest sequence: The water pump will energize and flow water over the evaporators.
- The water fill valve and water pump remain on until all bin switches have been activated, or until the 7-minute Harvest sequence time limit is reached.

Control Board Timers

The control board has the following non-adjustable timers:

- The ice machine is locked into the freeze cycle for 6 minutes before a harvest cycle can be initiated. Freeze lock is bypassed after moving the toggle switch from OFF to ICE position for the first cycle only.
- The maximum freeze time is 60 minutes at which time the control board automatically initiates a harvest sequence.
- The maximum harvest time is 7 minutes for multiple evaporator models. The control board automatically initiates a freeze sequence when these times are exceeded.

Safety Limits

Safety Limits are stored and indicated by the control board after three cycles. The number of cycles required to stop the ice machine varies for each Safety Limit.

- Safety Limit 1 - If the freeze time reaches 60 minutes, the control board automatically initiates a harvest cycle. If 6 consecutive 60 minute freeze cycles occur, the ice machine stops.
- Safety Limit 2 - If the harvest time reaches 7 minutes, the control board automatically returns the ice machine to the freeze cycle. If 500 consecutive 7 minute harvest cycles occur, the ice machine stops.
- Safety Limit 3 (ST3000W only) - If the low refrigerant pressure control opens, the ice machine shuts off and starts a 5 minute delay period. If 3 consecutive low pressure events occur, the ice machine stops and flashes the harvest light.

Use the following procedures to determine if the control board contains a safety limit indication.

- Move the toggle switch to OFF.
- Move the toggle switch back to ICE. Watch the safety limit lights/harvest light on the control board. If a safety limit has been recorded, the corresponding light will blink once, twice or three times to indicate which safety limit stopped the ice machine.

Minimum/Maximum Slab Weight

Adjust ice thickness to meet chart specifications.

Evaporator	Minimum Ice Weight Per Cycle	Maximum Ice Weight Per Cycle
Quad Evaporators	24.4 lbs (11.07 kg)	27.5 lbs (12.5 kg)

NOTE: S3000 series has four evaporators.

Notice

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

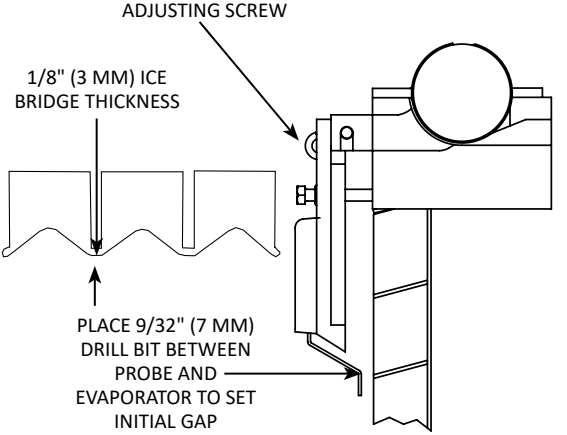
Ice Thickness Check

After a harvest cycle, inspect the ice cubes in the ice storage bin. The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8" (3 mm).

NOTE: Make sure the water curtain is in place when performing this check. It prevents water from splashing out of the water trough.

1. Inspect the bridge connecting the cubes. It must be approximately 1/8" (3 mm) thick.
2. If adjustment is necessary, turn the ice thickness probe adjustment screw clockwise to increase bridge thickness, counterclockwise to decrease bridge thickness. Set at 1/4" (6 mm) gap between ice machine and evaporator as starting point, then adjust to achieve a 1/8" (3 mm) bridge thickness.

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



NOTE: Verify the ice thickness probe wire doesn't restrict probe movement.

Safety Limits

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

Use the following procedures to determine if the control board contains a safety limit indication.

1. Move the toggle switch to OFF.
2. Move the toggle switch back to ICE.
3. Watch the safety limit lights/harvest light on the control board. If a safety limit has been recorded, the corresponding light will flash once, twice or three times to indicate which safety limit stopped the ice machine.

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

- **Safety Limit 1** ***all models*** - If the freeze time reaches 60 minutes, the control board automatically initiates a harvest cycle. If 6 consecutive 60-minute freeze cycles occur, the ice machine stops
- **Safety Limit 2** ***quad evaporator models*** - If the harvest time reaches 7 minutes, the control board automatically returns the ice machine to the freeze cycle. If 500 consecutive 7 minute harvest cycles occur, the ice machine stops.
- **Safety Limit 3 (ST3000W only)** ***quad evaporator models*** - If the low refrigerant pressure control opens, the ice machine shuts off and starts a 5 minute delay period. If 3 consecutive low pressure events occur the ice machine stops and flashes the harvest light.

QUAD EVAPORATOR MACHINES ONLY

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

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

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

When a safety limit condition is exceeded for 3 consecutive cycles the control board enters the limit to memory and the ice machine continues to run. Use the following procedure to determine if the control board contains a safety limit indication.

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

When a safety limit condition is exceeded (6 consecutive cycles for safety limit #1 or 500 cycles for safety limit #2) the ice machine stops, and the harvest light on the control board flashes on and off. Use the following procedure to determine which safety limit has stopped the ice machine.

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

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

SAFETY LIMIT ANALYSIS

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

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

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

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

Refrigeration and electrical component failures will cause a safety limit 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.

SAFETY LIMIT #1

Freeze time exceeds 60 minutes for 6 consecutive freeze cycles

Possible Cause Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 96

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 head pressure control
- 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

SAFETY LIMIT #2

Quad Models - Harvest time exceeds 7 minutes for 500 consecutive harvest cycles

Possible Cause Checklist

Improper Installation

- Refer to "Installation/Visual Inspection Checklist" on page 96

Water System

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

Electrical System

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

Refrigeration System

- Non-Manitowoc components
- Improper refrigerant charge
- Defective head pressure control valve
- Defective harvest valve
- TXV flooding (check bulb mounting)
- Defective fan cycling control
- CVD1486 Only - Water inlet valve is incorrectly adjusted or will not close during harvest cycle.

SAFETY LIMIT #3

Water System

- Water supply to machine is being interrupted
- Water leaking down the drain during freeze (dump valve)
- Water tracking into bin
- Uneven water flow over evaporator
- Water pump not pumping

Electrical System

- Water level probe prematurely satisfied
- Water inlet valve failure
- Water pump failure

Refrigeration System

- Low on Refrigerant
- Starving TXV

Control Board Testing

All replacement S Model control boards and ice machines with serial numbers larger than 110924847 have a control board that includes a diagnostic test cycle. The control board can be identified by the blue printed circuit board and a push button switch on the bottom left corner labeled “service mode”.

CONTROL BOARD TEST CYCLE

1. Place the toggle switch in the ice position.
2. Press and hold the test button for 5 seconds.
3. The control board memory is cleared.
    A. All safety limits are cleared
    B. Resets to factory default settings
    C. Calibration is cleared for ice thickness & water level probe.
4. The control board relays close at 1 second intervals and energize the corresponding control board light.
5. The relays remain closed and the lights remain energized for 3.5 minutes to allow time to test voltage at components.
6. After 3.5 minutes the ice machine automatically exits the test cycle.
7. An ice making cycle will automatically start (unless the toggle switch is moved to OFF).
8. Water level and ice thickness probe calibration are processed and stored in control board memory during the second ice making cycle.

NOTE: The test cycle can be terminated at anytime by moving the toggle switch from ICE to OFF, or by disconnecting and reapplying line voltage to the ice machine.

Troubleshooting By Symptom

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

Symptom #1

Ice Machine Stops Running
Toggle Switch is in the ICE position
or
Has a History of Shutting Down

Refer to Ice Machine Stops Running Flow Chart (page 81)

Symptom #2

Ice Machine has a Long Freeze Cycle.
Ice Formation is Thick
or
Thin Ice Fill on Top or Bottom of Evaporator
or
Low Production

Safety Limit #1 (possible)

- Refer to Freeze Cycle Refrigeration System Operational Analysis Table (page 76)

Symptom #3

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

Safety Limit #2 (possible)

- Refer to Refrigeration Harvest Flow Chart (page 114)

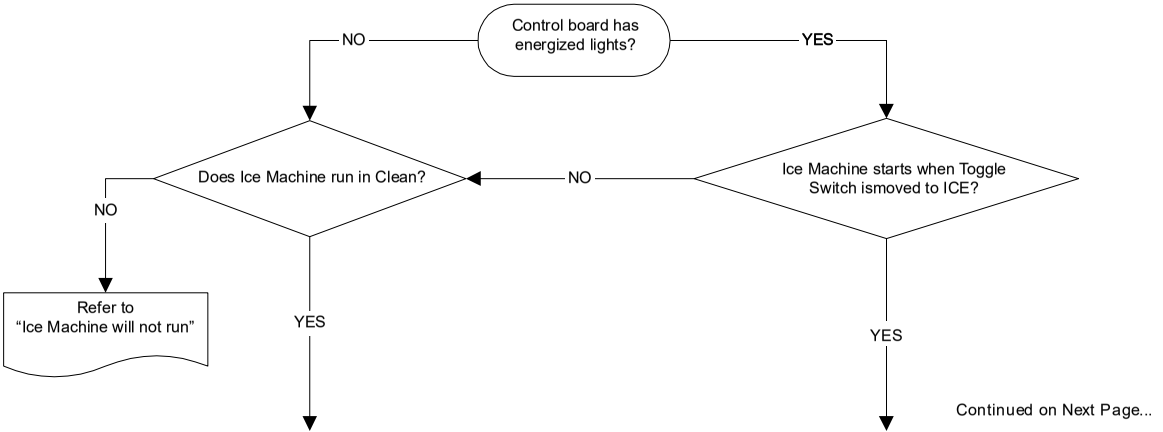
Symptom #4

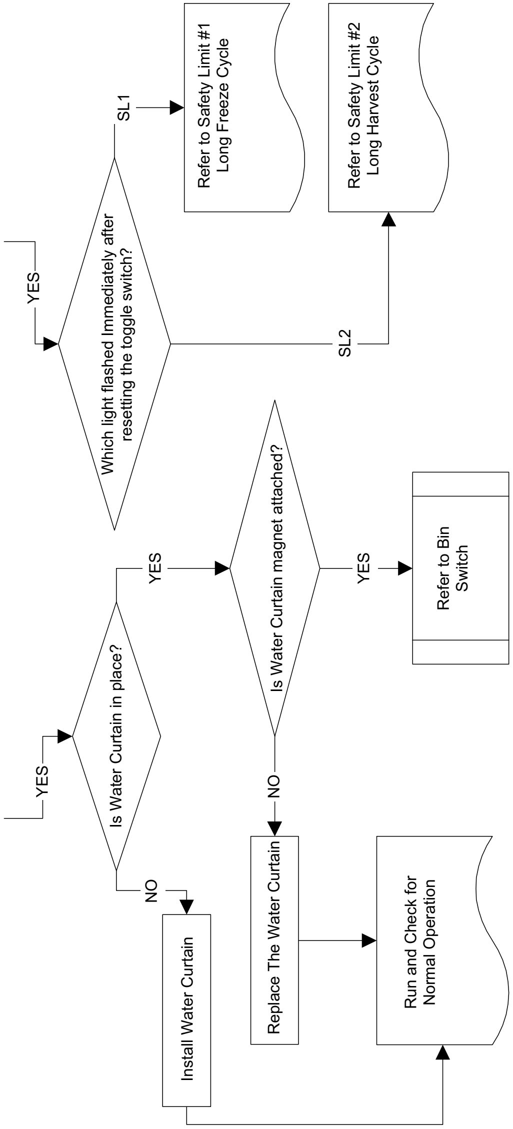
Ice Machine Will Not Harvest - Freeze Cycle is Normal and Ice Cubes are Melted After Harvest

- Refer to Ice Melt out Flow Chart (page 118)

Symptom #1 Ice Machine Will Not Run

Ice Machine Stops Running or has History of Shuttng Down




YES
Which light flashed Immediately after resetting the toggle switch?
SL1
Refer to Safety Limit #1 Long Freeze Cycle
SL2
Refer to Safety Limit #2 Long Harvest Cycle
YES
Is Water Curtain in place?
YES
Is Water Curtain magnet attached?
YES
Refer to Bin Switch
NO
Install Water Curtain
NO
Replace The Water Curtain
Run and Check for Normal Operation

DIAGNOSING AN ICE MACHINE HEAD SECTION THAT WILL NOT RUN

⚠Warning

High (line) voltage is applied to the control board (terminals #55 and #56) at all times. Removing control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

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

DIAGNOSING A CONDENSING UNIT THAT WILL NOT RUN

If the ice machine water pump is not energized, refer to “Diagnosing an Ice Machine Head Section that Will Not Run” on page 83

1. Verify primary voltage is supplied to ice machine condensing unit and the fuse/circuit breaker is closed.
2. Verify the high-pressure cutout and low-pressure cutouts are closed. The HPCO and LPCO are closed if primary line voltage is present at the contactor coil terminals.
3. Verify line voltage is present at the contactor coil.
4. Verify the contactor contacts are closed and line voltage is present across all lines.
5. Refer to compressor diagnostics page 85.

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 and a mechanically seized compressor.

To determine which you have:

- Install high and low side gauge set.
- Try to start the compressor.
- Watch the pressures closely.
- If the pressures do not move, the compressor is seized. Replace the compressor.

