

Introduction

To the owner or user: This service manual is intended to provide you, and the maintenance or service technician, with the information needed to install, start up, clean, maintain and repair this product.

The SCE170 is an ice machine that produces cubed ice on a grid type freezing surface. The cubes form into a cluster that falls into the ice storage bin where they break up into individual and small groups of cubes.

The SCE170 automatically maintains the level of ice by turning on when the ice level falls, and switches off when the bin is full.

This unit is serviceable in place; the ice storage bin and hood may be removed from the chassis to allow service access without removing the ice machine from its installed position. The refrigeration system uses HP62 as the refrigerant.

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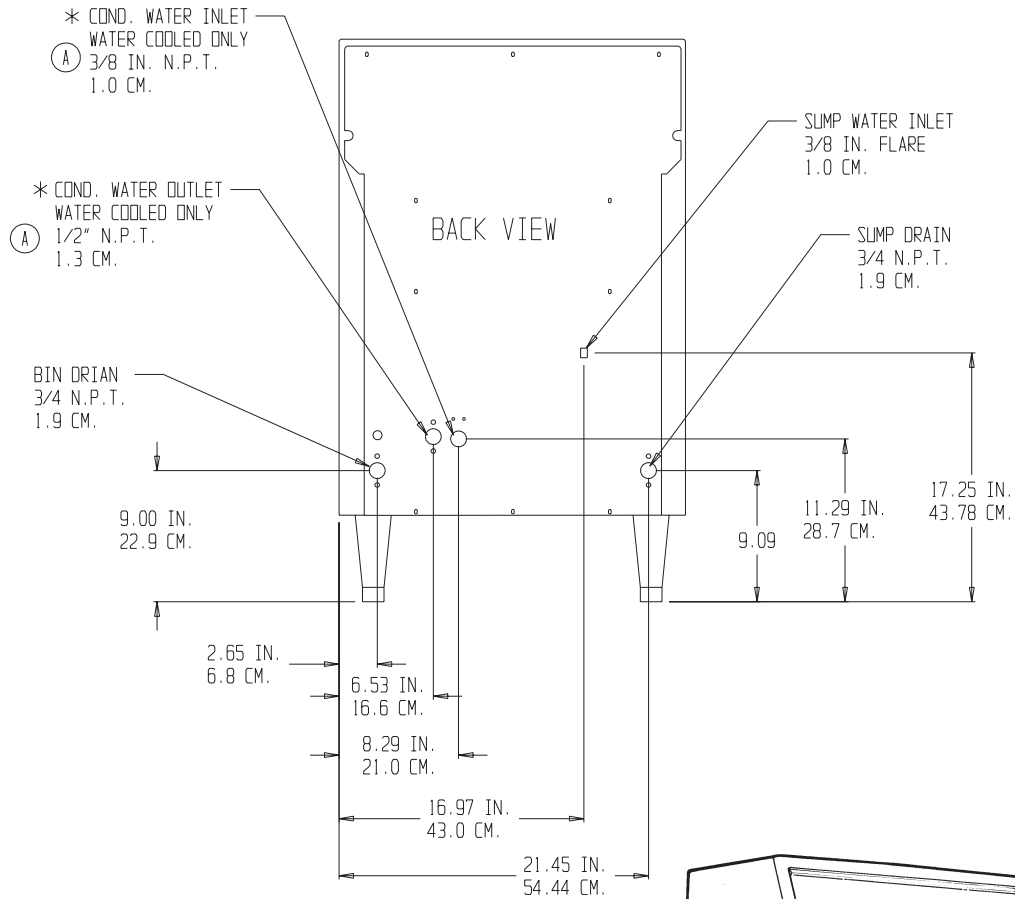
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Parts lists and wiring diagrams are located in the center of this manual, printed on yellow paper.

This manual was printed on recycled paper.

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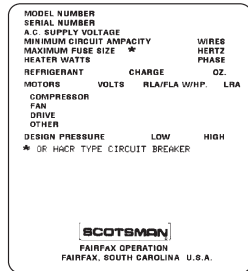
Specifications



The unit is equipped with an electrical power cord, but should only be plugged into a circuit dedicated to the ice machine.

THE NAMEPLATE IS LOCATED ON THE BACK PANEL.