If the pressures move, the compressor is turning slowly and is not seized. Check the capacitors and relay.

COMPRESSOR DRAWING HIGH AMPS

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

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

DIAGNOSING CAPACITORS

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

Symptom #2 Low Production, Long Freeze Cycle

Ice Machine has a Long Freeze Cycle.
Ice Formation is Thick
or
Thin Ice Fill on Top or Bottom 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" on page 93 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 check marks (√).

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

Example: Freeze cycle suction pressure is determined to be low. Enter a check mark in the "low" column.

Step 3 Add the check marks listed under each of the four columns. Note the column number with the highest total and proceed to "Final Analysis."

NOTE: If two columns have matching high numbers, a procedure was not performed properly, supporting material was not analyzed correctly or the problem component is not covered by the analysis table.

Quad Expansion Valve – S3070C/SF3000C				
Operational Analysis	**1**	**2**	**3**	**4**
Ice Production	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	All installation and water related problems must be corrected before proceeding with chart.			
Ice Formation Pattern Evaporators are numbered left to right viewed from the front of the ice machine Evaporator #1 _____ Evaporator #2 _____ Evaporator #3 _____ Evaporator #4 _____	Ice formation is normal	Ice formation is extremely thin on outlet of 1 or more evaporators -or- No ice formation on entire evaporator	Ice formation normal	Ice formation normal -or- No ice formation on entire evaporator

Quad Expansion Valve – S3070C/SF3000C				
Operational Analysis	**1**	**2**	**3**	**4**
Safety Limits Refer to "Analyzing Safety Limits" page 75 to eliminate all non-refrigeration problems.	Stops on Safety Limit: **2**	Stops on Safety Limit: **1 or 2**	Stops on Safety Limit: **2**	Stops on Safety Limit: **1**
Freeze Cycle **Discharge Pressure** _____ _____ _____ 1 minute Middle End	If discharge pressure is High or Low refer to freeze cycle high or low discharge pressure problem checklist page 102 & page 103 to eliminate problems and/or components not listed on this table before proceeding.			
Freeze Cycle Suction Pressure _____ _____ _____ 1 minute Middle End				
	If suction pressure is High or Low refer to freeze cycle high or low suction pressure problem checklist page 105 & page 106 to eliminate problems and/or components not listed on this table before proceeding.			
	Suction pressure is **Normal or High**	Suction pressure is **Low or Normal**	Suction pressure is **Normal or High**	Suction pressure is **High**

Quad Expansion Valve – S3070C/SF3000C				
Operational Analysis	**1**	**2**	**3**	**4**
Evaporator Outlet Temperature Comparison Attach and insulate temperature probes between evaporator outlet and 90° elbow	Evaporator outlet temperatures are **within 10°F of each other**	Evaporator outlet temperatures are **NOT within 10°F of each other** -or- **Within 10°F of each other and above 32°F**	Evaporator outlet temperatures are **NOT within 10°F of each other**	Evaporator outlet temperatures are **within 10°F of each other**
Harvest Valve A leaking harvest valve gives an audible indication before ice fill pattern or machine performance is affected	**Audible flow** of refrigerant through any harvest valve during the freeze cycle	**No Audible flow** of refrigerant through any harvest valve during the freeze cycle	**No Audible flow** of refrigerant through any harvest valve during the freeze cycle	**No Audible flow** of refrigerant through any harvest valve during the freeze cycle
Final Analysis Enter total number of boxes checked in each column.	**Harvest Valve Leaking**	**Low On Charge** **-or-** **TXV Starving**	**Refrigerant Overcharge** **-or-** **TXV Flooding**	**Compressor**

SYMPTOM #2 - FREEZE CYCLE REFRIGERATION SYSTEM OPERATIONAL ANALYSIS TABLE PROCEDURES

The following is the procedures for completing each step of the Symptom #2 - Freeze Cycle Refrigeration System Operational Analysis Tables see page 90. Each procedure must be performed exactly for the table to work correctly.

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?

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 (21.2°C) outdoor ambient temperature and 50°F (10.0°C) water produces more ice than the same model condensing unit with a 90°F (32.2°C) outdoor ambient temperature and 70°F (21.2°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. 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	×	_____ 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 is normal when these numbers match closely. 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.

Installation/Visual Inspection Checklist

Inadequate Clearances

- Check all clearances on sides, back and top.

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

Line set is improperly installed

- Reinstall according to the Installation Manual

Water System Checklist

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

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

Water area (evaporator) is dirty

- Clean as needed

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

- Install water regulator valve or increase water pressure

Incoming water temperature is not between 40°F (4.4°C) and 90°F (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

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 or float 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

Water is freezing behind the evaporator

- Correct the water flow

Plastic extrusions and gaskets are not secured to the evaporator

- Remount/replace as needed

Ice Formation Pattern

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

Analyzing the ice formation pattern alone cannot diagnose an ice machine malfunction. However, when this analysis is used along with Manitowoc's Symptom #2 - Refrigeration System Operational Analysis Table, it can help diagnose an ice machine malfunction.

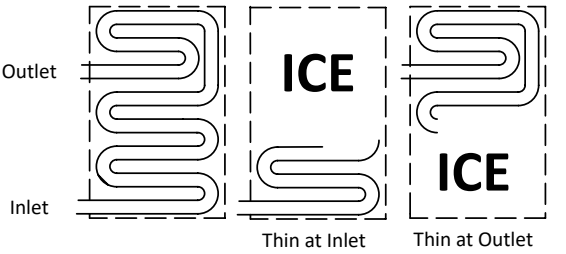
Any number of problems can cause improper ice formation.

Important

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

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.

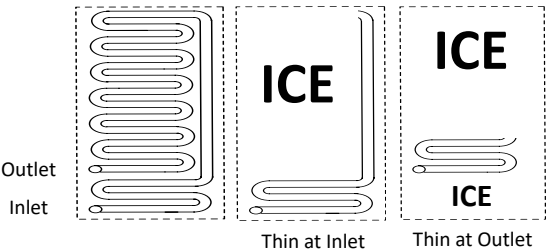


Ice Formation Pattern IB Models

Tubing routing for Ice Beverage evaporators is different. The evaporator outlet is moved lower on the evaporator.

- IB600 and IB800 evaporators outlets exit roughly 1/2 way down the evaporator. Extremely Thin at the Evaporator Outlet will first be visible near the middle of the evaporator
- IB1000 evaporator outlet is roughly 3/4 of the way down the evaporator. Extremely Thin at the Evaporator Outlet will first be visible near the bottom and then the right side of the evaporator.

Extremely Thin at the Evaporator Inlet remains the same as the other models and will first be visible several inches above the bottom of the evaporator.



Ice Formation Patterns

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

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" If ice forms uniformly across the evaporator surface, but does not reach 1/8". in the proper amount of time, this is still considered normal ice fill pattern.

2. Extremely Thin at Evaporator Outlet

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

Examples: No ice at all at 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" to initiate a harvest, but the inlet of the evaporator already has 1/2" to 1" of ice formation.

3. Extremely Thin at Evaporator Inlet

There is no ice, or a considerable lack of ice formation on the evaporator inlet. Examples: The ice at the outlet of the evaporator reaches 1/8" 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.

Analyzing Discharge Pressure

1. Determine the ice machine operating conditions:
   Air temp. entering condenser _____
   Air temp. around ice machine _____
   Water temp. entering sump trough _____
2. Refer to Cycle Times/24-Hour Ice Production/ Refrigeration Pressure Chart for ice machine being checked.

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

	Freeze Cycle psig
1 Minute into Freeze Cycle	_____
Middle of Freeze Cycle	_____
End of Freeze Cycle	_____

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

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

Freeze Cycle Discharge Pressure High Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 96

Condenser Restriction

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

Improper Refrigerant Charge

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

Other

- Non-Manitowoc components in system
- High side refrigerant lines/component restricted (before mid-condenser)
- Defective head pressure control valve
- Water Inlet Valve is incorrectly adjusted (CVD1486 only)

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

Freeze Cycle Discharge Pressure Low Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 96

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- Non-Manitowoc components in system
- High side refrigerant lines/component restricted (before mid-condenser)
- Defective head pressure control valve
- Defective fan cycle control
- Water regulating valve incorrectly set (CVD1486 only)

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

Analyzing Suction Pressure

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

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

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

PROCEDURE

Step 1 Determine the ice machine operating conditions. *Temperature of air entering the condenser. Look up and determine the published suction pressure.

Step 2 2. Perform an actual suction pressure check at the beginning, middle and end of the Freeze cycle. *Freeze cycle begins when the water pump starts

Step 3 3. Compare the actual Freeze cycle suction pressure (step 2) to the published Freeze cycle pressure. Determine if the suction pressure is high, low or normal.

Suction Pressure High Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” on page 96

Discharge Pressure

- Discharge pressure is too high and is affecting suction pressure – refer to page 102

Improper Refrigerant Charge

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

Other

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

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

Suction Pressure Low Checklist

Improper Installation

- Refer to “Installation/Visual Inspection Checklist” page 145

Discharge Pressure

- Discharge pressure is too low and is affecting suction pressure – refer to Discharge pressure is too high and is affecting suction pressure – refer to page 103

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- Non-Manitowoc components in system
- Improper water supply over evaporator – refer to page 96
- Loss of heat transfer from tubing on back side of evaporator
- Restricted/plugged liquid line drier
- Restricted/plugged tubing in suction side of refrigeration system
- TXV starving

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

Harvest Valve

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

NORMAL OPERATION

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

1. Prevents refrigerant from entering the evaporator during the Freeze cycle.

   The harvest valve is not used during the Freeze cycle. The harvest valve is de-energized (closed) preventing refrigerant flow from the receiver into the evaporator.

2. Allows refrigerant vapor to enter the evaporator in the Harvest cycle.

   During the Harvest cycle, the harvest valve is energized (open), allowing refrigerant gas from the top of the receiver to flow into the evaporator. The refrigerant changes state (from a vapor to a liquid) and gives up latent heat. This heat is absorbed by the evaporator and allows release of the ice slab. In general, Harvest cycle suction pressure rises, then stabilizes in the range of 65-125 psig (448-861 kPa).

   Exact pressures vary according to ambient temperature and ice machine model. Harvest pressures can be found in the “Cycle Times/24-Hour Ice Production/Refrigerant Pressure Charts” on page 181.

HARVEST VALVE ANALYSIS

The valve can fail in two positions:

- Valve will not open in the Harvest cycle.
- Valve remains open during the Freeze cycle.

Valve will not open in the Harvest cycle

Although the circuit board has initiated a Harvest cycle, suction and discharge pressures remain unchanged from the Freeze cycle. The ice machine will remain in the Harvest cycle for 3.5 minutes (7 minutes Quad Evaporators), then initiate a new Freeze cycle. After three consecutive Harvest cycles of 3.5 minutes (7 minutes Quad Evaporators) the ice machine will stop on a safety limit #2.

Valve remains open in the Freeze cycle

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

A small amount of leakage will cause increased freeze times and an ice fill pattern that is normal.

As the amount of leakage increases, the length of the Freeze cycle increases and the amount of ice on the bottom of the evaporator decreases.

A small amount of leakage will cause an audible indication as the vapor passes through the valve. As the size of the leak increases, the audible indication becomes more apparent.

If replacement is necessary, use only “original” Manitowoc replacement parts.

Analyzing Freeze Cycle Suction Line Temperature

Suction line temperature cannot diagnose an ice machine. However, comparing this temperature during the freeze cycle, along with using Manitowoc's Symptom #2 - Refrigeration System Operational Analysis Table, can help diagnose an ice machine malfunction.

The actual temperature of the suction line varies by model, and will change throughout the freeze cycle. This makes documenting the "normal" suction line temperature difficult. The key to the diagnosis is observing the compressor suction line temperature during the last three minutes of the freeze cycle.

1. Use a quality temperature meter, capable of taking temperature readings on curved copper lines.
2. Attach the temperature meter thermocouple to the copper suction line within 6" of the shut-off valves.

Important

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

3. Monitor the suction line temperature during the last three minutes of the freeze cycle and record the low event.
4. Use this with other information gathered on the Refrigeration Component Analysis Chart to determine the ice machine malfunction.
5. Verify refrigerant amount is correct by weight when recovering refrigerant and replacing a TXV. Grossly overcharged QuietQube® ice machine in ambient temperatures below 70°F will have a suction line temperature below 10°F.

Final Analysis

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

COLUMN 1 - HARVEST VALVE LEAKING

A leaking harvest valve must be replaced.

COLUMN 2 - LOW CHARGE OR TXV STARVING

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

1. Do not add charge to remotes. The symptoms of a remote low on charge will result in a safety limit #1 or #2 in cool ambient temperatures. Low on charge symptoms would be a hot liquid line with normal or below normal head pressure.
2. Find the refrigerant leak. The ice machine must operate with the nameplate charge. If the leak cannot be found, proper refrigerant procedures must still be followed Change the liquid line drier. Then, evacuate and weigh in the proper charge.