A SERIAL NUMBER PLATE IS LOCATED BEHIND THE RIGHT FRONT PANEL, ON THE BASE IN FRONT OF THE CONTROL BOX



Serial Number Plate (Behind Grill)

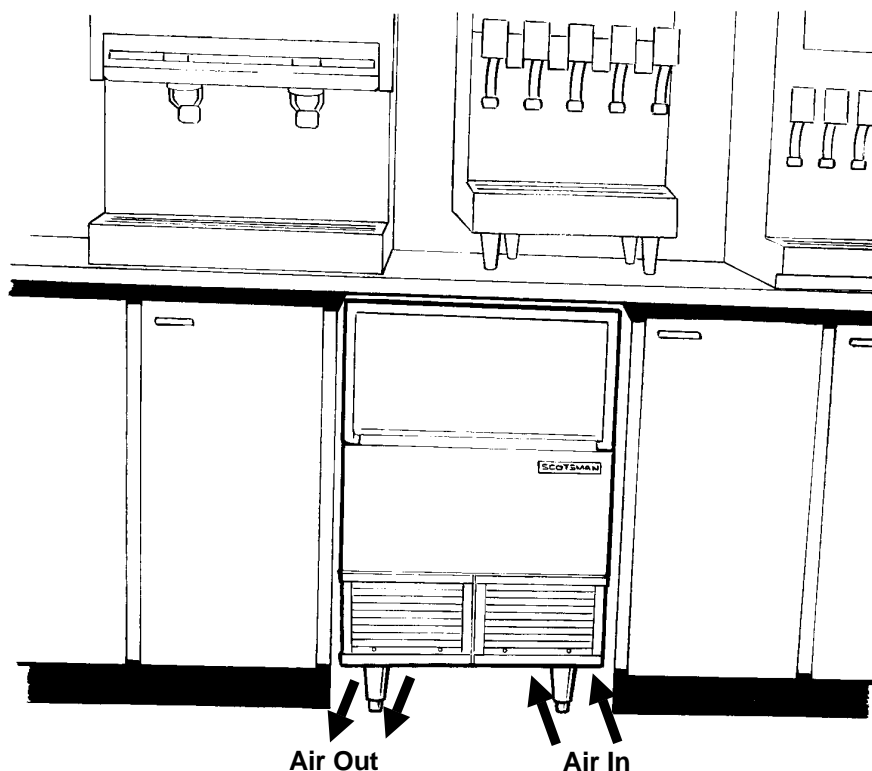
Model Number	Dimensions (w/o legs) H" x W" x D"	Basic Electrical	Ice Type	Condenser Type	Total Load Amps	Total Wattage	Refrigerant HP62 (R-404a)
SCE170A-1A	33 x 24 1/4 x 24	115/60/1	"Half-Dice" Cube	Air	10		see page 18
SCE170A-1C	SAME	SAME	SAME	Air	10		see page 18
SCE170W-1A	SAME	SAME	SAME	Water	10		see page 18
SCE170W-1C	SAME	SAME	SAME	Water	10		see page 18
SCE170A-6C	same	230/50/1	SAME	Air	5	1150	see page 18
SCE170W-6C	same	230/50/1	SAME	Water	5	1150	see page 18

Note: A scoop and legs are included. Power Cord Supplied.

For The Installer: Environmental Limitations

The ice machine must be installed indoors in a controlled environment.

	Minimum	Maximum
Air Temp	50 ⁰ F.	100 ⁰ F.
Water Temp	40 ⁰ F.	100 ⁰ F.
Water Pressure	20 PSI	80 PSI
Voltage	103.5	126.5



Operating the ice machine outside of the above limitations, or outdoors, is potentially damaging to the machine, and it is misuse of the machine. This may void the warranty.

Scotsman Ice Systems are designed and manufactured with the highest regard for safety and performance. They meet or exceed the standards of UL, NSF, and CSA.

Scotsman assumes no liability or responsibility of any kind for products manufactured by Scotsman that have been altered in any way, including the use of any part and/or other components not specifically approved by Scotsman.

Scotsman reserves the right to make design changes and/or improvements at any time.

Specifications and design are subject to change without notice.

Airflow on air cooled models is:

- Intake through the right front grill.
- Exhaust through the left front grill.

Do not install where this air flow is obstructed.

The SCE170 has a removable cabinet. When installed, the machine should have some extra clearance ($\frac{1}{8}$ ") on the left and right sides so that the cabinet may be easily removed when the machine is in place.

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Installation

Water

The water supply for this ice machine has been in contact with many materials since it fell from the sky as rain. All rain is slightly acidic, and tends to dissolve the materials it comes in contact with.

During water's journey to the ice machine, it has flowed over and through the ground, been picked up by a municipal or private pump, forced through a series of pipes of differing construction and may have been treated by the municipality providing the water.

The water supplied to this ice machine will then contain a variety of substances that will likely show up as solids during the ice making process. These solids are similar to those found when water is boiled out of a saucepan. Only the water boils away, and the minerals that were in the water solidify in the pan. During ice making only the water is frozen into ice, the minerals stay behind in the reservoir. This machine pumps out the water in the reservoir every cycle to minimize the amount of minerals in the water system, but after time the minerals will appear and have to be dissolved by ice machine cleaner, then flushed away during the cleaning process.

An ice machine is a food manufacturing plant; it takes a raw material, in this case water, and transforms it into a food product, ice. The purity of the water is very important in obtaining pure ice and in maximizing product life.

The water to the ice machine should be filtered. Water filters vary greatly in ability and function. Install one that filters out suspended solids to a dimension of 5 microns or less. The finer the filter the better, but finer filters may plug-up sooner than course ones. It may be necessary to add a course filter ahead of the fine filter to prolong filter life.

Have the water tested. Acidic water or alkaline water will both cause corrosion. Dissolved solids cannot be filtered out. Check with a water treatment specialist regarding testing, treatment and filters.

This ice machine may be installed in the open or under a counter. No clearance is required at the sides or top beyond what's needed to place the cabinet into position. Air cooled models blow air in and out through the grills at the front. Space is required for utility connections at the back.

The ice machine is not designed for outdoor use. It must be installed indoors, in a controlled environment. The air and water temperatures must not exceed rated limits.

Electrical power is supplied through a cord connected to the unit. All local codes must be followed.

Pre-installation:

1. Inspect the place where the ice machine is to be installed. Check for:

- space for the cabinet,
- water supply,
- drain availability
- and electrical power supply.

No extension cords are allowed. The building drain inlet must be lower than the drain outlets at the back of the ice machine. The water supply must have a hand shut off valve accessible when the unit is installed.

2. Determine the method of installation, is the machine to be installed under the counter? Is the drain in the floor under the machine? Is the water inlet valve accessible?

Installation

For The Plumber

1. Connect cold potable water to the 3/8" male flare at the top back of the cabinet. A water filter is recommended. Flush the water line prior to connecting to the ice machine.

If water cooled, connect a separate water inlet line to the water cooled condenser inlet fitting. It should also have a hand shut off valve.

A loop of copper tubing may be used between the ice machine and the water supply. This will allow the ice machine to be pulled out from its installed location without disconnecting the water line. No back-flow preventer should be needed in the inlet potable water line because provision for that is incorporated in this N.S.F. listed product (the float seat is above the reservoir wall and cannot siphon).

2. Connect a drain tube to each drain. The drain tubes from these connections must be run separately. There are two connections at the back of the cabinet, one is the bin drain and the other is the purge drain. Both are 3/4" F.P.T. brass fittings.

Drain tube material must be rigid and meet local code.

Traps in the bin drain line without vents ahead of them will cause poor draining.