COLUMN 3 - REFRIGERANT OVERCHARGE OR TXV FLOODING

A loose or improperly mounted expansion valve bulb causes the expansion valve to flood. Check bulb mounting, insulation, etc., before changing the valve. Verify refrigerant amount is correct by weighing recovered refrigerant before replacing a TXV. On Quad evaporator machines, the service technician is able to tell which TXV is flooding by comparing the evaporator outlets. Change only the flooding expansion valve.

COLUMN 4 - COMPRESSOR

Replace the compressor and start components. To receive warranty credit, the compressor ports must be soldered closed to prevent oil leakage in transit.

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

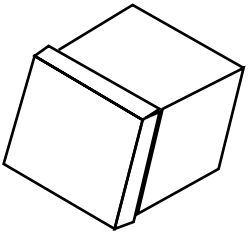
Symptom #3 Ice Will Not Harvest

ICE MACHINE WILL NOT HARVEST DIAGNOSTICS

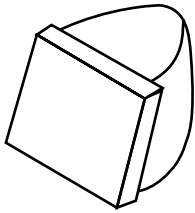
Ice release issues fall into two main categories mechanical or refrigeration. The first step in solving an ice release issue is to determine which condition exists. At the end of the harvest cycle place the toggle switch in the OFF position, then remove and inspect the sheet of ice.

- If the cubes are well defined and show no signs of melting a refrigeration problem is indicated.
- If the cubes are deformed and melted away (sharks teeth) a mechanical problem is indicated. Something on the evaporator is causing the harvest problem.
- Always clean the evaporator before diagnosing the refrigeration system.
- The water curtain must swing freely open and closed and the bin switch must function properly.

Harvest Problems



Normal Ice Cube



Melted Out Ice Cube

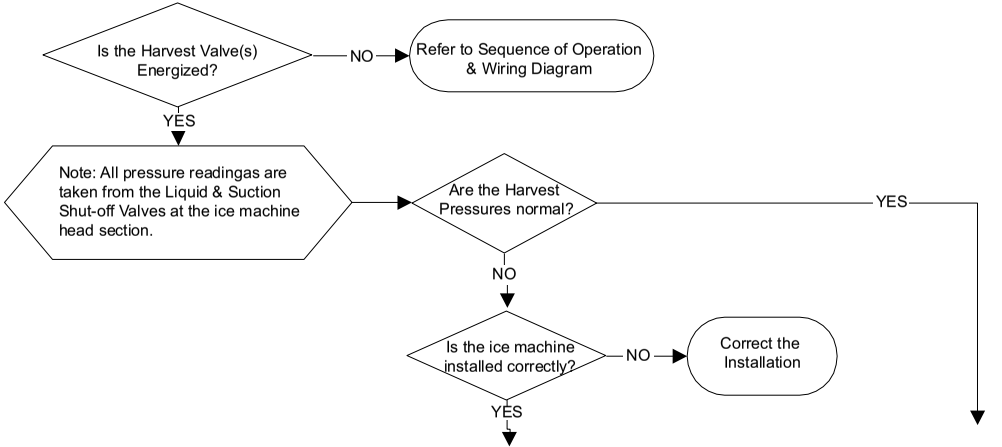
Definition of a harvest problem; At the end of a 3.5 minute harvest cycle the slab of ice is still contacting the evaporator. The slab of ice may or may not be removable by hand.

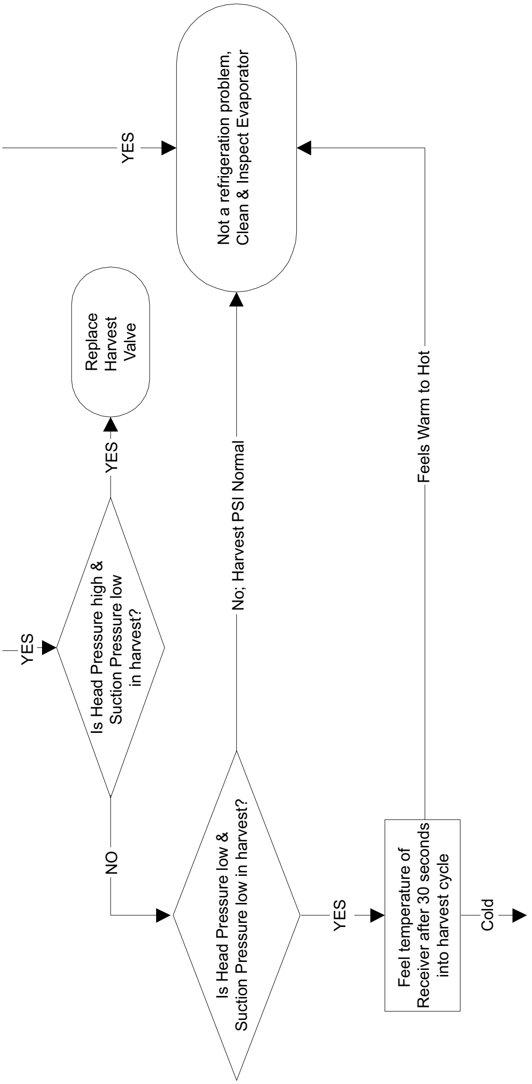
Harvest problems can be split into two categorizes.

- 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 on the evaporator preventing the ice slab from releasing. A manual cleaning procedure must always be performed when this problem is encountered.
- 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.

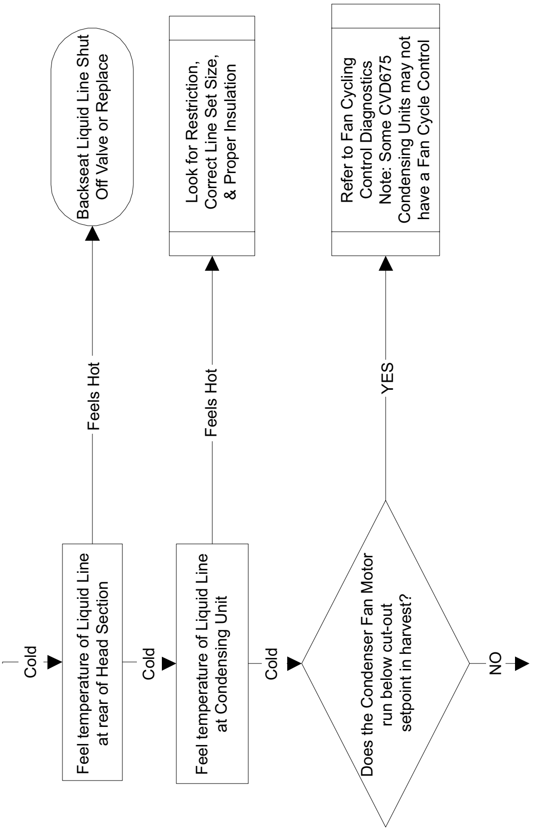
Symptom #3 Ice Will Not Harvest, Cubes Are Not Melted Flowchart

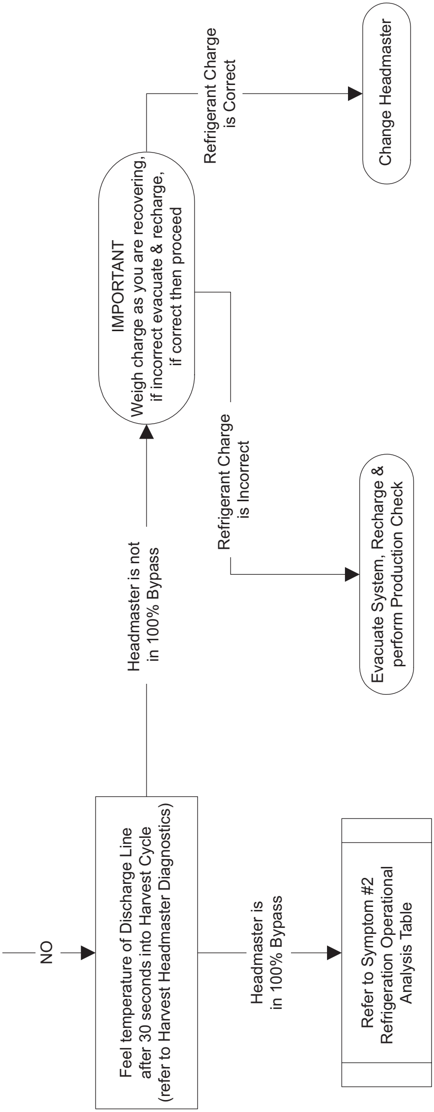
Ice Machine Will Not Harvest Freeze Cycle is Normal and Ice Cubes Are Not Melted After Harvest





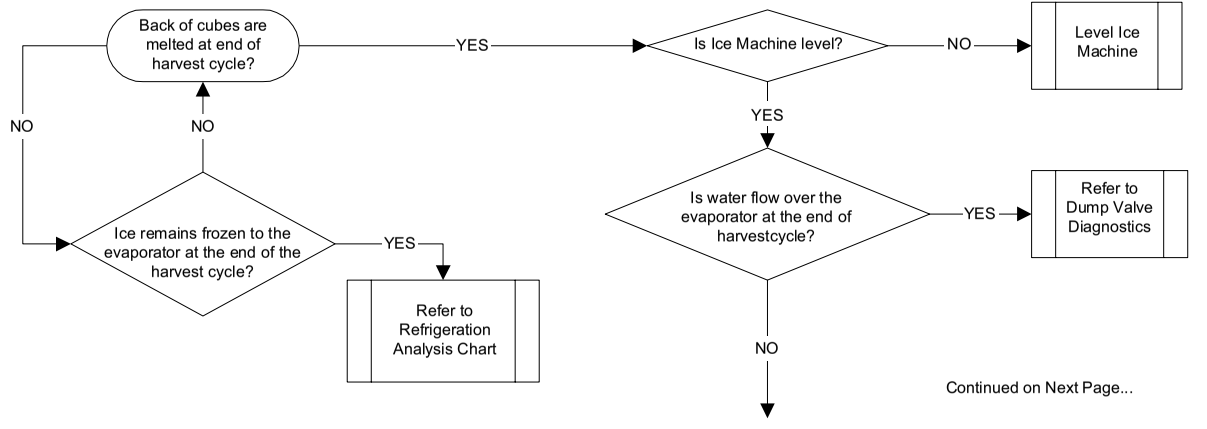
YES
Not a refrigeration problem, Clean & Inspect Evaporator
Replace Harvest Valve
YES
No; Harvest PSI Normal
Feels Warm to Hot
YES
Is Head Pressure high & Suction Pressure low in harvest?
NO
Is Head Pressure low & Suction Pressure low in harvest?
YES
Feel temperature of Receiver after 30 seconds into harvest cycle
Cold

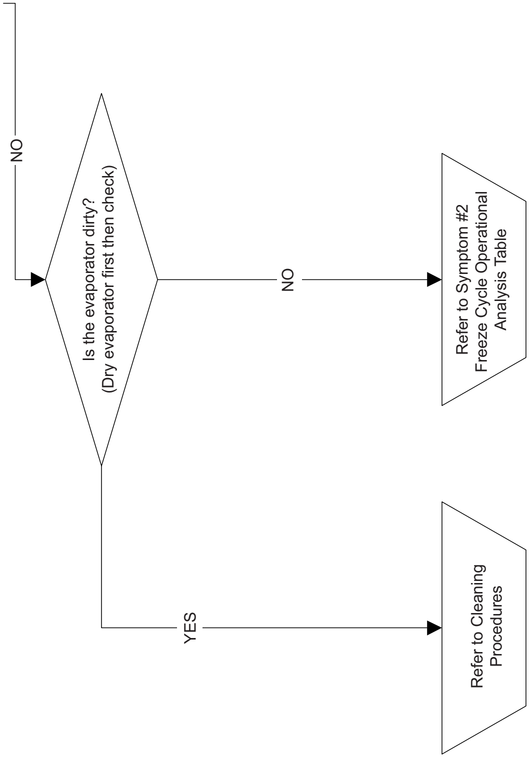

Cold
Feel temperature of Liquid Line at rear of Head Section
Feels Hot
Backseat Liquid Line Shut Off Valve or Replace
Cold
Feel temperature of Liquid Line at Condensing Unit
Feels Hot
Look for Restriction, Correct Line Set Size, & Proper Insulation
Cold
Does the Condenser Fan Motor run below cut-out setpoint in harvest?
YES
Refer to Fan Cycling Control Diagnostics Note: Some CVD675 Condensing Units may not have a Fan Cycle Control
NO


NO
Feel temperature of Discharge Line after 30 seconds into Harvest Cycle (refer to Harvest Headmaster Diagnostics)
Headmaster is in 100% Bypass
Refer to Symptom #2 Refrigeration Operational Analysis Table
Headmaster is not in 100% Bypass
IMPORTANT
Weigh charge as you are recovering, if incorrect evacuate & recharge, if correct then proceed
Refrigerant Charge is Incorrect
Evacuate System, Recharge & perform Production Check
Refrigerant Charge is Correct
Change Headmaster

Symptom #4 Ice Will not Harvest - Cubes Are Melted Flowchart

ICE MACHINE WILL NOT HARVEST - FREEZE CYCLE IS NORMAL AND ICE CUBES ARE MELTED AFTER HARVEST




NO
Is the evaporator dirty?
(Dry evaporator first then check)
NO
Refer to Symptom #2
Freeze Cycle Operational
Analysis Table
YES
Refer to Cleaning
Procedures

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Component Check Procedures

Electrical Components

MAIN FUSE

Function

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

Specifications

The main fuse is 250 Volt, 7 amp.

> **⚠Warning**
>
> High (line) voltage is applied to the control board (terminals #55 and #56) at all times. Removing the control board fuse or moving the toggle switch to OFF will not remove the power supplied to the control board.

Check Procedure

1. If the bin switch light is on with the 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

ICE/OFF/CLEAN TOGGLE SWITCH

Function

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

Specifications

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

Check Procedure

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

1. Inspect the toggle switch for correct wiring.
2. Isolate the toggle switch by disconnecting the Molex connector.
3. Check continuity across the toggle switch terminals. Note where the wire numbers are connected to the switch terminals, or refer to the wiring diagram to take proper readings.

Switch Setting	Terminals	Ohm Reading
ICE	1-6	Open
	1-2	Closed
	2-6	Open
CLEAN	1-6	Closed
	1-2	Open
	2-6	Open
OFF	1-6	Open
	1-2	Open
	2-6	Open

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

BIN SWITCH

Function

Movement of the 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 ice dampers and holds it open. After the 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 ice dampers. As the ice dampers swing back to the operating position, the bin switch closes and the ice machine restarts, provided the 3-minute delay has expired.

Important

The 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 ice dampers. The switch is attached to the right bulkhead wall.

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.

Symptoms

Bin Switch Fails Open

- The ice machine will not start with the toggle switch in the ice position, but runs normally with the toggle switch in the clean position.

Bin Switch Fails Closed

Safety limit 2 is recorded in the control board memory and the harvest cycle continues after the ice opens and closes the ice dampers (harvest cycle is 7 minutes for Quad evaporator models).

DIAGNOSTIC AIDS:

- Always use the ice dampers magnet to cycle the switch (a larger or smaller magnet will affect switch operation).
- Readings are affected by your test lead connection and VOM battery strength. Verify you have solid connections and a correctly functioning VOM before testing bin switch.
- Open the ice dampers for 3 seconds, then close the ice dampers for 3 seconds. This will allow your VOM display to settle.
- With the bin switch closed your meter reading should be 0 (0 to 10 is acceptable). With the ice dampers open the reading must be infinity (OL).

CONTINUITY TEST

1. Disconnect the bin switch wires to isolate the bin switch from the control board.
2. Connect an ohmmeter to the disconnected bin switch wires.
3. Cycle the bin switch open and closed 25 times by opening and closing the ice dampers. Watch for consistent readings each time the bin switch is cycled open and closed (bin switch failure could be erratic).

Ice Damper Removal Notes

The ice dampers must be on (bin switch closed) to start ice making. While a Freeze cycle is in progress, the dampers can be removed and installed at any time without interfering with the electrical control sequence.

If the ice machine goes into Harvest sequence while the ice dampers are removed, one of the following will happen:

- Ice dampers remain off:
  When the Harvest cycle time reaches 3.5 minutes and the bin switch is not closed, the ice machine stops as though the bin were full.
- Ice dampers are put back on:
  If the bin switch closes prior to reaching the 3.5-minute point, the ice machine immediately returns to another Freeze sequence prechill.

Water Level Control Circuitry

The water level probe circuit can be monitored by watching the water level light. The water level light is on when water contacts the probe, and off when no water is in contact with the probe. The water level light functions any time power is applied to the ice machine, regardless of toggle switch position.

FREEZE CYCLE WATER LEVEL SETTING

During the Freeze cycle, the water level probe is set to maintain the proper water level above the water pump housing. The water level is not adjustable. If the water level is incorrect, check the water level probe position. Reposition or replace the probe as necessary.

WATER INLET VALVE SAFETY SHUT-OFF

In the event of a water level probe failure, this feature limits the water inlet valve to a six-minute on time. Regardless of the water level probe input, the control board automatically shuts off the water inlet valve if it remains on for 12 continuous minutes. This is important to remember when performing diagnostic procedures on the water level control circuitry.

FREEZE CYCLE CIRCUITRY

Manitowoc's electronic sensing circuit does not rely on float switches or timers to maintain consistent water level control. During the Freeze cycle, the water inlet valve energizes and de-energizes in conjunction with the water level probe located in the water trough.

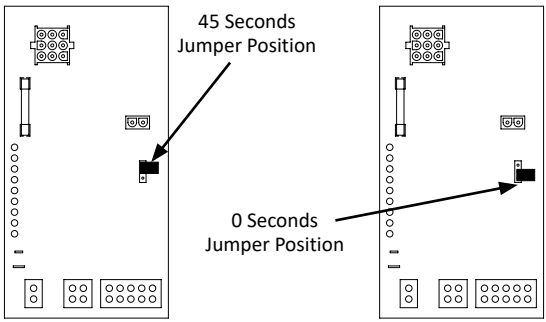
During the first 45 seconds of the Freeze cycle:

- The water inlet valve is ON when there is no water in contact with the water level probe.
- The water inlet valve turns OFF after water contacts the water level probe for 3 continuous seconds.
- The water inlet valve will cycle ON and OFF as many times as needed to fill the water trough.

After 45 seconds into the Freeze cycle:
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.

Harvest Cycle Circuitry

The water level probe does not control the water inlet valve during the harvest cycle. During the harvest cycle water purge, the water inlet valve energizes and de-energizes strictly by time. The harvest water purge may be set at 45 seconds (top and center terminals) or 0 seconds (center and bottom terminals). Set the harvest water purge to 0 seconds when reverse osmosis or deionized water is used. Use the factory setting of 45 seconds for all other types of water.



DIAGNOSING WATER LEVEL CONTROL CIRCUITRY

Problem: Water trough overfilling during the freeze cycle

Step 1 Start a new Freeze sequence by moving the ICE/OFF/CLEAN toggle switch to OFF and then back to ICE. (if water flows with the switch off, check the water inlet valve).

> **Important**
>
> This restart must be done prior to performing diagnostic procedures. This ensures the ice machine is not in a Freeze cycle water inlet valve safety shut-off mode. You must complete the entire diagnostic procedure within 6 minutes of starting.

Step 2 Wait until the Freeze cycle starts (the Freeze cycle starts when the water pump energizes).

Step 3 Disconnect the water level probe from the control board, then connect a jumper from the control board terminal and any cabinet ground, & refer to chart on the next page.

> **Important**
>
> For the test to work properly you must wait until the Freeze cycle starts, prior to disconnecting the water level probe. If you restart the test, you must reconnect the water level probe, restart the ice machine (step 1), and then disconnect the water level probe after the compressor starts.

WATER TROUGH OVERFILLING CONTINUED

Step 4 Jumper wire connected from control board terminal to ground.

Is Water Flowing into the Water Trough?	The Water Level Light Is:	The Water Inlet Valve Solenoid Coil Is:	Cause
No	On	De-energized	The water level probe is causing the problem. Ohm, then clean or replace the water level probe.
Yes	Off	Energized	The control board is causing the problem.
Yes	On	De-energized	The water fill valve is causing the problem. Or higher than 80 psi water supply.

PROBLEM: WATER WILL NOT RUN INTO THE SUMP TROUGH DURING THE FREEZE CYCLE

Step 1 Verify water is supplied to the ice machine. Start a new Freeze sequence by moving the ICE/OFF/CLEAN toggle switch to OFF, then back to ICE.

Step 2 Wait until the freeze cycle starts (approximately 45 seconds, the freeze cycle starts when the compressor energizes).

Important

This restart must be done prior to performing diagnostic procedures. This ensures the ice machine is not in a freeze cycle water inlet valve safety shut-off mode. You must complete the entire diagnostics within 6 minutes of starting.

Step 3 Disconnect the water level probe from the water level probe terminal on the control board.

Important

For the test to work properly you must wait until the Freeze cycle starts, prior to disconnecting the water level probe. If you restart the test, you must reconnect the water level probe, restart the ice machine (step 1), and then disconnect the water level probe after the compressor starts.

Step 4 Disconnect probe from control board.

Is Water Flowing into the Water Trough?	The Water Level Light Is:	The Water Inlet Valve Solenoid Coil Is:	Cause
Yes	Off	Energized	The water level probe is causing the problem. Clean or replace the water level probe.
No	Off	Energized	The water inlet valve is causing the problem.
No	On or Off	De-energized	The control board is causing the problem.

Ice Thickness Probe (Harvest Initiation)

HOW THE PROBE WORKS

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

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

ICE PROBE LIGHT

This light's primary function is to be on as water contacts the ice thickness probe during the freeze cycle, and remain on throughout the entire harvest cycle. The light will flicker as water splashes on the probe.

FREEZE TIME LOCK-IN FEATURE

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

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

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

MAXIMUM FREEZE TIME

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

ICE THICKNESS CHECK

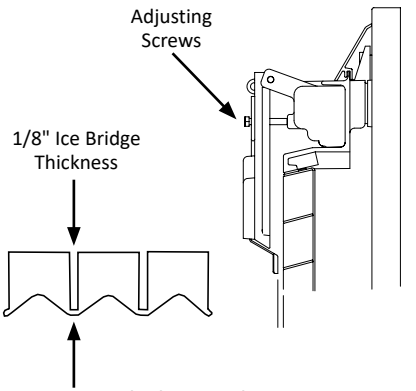
The ice thickness probe is factory-set to maintain the ice bridge thickness at 1/8" (32 mm).

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.

1. Inspect the bridge connecting the cubes. It should be about 1/8" (32 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 1/4" gap between the ice thickness probe and evaporator as a starting point. Then adjust to achieve 1/8" ice thickness.

NOTE: The starting point before final adjustment is approximately a 1/4" gap.

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



Ice Thickness Adjustment

Diagnosing Ice Thickness Control Circuitry

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

Step 1 Bypass the freeze time lock-in feature by moving the ICE/OFF/CLEAN switch to OFF and back to ICE.

Step 2 Wait until water starts to flow over the evaporator (freeze cycle).

Step 3 Disconnect the ice thickness control from the control board, then connect a jumper wire from the control board to any cabinet ground and monitor the ice probe light.

Ice Probe Light On

- The ice probe light comes on, and 10 seconds later, the ice machine cycles from Freeze to Harvest.

The ice thickness probe is causing the malfunction.

- The ice probe light comes on, but the ice machine stays in the Freeze sequence.

The control board is causing the malfunction.

Ice Probe Light Off

- The ice probe light does not come on.

The control board is causing the malfunction.

If you suspect a defective probe check for continuity from the ice thickness probe to the connector.

- With continuity DO NOT change the probe.
- Without continuity, the probe is defective.

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

Step 1 Bypass the freeze time lock-in feature by moving the ICE/OFF/CLEAN switch to OFF and back to ICE.

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

Step 3 Wait until water starts to flow over the evaporator, then monitor the ice probe light.

Ice Probe Light Off

- The ice probe light stays off, and the ice machine remains in the Freeze sequence.

The ice thickness probe is causing the malfunction.

Verify that the ice thickness probe is adjusted correctly and clean.

Ice Probe Light On

- The ice probe light comes on, and 10 seconds later, the ice machine cycles from Freeze to Harvest.

The control board is causing the malfunction.

Harvest Assist Air Pump

FUNCTION

The air pump breaks 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. Verify when the air pump should be running in the sequence of operation.
2. If the compressor is not running when it should be, check voltage at the control board.
3. If there is no voltage present at the control board, replace the control board.
4. If there is voltage present at the control board, check for voltage at the air pump connector.
5. If there is no voltage present at the air pump connector, replace wire.
6. 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.

ELECTRONIC BIN THERMOSTAT CONTROL

The temperature control opens the bin switch circuit when ice contacts the sensor. When ice no longer contacts the sensor, the circuit closes and the ice machine starts.

SPECIFICATIONS

Setpoint Range: -30 to 212°F (-34 - 100°C)

CONTROL SETTINGS

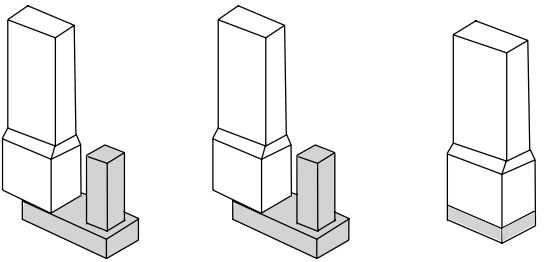
Verify control is set properly before proceeding.

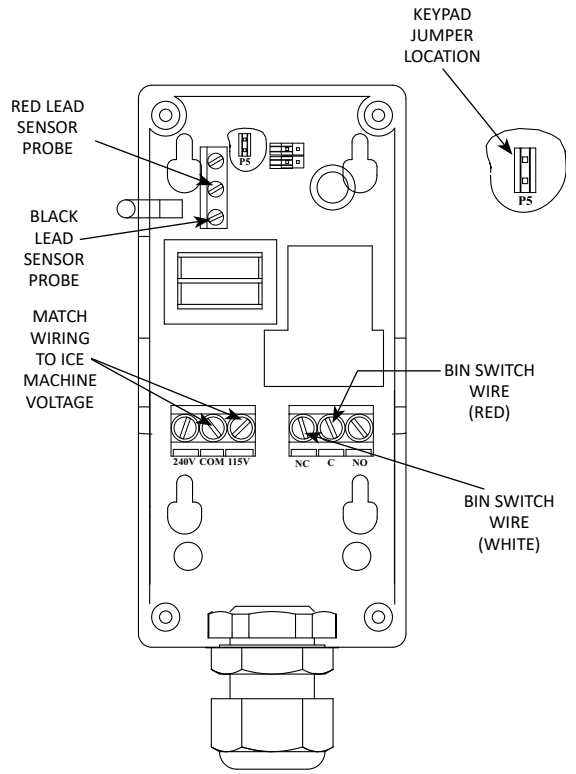
Display	Function	Preset Settings
SP	Set Point	40
DIF	Differential	1
ASD	Anti-Short Cycle Delay	1
OFS	Temperature Offset	0
SF	Sensor Failure Mode	1

POSITIONING THE TOUCH PAD JUMPERS

P5 Jumper

The P5 jumper position determines if the touch pad is locked or unlocked. The control is factory locked; to unlock move the jumper from one pin to two pins.



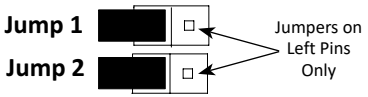


Inside of Bin Thermostat Control

P4 Jumper

The P4 jumper labeled Jump 1 is used to set the control for heating or cooling mode. Jump 2 is used to establish Setpoint at either cut-in or cutout.

Cooling Mode
Cut-Out at Setpoint



P4

SETTING CONTROL SETPOINT VALUE

To view and adjust setpoint, follow these steps:

1. Press MENU until the display flashes SP.
2. Press MENU again to display the existing setpoint value.
3. Press Up or Down (arrows) to change the setpoint value.
4. Press MENU again to save the new value. The display returns to the sensed temperature.

NOTE: If no setup entry is made for 30 seconds, the control reverts to the normal temperature display.

Important

If MENU is not pressed after changing the setpoint value, the control reverts to the previously programmed setpoint value.

DIFFERENTIAL, ANTI-SHORT CYCLE DELAY, TEMPERATURE OFFSET, OR SENSOR FAILURE OPERATION

To set or verify the Differential, Anti-Short Cycle Delay, Temperature Offset or Sensor Failure Operation use the following method.

Factory Preset Temperature Control Code Settings as follows:

1. Press and hold MENU until the display changes to flashing SP.
2. Press up and down (arrows) repeatedly until the desired function is displayed.
3. Press MENU to display the function's current value.
4. Press up and down (arrows) until the desired value is displayed.
5. Press MENU to save the new value. The display returns to the sensor temperature.

NOTE: If no setup entry is made for 30 seconds, the control reverts to the temperature display.

NOTE: Any saved control settings are non-volatile and remain in the control's memory during power interruptions.

CHECK PROCEDURE

⚠Warning

Line voltage is present inside control. Contact with line voltage can cause serious injury or death.

If the control system does not function properly, verify that the control is wired and set up properly. If the problem persists use the following procedures to determine the cause of the problem.

1. Check the proper voltage to the control.
   A. Remove the cover, loosen the four cover screws.
   B. Use an AC voltmeter to check the voltage between the common and 120V or 240V terminals.
   C. The voltage must be between 102 and 132 volts for 120V applications, 177 and 264 volts for 208/230V applications.
   D. If the voltage reading is not within the required range, check the power source and input power wires for problems.
2. Fault Codes

If the LCD displays an alarm or fault code (SF or EE):

Fault Code	Definition	Solution
SF flashing alternately with OP	Open temperature sensor or sensor wiring	See Step 3. Cycle power to reset control.
SF flashing alternately with SH	Shorted temperature sensor or sensor wiring	See Step 3. Cycle power to reset control.
EE	Program failure	Reset the control by pressing MENU. If problem persists, replace the control.

3. Check for proper operation.

NOTE: Perform Steps 1 and 2 before performing this step.

A. Disconnect the load from the output relay terminals.

B. Reconnect the sensor leads and supply power to the control.

C. Replace the cover.

D. Check the control settings for proper values.

E. Press and hold MENU until SP appears.

F. Press up and down (arrows) to change the setpoint temperature above and below the sensor temperature until the relay energizes and de-energizes.

G. If the output relay does not perform as indicated replace the control.

H. If proper operation of the control is verified, reconnect the load.

Cleaning the Ice Thickness or Water Level Probe

Clean the probes using the following procedure.

1. Mix a solution of Manitowoc ice machine descaler and water (2 ounces of cleaner to 16 ounces of water) in a container.
2. Soak probes in container of cleaner/water solution while disassembling and cleaning water circuit components (soak probes for 10 minutes or longer).
3. Clean all probe surfaces including all plastic parts (do not use abrasives). Verify all cavities are clean. Thoroughly rinse probes (including cavity) with clean water, then dry completely. **Incomplete rinsing and drying of the ice thickness probe can cause premature harvest.**

Reinstall probes, then sanitize all ice machine and bin/dispenser interior surfaces.

Compressor Electrical Diagnostics

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

CHECK RESISTANCE (OHM) VALUES

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

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

Single Phase Compressors

1. Disconnect power 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 and a mechanically seized compressor.

To determine which you have:

1. Install high and low side gauges.
2. Try to start the compressor.
3. Watch the pressures closely.
    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.

Refrigeration Components

HIGH PRESSURE CUTOUT (HPCO) CONTROL

ST3000W PROCEDURES

Function

Stops the ice machine if subjected to excessive high-side pressure. The HPCO control is normally closed, and opens on a rise in discharge pressure.

Specifications	
Cut-Out	**Cut-In**
600 psig ±10 (3147 kPa ±69 bar)	450 psig ±10 (3103 kPa ±69 bar)

Check Procedure

1. Set ICE/OFF/CLEAN switch to OFF, (Manual reset HPCO reset if tripped).
2. Connect manifold gauge set.
3. Hook voltmeter in parallel across the HPCO, leaving wires attached.
4. On water-cooled models, close the water service valve to the water condenser inlet.
5. Set ICE/OFF/CLEAN switch to ICE.
6. No water or air flowing through the condenser will cause the HPCO control to open because of excessive pressure. Watch the pressure gauge and record the cut-out pressure.

⚠Warning

If discharge pressure exceeds cutout setting and the HPCO control does not cut out, set ICE/OFF/CLEAN switch to OFF to stop ice machine operation.

Replace the HPCO control if it:

1. Will not reset (below 300 psig [2068 kPa 20.68 bar]).
2. Does not open at the specified cut-out point.

SF3000C PROCEDURES

Function

Stops the ice machine if subjected to excessive highside pressure. The HPCO control is normally closed, and opens on a rise in discharge pressure.

Specifications	
Cut-Out	**Cut-In**
450 psig ±10 (3103 kPa ±69 31 bar ±0.69)	300 psig ±10 (2068 kPa ±69 20.68 bar ±0.69)
Automatic Reset	

Check Procedure

1. Set ICE/OFF/CLEAN switch to OFF.
2. Disconnect power to condensing unit.
3. Connect manifold gauge set on condensing unit access valves.
4. Hook voltmeter in parallel across the HPCO, leaving wires attached.
5. Reconnect condensing unit.
6. Set ICE/OFF/CLEAN switch to ICE, block condensing unit with cardboard or similar object.
7. No air flowing through the condenser will cause the HPCO control to open because of excessive pressure. Watch the pressure gauge and record the cut-out pressure.

⚠Warning

If discharge pressure exceeds 460 psig and the HPCO control does not cut out, set ICE/OFF/CLEAN switch to OFF to stop ice machine operation.

Replace the HPCO control if it:

1. Will not reset (below 300 psig [2068 kPa 20.68 bar]).
2. Does not open at the specified cut-out point.

LOW PRESSURE CUTOUT (LPCO) CONTROL

ST3000W PROCEDURES

Function

Signals the control board to energize and de-energize the ice machine when suction pressure rises above or falls below setpoint.

The LPCO control is closed at pressures above setpoint and opens at pressures below setpoint. Two controls have been used and either will function correctly.

Specifications	
Cut-Out	**Cut-In**
12 psig ±3	35 psig ±3

CHECK PROCEDURE

1. Connect manifold gauge set at suction and discharge access valves and verify refrigerant pressure exceeds LPCO cut-in.
2. Isolate LPCO electrical leads, connect a multimeter and read resistance.

Open = Replace Switch

Closed = Switch OK

NOTE: When the LPCO opens the compressor contactor opens and the control board light will flash. When the control closes the compressor contactor closes and the control board light stops flashing.

SF3000C PROCEDURES

Function

Energizes and de-energizes the contactor coil when suction pressure rises above or falls below setpoint.

The LPCO control is closed at pressures above setpoint and opens at pressures below setpoint.

Specifications	
Cut-Out	**Cut-In**
7 psig ±3	22 psig ±3

CHECK PROCEDURE

1. Connect manifold gauge set at suction and discharge access valves at the condensing unit.
2. Set ICE/OFF/CLEAN switch to OFF.
3. The liquid line solenoid valve will de-energize and the suction pressure will begin to decrease. The low-pressure control will open at the listed specification.
4. Use the manifold gauge set to increase suction pressure. Feed refrigerant from the high side access valve to the low side access valve. Add refrigerant in small increments to allow the low side pressure to be monitored. The low pressure control will close at the listed specification.

Replace the LPCO control if it:

1. Will not close at the specified setpoint.
2. Does not open at the specified setpoint.

Water Regulating Valve

SELF-CONTAINED WATER-COOLED MODELS ONLY – ST3000W

Function

The water regulating valve maintains the freeze cycle discharge pressure.

Valve Setting for the ST3000W	
Max	350 psig
Set at	275 psig
Flow Rate	14.0 GPM
Setpoint Range	160-340 psig

Check Procedure

1. Determine if the head pressure is high or low (refer to “Cycle Times/24-Hour Ice Production/Refrigerant Pressure Charts” on page 181).
2. Verify the condenser water meets specifications.
3. Adjust valve to increase or decrease discharge pressure.
4. Determine the temperature of the liquid line entering the receiver by feeling it. This line is normally warm; body temperature.
5. Using the information gathered, refer to the list for diagnosis.

PROBLEM (FREEZE CYCLE)

1. Valve not maintaining discharge pressure.
   - Valve incorrectly set, dirty or defective. Adjust, clean or replace valve.
2. Discharge pressure extremely high; Liquid line entering receiver feels hot.
   - Water regulating valve incorrectly set or not opening.
3. Discharge pressure low, Liquid line entering receiver feels warm to hot.
   - Ice machine low on charge. Refer to the serial tag on the ice machine for the appropriate refrigerant charge.

ST3000W Harvest Pressure Solenoid Valve

FUNCTION

Transfers refrigerant from the high side to the low side during the harvest cycle.

CHECK PROCEDURE

1. Reset the ice machine with the toggle switch to override the 6 minute freeze lock.
2. Initiate a premature harvest by grounding the ice thickness probe.
3. Verify the coil has line voltage supplied in the harvest cycle and magnetism is present.
4. If voltage and magnetism are present Refer to S Model Quad evaporator operational analysis chart page 90.

Refrigerant Recovery/Evacuation

DEFINITIONS

Recover

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

Recycle

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

Reclaim

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

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

New Product Specifications

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

REFRIGERANT RE-USE POLICY

Manitowoc recognizes and supports the need for proper handling, re-use, and disposal of refrigerants. Manitowoc service procedures require recapturing refrigerants, not venting them to the atmosphere. It is not necessary, in or out of warranty, to reduce or compromise the quality and reliability of your customers' products to achieve this.

Notice

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

Manitowoc approves the use of:

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

- Compressor motor burnouts and improper past service prevent refrigerant re-use.

Refer to “Determining Severity of Contamination” on page 163 to test for contamination.

5. “Substitute” or “Alternative” Refrigerant
   - Must use only Manitowoc-approved alternative refrigerants.
   - Must follow Manitowoc-published conversion procedures.

ST3000W MODEL PROCEDURES

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

Important

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

Important

Replace the liquid line drier after recovering the refrigerant and before evacuating and recharging. Use only a Manitowoc (OEM) liquid line filter-drier to prevent voiding the warranty.

Connections

Manifold gauge sets must utilize low loss fittings to comply with local rules and regulations.

Make these connections:

- Suction side of the compressor through the suction access valve.
- Discharge side of the compressor through the discharge access valve.
- Liquid side through the liquid line drier.

ST3000W RECOVERY/EVACUATION PROCEDURES

1. Press the Power button and cycle the ice machine off.
2. Install manifold gauge, scale and recovery unit or two-stage vacuum pump and open high, low and charging ports.
3. Perform recovery or evacuation:
   A. Recovery: Operate the recovery unit as directed by the manufacturer's instructions.
   B. Evacuation prior to recharging: Pull the system down to 500 microns. Then allow the pump to run for an additional half hour. Turn off the pump and perform a standing vacuum leak check.
4. Follow the Charging Procedures.

ST3000W CHARGING PROCEDURES

Important

The charge is critical on all Manitowoc ice machines. Use a scale to ensure the proper charge is installed.

1. Be sure the ice machine is off.
2. Isolate the vacuum pump valve, low side and high side access valves from the refrigeration system. The refrigerant charging access valve remains open.
3. Open the refrigerant cylinder and add the proper refrigerant charge (shown on nameplate) through the liquid line dryer.

⚠ Caution

Damage may occur when charging liquid into the front discharge line access port.

Manitowoc replacement driers have a Schrader valve built into the inlet of the drier. Filter driers without an access port must be replaced with the current OEM part before recharging the ice machine. All Liquid refrigerant must be added through the liquid line drier access port.

4. Let the system "settle" for 2 to 3 minutes.
5. Isolate the refrigerant cylinder/charging hose from the liquid line drier.
6. Press the Power button.

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

7. Make sure that all of the vapor in the charging hoses is drawn into the ice machine before disconnecting the charging hoses.
   A. Run the ice machine in freeze cycle.
   B. Remove the high side low loss fitting from the liquid line filter drier.
   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 pressures to equalize while the ice machine is in the freeze cycle.
   E. Remove the hoses from the ice machine and install the caps.

SF3000C MODEL PROCEDURES

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

Important

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.

Important

Replace the liquid line drier after recovering the refrigerant and before evacuating and recharging. Use only a Manitowoc (OEM) liquid line filter-drier to prevent voiding the warranty.

Important

Recovery/evacuation of a QuietQube® remote system requires connections at either 4 or 5 recovery points for complete system recovery/evacuation. Check valves are located in the ice machine head section and the CVD condensing unit. Five point requires connections between the compressor and suction filter access valve, receiver access valve and the high and low side access valves on the front or rear of the ice machine. Four point is required on units that do not have a receiver service valve.

Important

The receiver access valve (located in the ice machine head section) must be accessed during refrigerant recovery to allow complete removal of the refrigerant charge.

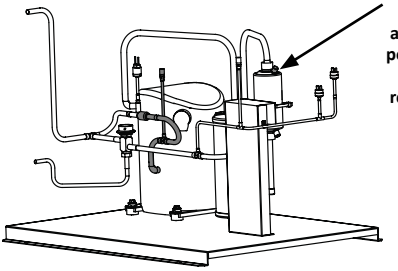
CONNECTIONS

Manifold gauge sets must utilize low loss fittings to comply with U.S. Government rules and regulations.

CVD condensing units with reciprocating compressors are manufactured with a check valve in the compressor discharge line. The check valve requires an additional connection on the condensing unit during evacuation or recovery procedures. Connection of a manifold gauge set (or a hose with core depressors on both ends) between the suction filter access port and the compressor access valve (located between the compressor and discharge line check valve) is required.

Make these connections:

Ice Machine Head Section	CVD Condensing Unit
Receiver Service Valve	Compressor Discharge Access Valve
Low Side Access Valve	Suction Filter Access Valve
High Side Access Valve	



Connections must also be made at two points on condensing unit for complete refrigerant recovery.

SF3000C RECOVERY/EVACUATION PROCEDURES

1. Press the power button to stop the ice machine and disconnect all power to the ice machine and condensing unit.
2. Install manifold gauges, charging scale, and recovery unit or two-stage vacuum pump.
3. Open high and low side on the manifold gauge set.
4. Perform recovery or evacuation:
   A. Recovery: Operate the recovery unit as directed by the manufacturer's instructions.
   B. Pressure test the system.
   C. Evacuation prior to recharging: Evacuate to 500 microns. Then allow the pump to run for an additional hour.
5. Refer to Charging Procedures.

SF3000C CHARGING PROCEDURES

1. The ice machine must be off.
2. Close the vacuum pump valve and the low side manifold gauge valve.
3. Open the refrigerant cylinder and add the proper refrigerant charge (shown on nameplate) into the system high side (receiver service valve and discharge line shut-off valve).
4. If the high side does not take the entire charge, close the high side on the manifold gauge set. Start the ice machine and wait until the freeze cycle starts, then add the remaining charge through valves on back of ice making head, or through valves on suction filter.
5. Disconnect the manifold gauge set from the liquid line shut-off valve.
6. 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.
7. Allow the pressures to equalize while the ice machine is in the freeze cycle.
8. Disconnect the manifold gauge set from the suction line shut-off valve.
9. Install and torque all valve caps

NOTE: Check for refrigerant leaks after all valve caps have been installed.

System Contamination Clean-Up

GENERAL

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

Important

Manitowoc Ice, Inc. assumes no responsibility for the use of contaminated refrigerant. Damage resulting from the use of contaminated refrigerant is the sole responsibility of the servicing company.

Determining Severity of Contamination

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

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

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

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

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

Check the chart on the next page 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 *(This is for the ST3000W only)* • 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

ST3000W MILD SYSTEM CONTAMINATION

1. Replace any failed components.
2. If the compressor is good, change the oil. Pour the oil from the compressor into a graduated vessel and replace with the same amount removed.
3. Replace the liquid line drier.

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

Important

Dry nitrogen is required for this procedure to prevent refrigerant release.

4. Follow the normal evacuation procedure, except replace the evacuation step with the following:
   A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (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 5 psig (35 kPa, .35 bar).
   C. Change the vacuum pump oil.
   D. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour on self-contained models, 1 hour on remotes.
   E. You may perform a standing vacuum test to make a preliminary leak check. You should use an electronic leak detector after system charging to be sure there are no leaks.
5. Charge the system with the proper refrigerant to the nameplate charge.
6. Operate the ice machine.

ST3000W 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, replace the manifold strainer, TXV and harvest pressure regulating valve.
3. Wipe away any burnout deposits from suction and discharge lines at compressor.
4. Sweep through the open system with dry nitrogen.

Important

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

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.

Important

Dry nitrogen is required for this procedure. This will prevent refrigerant release.

9. Follow the normal evacuation procedure, except replace the evacuation step with the following:
    A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, .35 bar).
    B. Change the vacuum pump oil.
    C. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, .35 bar).
    D. Change the vacuum pump oil.
    E. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour on self-contained models, 1 hour on remotes.

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

10. Charge the system with the proper refrigerant to the nameplate charge.
11. Operate the ice machine for one hour. Then, check the pressure drop across the suction line filter-drier.
    A. If the pressure drop is less than 1 psig (7 kPa, .07 bar), the filter-drier should be adequate for complete cleanup.
    B. If the pressure drop exceeds 1 psig (7 kPa, .07 bar), 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.

SF3000C 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.

Important

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

4. Follow the normal evacuation procedure, except replace the evacuation step with the following:
   A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, 0.35 bar).
   B. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, 0.35 bar).
   C. Change the vacuum pump oil.
   D. Pull vacuum to 500 microns. Run the vacuum pump for 1 hour.

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

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

SF3000C 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.

Important

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

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.

Important

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

9. Follow the normal evacuation procedure, except replace the evacuation step with the following:
    A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, 0.35 bar).
    B. Change the vacuum pump oil.
    C. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of 5 psig (35 kPa, 0.35 bar).
    D. Change the vacuum pump oil.
    E. Pull vacuum to 500 microns. Run the vacuum pump for 1 hour.

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

10. Charge the system with the proper refrigerant to the nameplate charge.
11. Operate the ice machine for one hour. Then check the pressure drop across the suction line filter-drier.
    A. If the pressure drop is less than 1 psig (7 kPa, 0.7 bar), the filter-drier should be adequate for complete cleanup.
    B. If the pressure drop exceeds 1 psig (7 kPa, 0.7 bar), 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.

SF3000C LIQUID LINE FILTER-DRIERS

The filter-driers used on Manitowoc ice machines are manufactured to Manitowoc specifications. A Manitowoc drier has dirt-retaining filtration, with fiberglass filters on both the inlet and outlet ends. This is very important because ice machines have a back-flushing action that takes place during every Harvest cycle.

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.

SF3000C SUCTION FILTER

The suction filter on QuietQube® CVD condensing units traps particulate only, and do not contain a desiccant. The filter needs replacement when:

1. The pressure drop across the drier exceeds 2 psig.
2. A compressor is replaced.
3. Refrigeration system contains contaminants.

Replacing Pressure Controls Without Removing Refrigerant Charge

ST3000W PROCEDURE

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.

- Water regulating valve (water cooled only)
- High pressure cut-out control
- High side service valve

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. (See the figure on next page.) Clamp down on the tubing until the pinch-off is complete.

⚠Warning

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

3. Cut the tubing of the defective component with a small tubing cutter.
4. Solder the replacement component in place. Allow the solder joint to cool.
5. Remove the pinch-off tool.
6. Re-round the tubing. NOTE: The pressure controls will operate normally once the tubing is re-rounded. Tubing may not re-round 100%.

SF3000C PROCEDURE

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
- Low Pressure cut-out control
- High side service valve
- Low side service valve

Important

This is a required in-warranty repair procedure.

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. (See the figure on next page.) Clamp down on the tubing until the pinch-off is complete.

⚠Warning

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

3. Cut the tubing of the defective component with a small tubing cutter.
4. Solder the replacement component in place. Allow the solder joint to cool.
5. Remove the pinch-off tool.
6. Re-round the tubing. The pressure controls will operate normally once the tubing is re-rounded. Tubing may not re-round 100%.

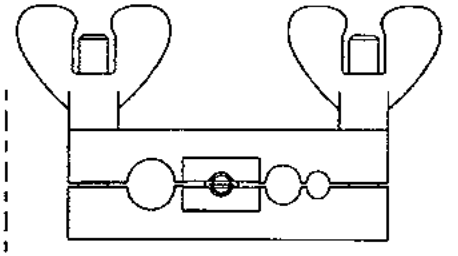


FIG. A - "PINCHING OFF" TUBING

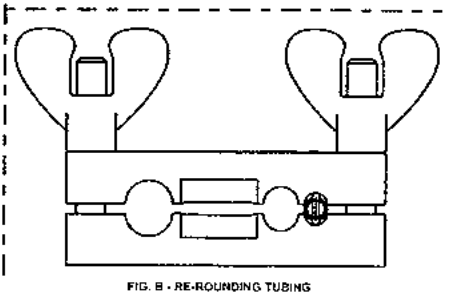


FIG. B - RE-ROUNDING TUBING

Using Pinch-Off Tool

Component Specifications

MAIN FUSE

The main control board fuse is 250 Volt, 7 amp.

BIN SWITCH

The bin switch is a magnetically operated reed switch. The magnet is attached to the lower right corner of the water curtain. The switch is attached to the right bulkhead wall.

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.

HARVEST ASSIST AIR PUMP

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

ICE/OFF/CLEAN TOGGLE SWITCH

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

ELECTRONIC BIN THERMOSTAT CONTROL

Setpoint Range: -30 to 212°F (-34 - 100°C)

WATER REGULATING VALVE

SELF-CONTAINED WATER-COOLED MODELS ONLY – ST3000W

Function

The water regulating valve maintains the freeze cycle discharge pressure.

Valve Setting for the ST3000W	
Max	350 psig
Set at	275 psig
Flow Rate	14.0 GPM
Setpoint Range	160-340 psig

Check Procedure

1. Determine if the head pressure is high or low (refer to “Cycle Times/24-Hour Ice Production/Refrigerant Pressure Charts” on page 181).
2. Verify the condenser water meets specifications.
3. Adjust valve to increase or decrease discharge pressure.
4. Determine the temperature of the liquid line entering the receiver by feeling it. This line is normally warm; body temperature.
5. Using the information gathered, refer to the list for diagnosis.

PROBLEM (FREEZE CYCLE)

1. Valve not maintaining discharge pressure.
   - Valve incorrectly set, dirty or defective. Adjust, clean or replace valve.
2. Discharge pressure extremely high; Liquid line entering receiver feels hot.
   - Water regulating valve incorrectly set or not opening.
3. Discharge pressure low, Liquid line entering receiver feels warm to hot.
   - Ice machine low on charge. Refer to the serial tag on the ice machine for the appropriate refrigerant charge.

FAN CYCLE CONTROL - SF3000C ONLY

Specifications	
Cut-In (Close)	**Cut-Out (Open)**
First Condenser Fan 250 psig ±5	200 psig ±5
Second Condenser Fan 275 psig ±5	225 psig ±5

HIGH PRESSURE CUTOUT (HPCO) CONTROL

ST3000W

Specifications	
Cut-Out	**Cut-In**
600 psig ±10 (3147 kPa ±69)	450 psig ±10 (3103 kPa ±69)

SF3000C

Specifications	
Cut-Out	**Cut-In**
450 psig ±10 (3103 kPa ±69 31 bar ±.69)	Automatic Reset
(Must be below 300 psig [2068 kPa 20.68 bar] to reset.)	

LOW PRESSURE CUTOUT (LPCO) CONTROL

ST3000W

Specifications	
Cut-Out	**Cut-In**
12 psig ±3	35 psig ±3

SF3000C

Specifications	
Cut-Out	**Cut-In**
7 psig ±3	22 psig ±3

FILTER-DRIERS

Liquid Line Filter-Drier

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

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

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

Listed below is the recommended OEM field replacement drier:

Liquid Line Driers		
Model	**Drier Size**	**End Connection Size**
SF3000C ST3000W	DML-084S	1/2"

Important

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

Suction Line Filter - CVDF3000 Only

The suction filter traps particulate only and does not contain a desiccant. The filter needs replacement when:

1. The pressure drop across the drier exceeds 2 psig.
2. The total system refrigerant charge has escaped and the refrigeration system has been exposed to the atmosphere.
3. A compressor is replaced.
4. Refrigeration system contains contaminants.

Listed below is the recommended OEM field replacement filter:

Suction Line Filter		
Model	**Drier Size**	**End Connection Size**
CVDF3000	ASF45S7	7/8"

TOTAL SYSTEM REFRIGERANT CHARGE

NOTE: 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 in this table.

Model	Refrigerant Type	Refrigerant Charge	Line Set Length
ST3000W	R410A	6 lbs. (2.7 kg)	—
SF3000C CVDF3000	CVDF3000 R404A	20 lbs. (9.1 kg.)	0-50 ft. (0-15 M)
		23 lbs. (10.4 kg.)	51-100 ft. (15-30 M)

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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.

- Production and cycle times are for dice cube - Half dice cube cycle times can be 2 - 3 minutes faster, depending on model and ambient temperature.
- 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 “Troubleshooting” on page 73 for the data that must be verified for refrigeration diagnostics.
- Zero out manifold gauge set before obtaining pressure readings to avoid mis-diagnosis.
- Discharge and suction pressure are highest at the beginning of the cycle. Suction pressure will drop throughout the cycle. Verify the pressures are within the range indicated.
- Record beginning of freeze cycle suction pressure one minute after water pump energizes.
- 50 Hz dice and half dice production derate is 12%.

FOR SF3000C/CVDF3000 MODELS ONLY

- All pressure readings are taken at the ice machine head section. Connect Manifold gauge set at the suction and liquid line shut-off valves to obtain pressure readings Pressures taken at the condensing unit will vary with line set length, ambient, exposed line set etc. and will not match the published pressures. Do not use the receiver service valve to obtain high side pressures.
- During low ambient conditions, it is normal for the head pressure control valve to hunt (fluctuate up and down) on CVD condensing units. Hunting varies by model and ambient temperature, but generally settles out within the first 6 minutes of the freeze cycle.

ST3000W SERIES

SDT3000W Self Contained Water-Cooled All Dice Cube, Self-Contained Water-cooled Ice Machines

Characteristics vary depending on operating conditions.
All data on this page is preliminary and subject to change

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Around Ice Machine °F/°C	Freeze Time Water Temperature °F/°C			Harvest Time [1]
	50/10	70/21	90/32	
70/21	10.9-12.3	11.9-13.4	13.8-15.6	**0.75-2.5**
80/27	11.0-12.5	12.1-13.7	14.1-15.9	
90/32	11.1-12.6	12.6-14.2	14.3-16.2	
100/38	11.2-12.6	12.7-14.4	14.5-16.4	
110/43	11.2-12.7	12.9-14.5	14.6-16.5	

[1]Times in minutes

24-Hour Ice Production

Air Temp. Around Ice Machine °F/°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
70/21	2970	2750	2395
80/27	2940	2705	2355
90/32	2920	2610	2325
100/38	2905	2580	2300
110/43	2885	2560	2280

[1]Based on average ice slab weight of 6.38-7.13 lb. per evaporator.

Condenser Water Consumption

Air Temp. Around Ice Machine 90°F/32°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
Gal/100 lbs. of Ice	52	108	358

[1]Water regulating valve set to maintain 330 psiG discharge pressure

Operating Pressures

Air Temp. Around Ice Machine °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure psig	Suction Pressure psig [1]	Discharge Pressure psig	Suction Pressure psig
70/21	325-335	60-44	180-200	95-115
80/27	325-335	70-45	185-205	110-125
90/32	325-335	75-45	180-210	110-125
100/38	325-335	75-45	180-210	110-125
110/43	335-355	80-45	185-220	110-125

[1]Suction pressure drops gradually throughout the freeze cycle

SYT3000W Self Contained Water-Cooled
All Dice Cube, Self-Contained Water-cooled Ice Machines

Characteristics vary depending on operating conditions.
All data on this page is preliminary and subject to change

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Around Ice Machine °F/°C	Freeze Time			Harvest Time [1]
	Water Temperature °F/°C			
	50/10	70/21	90/32	
70/21	10.7-12.1	11.5-13.0	13.3-15.1	**0.75-2.5**
80/27	10.8-12.3	11.8-13.4	13.7-15.5	
90/32	10.9-12.4	12.2-13.9	13.9-15.7	
100/38	11.0-12.4	12.4-14.0	14.0-15.9	
110/43	11.1-12.5	12.5-14.1	14.2-16.1	

[1]Times in minutes

24-Hour Ice Production

Air Temp. Around Ice Machine °F/°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
70/21	3015	2815	2480
80/27	2985	2765	2425
90/32	2965	2675	2390
100/38	2950	2645	2365
110/43	2925	2625	2340

[1]Based on average ice slab weight of 6.38-7.13 lb. per evaporator.

Condenser Water Consumption

Air Temp. Around Ice Machine 90°F/32°C	Water Temperature °F/°C [1]		
	50/10	70/21	90/32
Gal/100 lbs. of Ice	52	108	358

[1]Water regulating valve set to maintain 330 psiG discharge pressure

Operating Pressures

Air Temp. Around Ice Machine °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure psig	Suction Pressure psig [1]	Discharge Pressure psig	Suction Pressure psig
50/10	325-335	60-44	180-200	95-115
70/21	325-335	70-45	185-205	110-125
80/27	325-335	75-45	180-210	110-125
90/32	325-335	75-45	180-210	110-125
100/38	335-355	80-45	185-220	110-125
110/43	325-335	60-44	180-200	95-115

[1]Suction pressure drops gradually throughout the freeze cycle

SF3000C MODELS

SDF3000C/CVDF3000 Series

Characteristics vary depending on operating conditions.
All data on this page is preliminary and subject to change

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °F/°C	Freeze Time Water Temperature °F/°C			Harvest Time [1]
	50/10	70/21	90/32	
-20 to 70/ -29 to 21	10.9-12.4	11.8-13.4	12.6-14.3	0.75-2.5
90/32	12.3-14.0	13.4-15.4	14.5-16.5	
100/38	13.2-15.0	14.5-16.5	15.7-17.8	
110/43	14.5-16.5	16.1-18.3	17.6-19.9	

[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
-20 to 70/ -29 to 21	2850	2650	2500
90/32	2550	2350	2200
100/38	2400	2200	2050
110/43	2200	2000	1850

[1]Based on average ice weight of one Harvest cycle 24.5-27.5 lb. (6.38-7.13 lb. per evaporator).

Operating Pressures

Air Temp. Entering Condenser °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure psig	Suction Pressure psig	Discharge Pressure psig	Suction Pressure psig
-20 to 70/ -29 to 21	250-220	48-30	135-150	70-85
80/27	300-240	50-30	145-170	70-90
90/32	320-280	55-32	165-190	80-100
100/38	350-310	60-33	180-200	90-110
110/43	400-350	65-35	180-210	100-115

During low ambient conditions, it is normal for the head pressure control valve to hunt (fluctuate up and down) on CVD condensing units. Hunting varies by model and ambient temperature, but generally settles out within the first 6 minutes of the freeze cycle.

SYF3000C/CVDF3000 Series

Characteristics vary depending on operating conditions.
All data on this page is preliminary and subject to change

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	
-20 to 70/ -29 to 21	10.6-12.1	11.2-12.8	12.6-14.3	0.75-2.5
90/32	11.8-13.4	13.1-14.9	14.8-16.8	
100/38	12.5-14.2	14.0-15.9	16.0-18.1	
110/43	13.4-15.3	15.1-17.2	17.5-19.8	

[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
-20 to 70/ -29 to 21	2910	2770	2510
90/32	2660	2420	2160
100/38	2520	2280	2020
110/43	2360	2120	1860

[1]Based on average ice weight of one Harvest cycle 24.5-27.5 lb. (6.38-7.13 lb. per evaporator).

Operating Pressures

Air Temp. Entering Condenser °F/°C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure psig	Suction Pressure psig	Discharge Pressure psig	Suction Pressure psig
-20 to 70/ -29 to 21	250-220	48-30	135-150	70-85
80/27	300-240	50-30	145-170	70-90
90/32	320-280	55-32	165-190	80-100
100/38	350-310	60-33	180-200	90-110
110/43	400-350	65-35	180-210	100-115

During low ambient conditions, it is normal for the head pressure control valve to hunt (fluctuate up and down) on CVD condensing units. Hunting varies by model and ambient temperature, but generally settles out within the first 6 minutes of the freeze cycle.

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 (“Model Numbers” on page 21) to reference the correct diagrams.

WIRING DIAGRAM LEGEND

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


Equipment Ground

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

—>>— Multi-Pin Connection

—▭— (Electrical Box Side) —>
(Compressor Compartment Side) >—

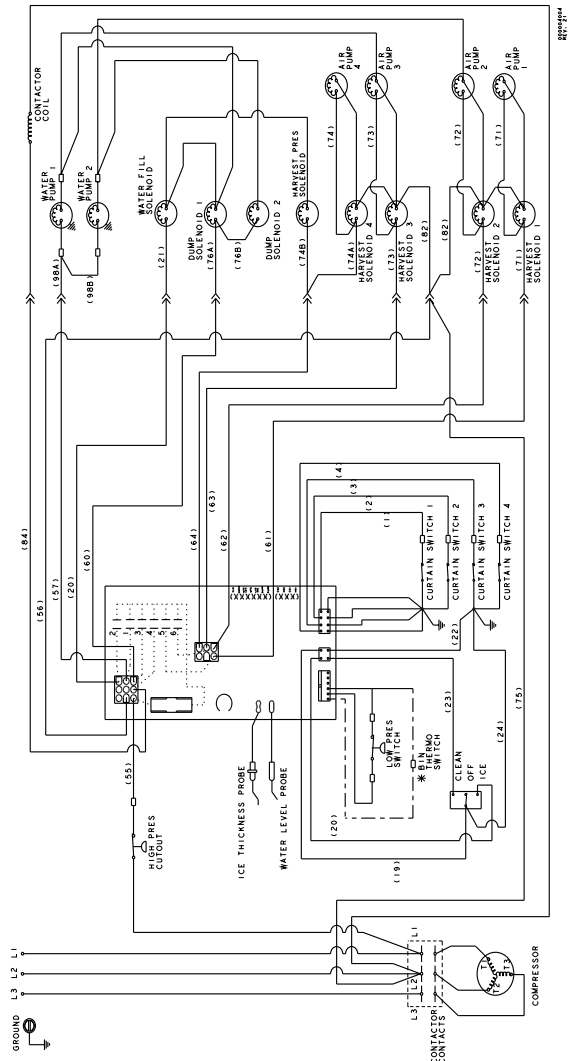
Male/Female Disconnect


Crimp Connector

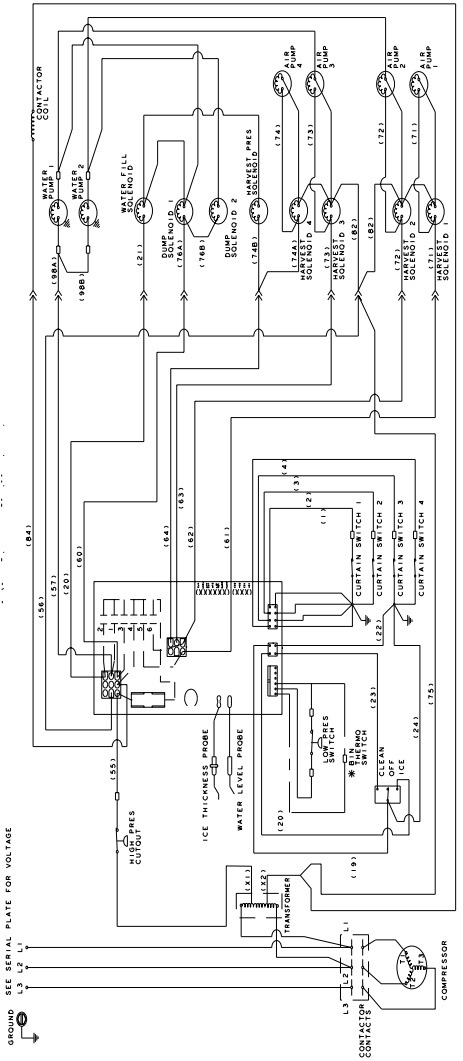
Water-Cooled Wiring Diagrams

ST3000W

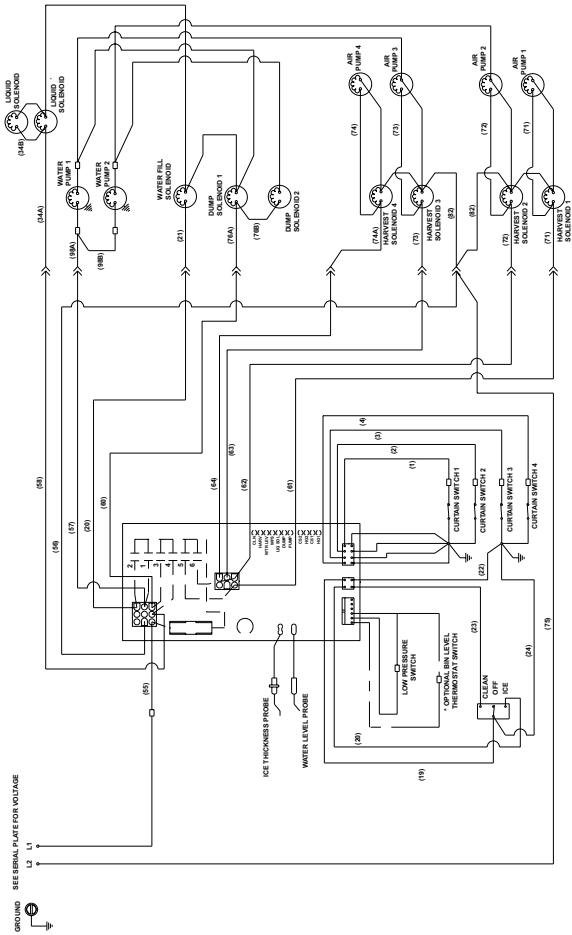
Self-Contained - 3 Phase



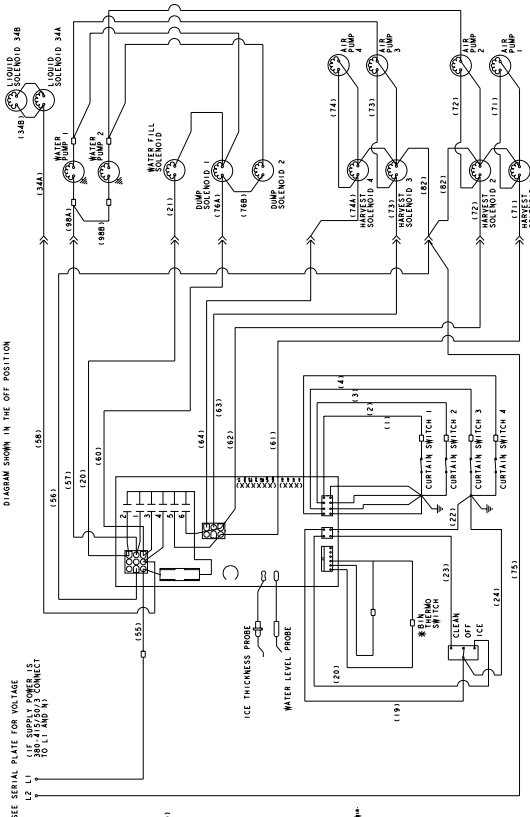
QuietQube Wiring Diagrams



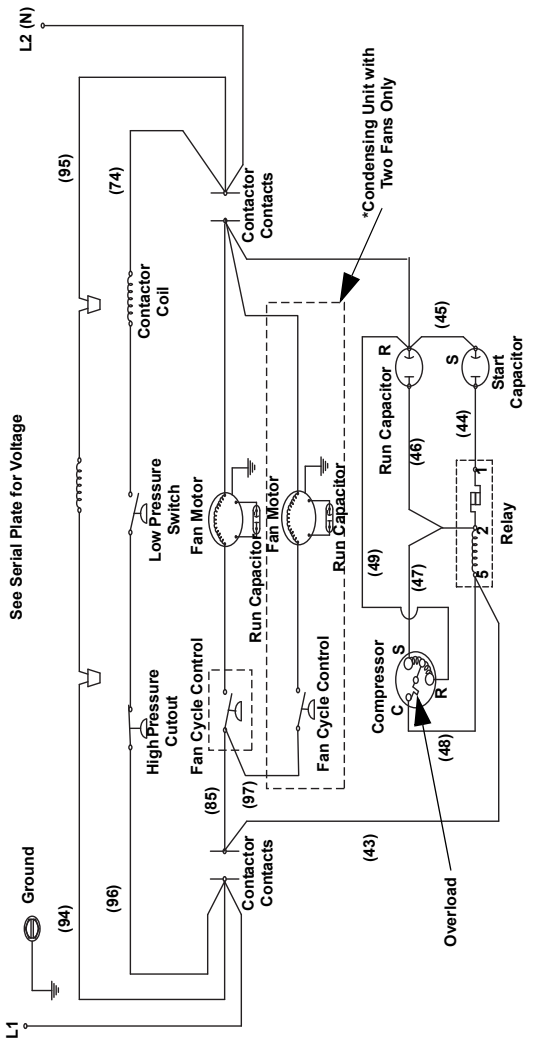
SF3000C 115/60/1



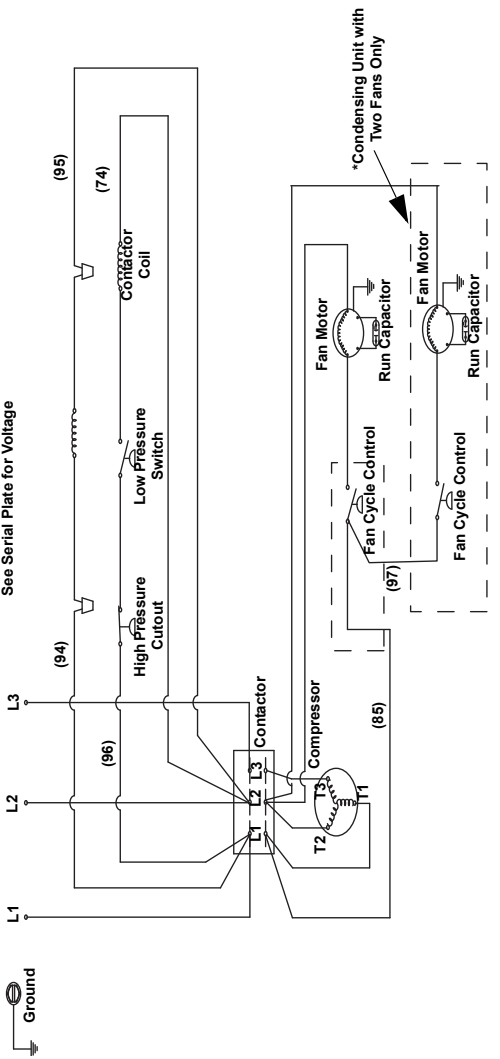
SF3000C 230V/50Hz/1Ph



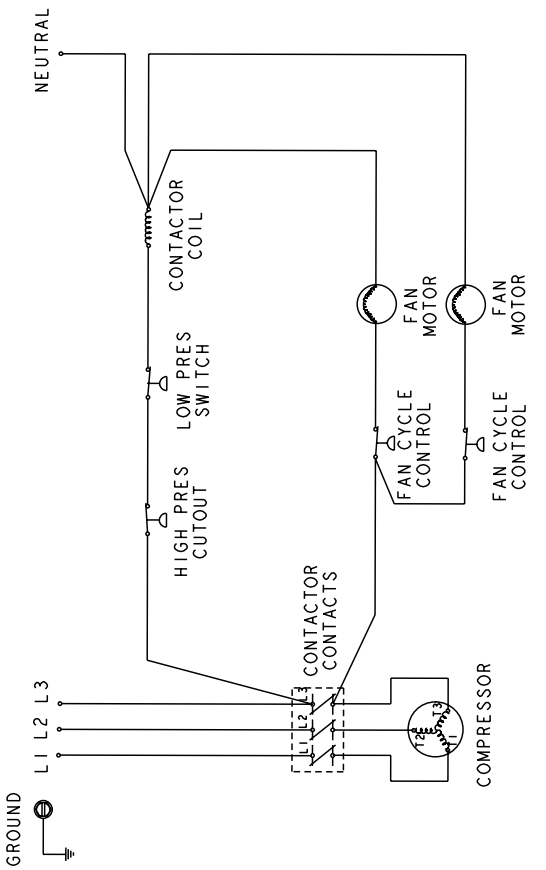
CVDF3000 - 1 Phase



CVDF3000 - 3 Phase

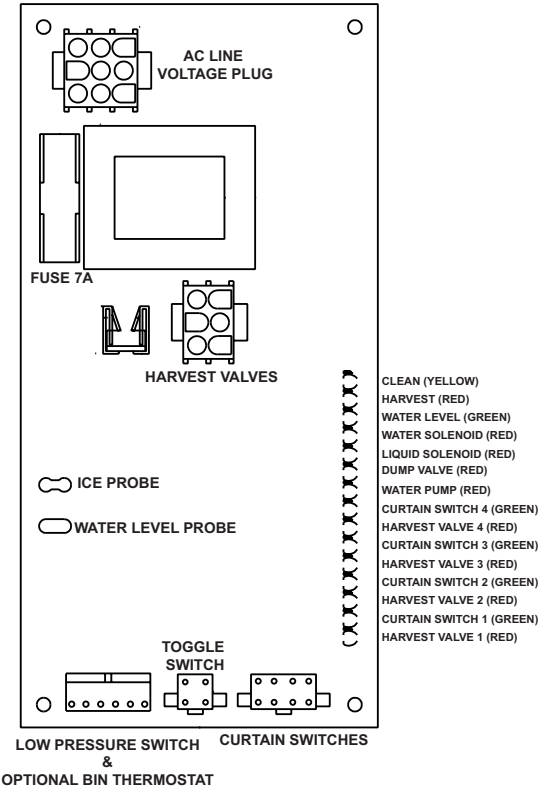


CVDF3000 380V/50hz/3ph



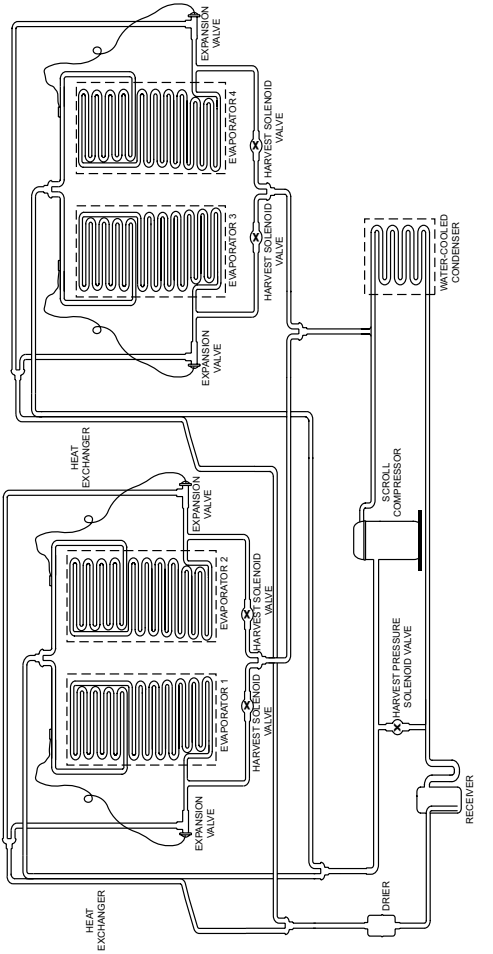
Electronic Control Board

ST3000W & SF3000C Ice Machines

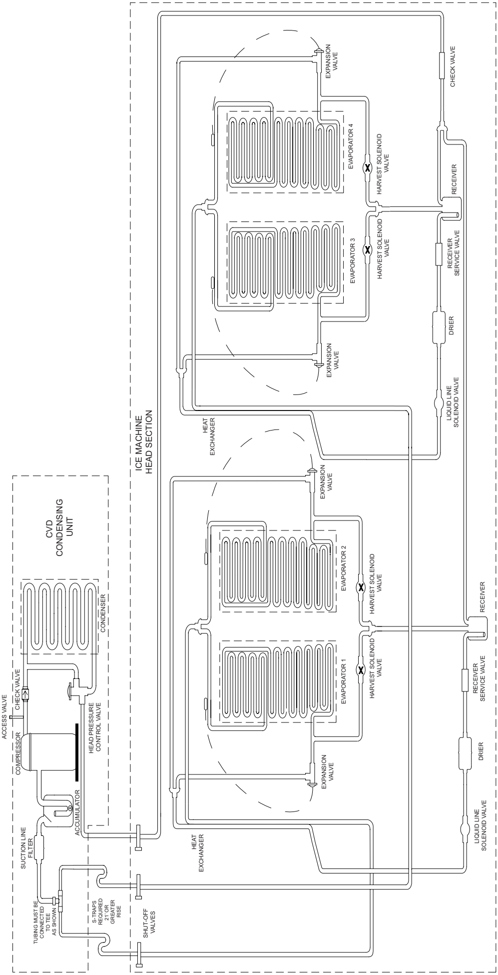


Refrigeration Tubing Schematics

ST3000W



SF3000C



ICE MACHINE HEAD SECTION
CVD CONDENSING UNIT
EXPANSION VALVE
CHECK VALVE
EVAPORATOR 4
HARVEST SOLENOID VALVE
RECEIVER
EVAPORATOR 3
RECEIVER SERVICE VALVE
DRIER
LIQUID LINE SOLENOID VALVE
HEAT EXCHANGER
EVAPORATOR 2
EVAPORATOR 1
CONDENSER
ACCESS VALVE
COMPRESSOR
HEAD PRESSURE CONTROL VALVE
ACCUMULATOR
SUCTION LINE FILTER
TUBING MUST BE CONNECTED TO TEE AS SHOWN
S-TRAPS REQUIRED 21' OR GREATER RISE
SHUT-OFF VALVES

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MANITOWOC ICE
2110 SOUTH 26TH STREET
MANITOWOC, WI 54220

800-545-5720
WWW.MANITOWOCICE.COM

Part Number: STH114_00 01/24