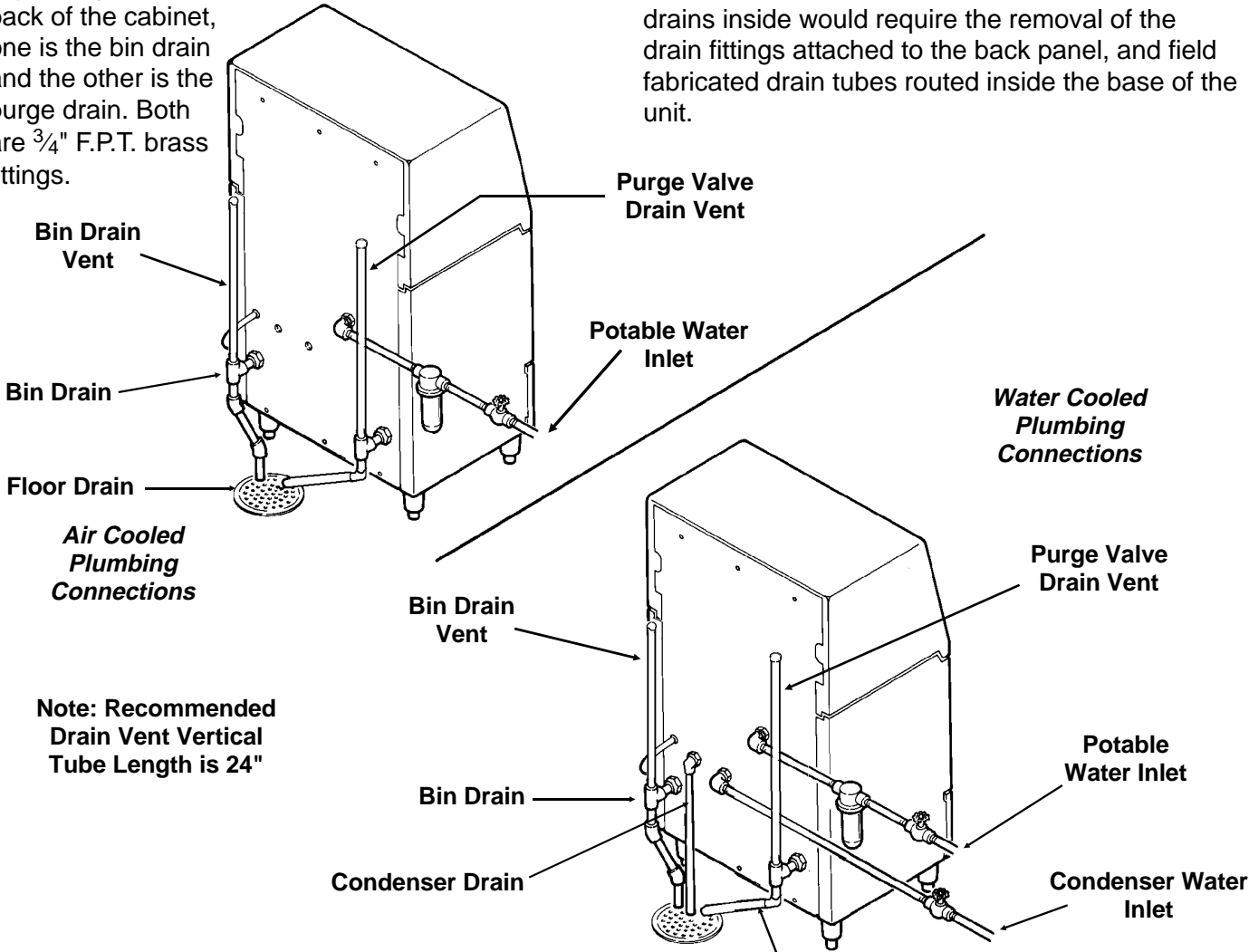
The bin drain must be vented if there is a long horizontal run (5' or more). The purge drain must also be vented. All drains are gravity, and must have a minimum fall of 1/4" per foot of horizontal run. The water cooled condenser drain should not be vented, and is routed separately.

Maintain the air gap required by local code between the end of the drain tubes and the building drain receptacle.

Note: Drain tubing should be insulated to prevent condensation from forming on the tubing.

CONFORM TO ALL LOCAL CODES

Note: The unit is designed for drain connections on the outside of the cabinet. To connect the drains inside would require the removal of the drain fittings attached to the back panel, and field fabricated drain tubes routed inside the base of the unit.



Note: Recommended Drain Vent Vertical Tube Length is 24"

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Installation

For The Electrician

This is a cord-connected unit, and must be on a separate 115 volt AC 60 cycle single phase power supply. The maximum fuse size for this circuit should be 15 amps, per the nameplate use fuses, or HACR circuit breakers.

Follow All Local Codes - This Unit Must Be Grounded. Do not use extension cords and do not disable or by-pass ground prong on electrical plug.

After Utility Connections:

1. Level the cabinet, use the leg levelers on the end of the legs to adjust the cabinet height. (Legs should have been installed when the unit was unpacked).
2. Wash out the bin and hood. If desired, the interior of the bin could be sanitized.
3. Locate the scoop, wash it and have it available for use when needed.

Final Check List

1. Is the ice maker cabinet in a room where ambient temperatures are within the minimum and maximum temperatures specified?
2. Has the water supply been connected?
3. Is the water pressure adequate?
4. Have the water connections been checked for water leaks?
5. Have the drain connections been made?
6. Have the drain connections been checked for leaks?
7. Is the cabinet level?
8. Is the ice machine plugged into a 115 volt electrical power supply and is the ice machine the only load on that circuit?
9. Has all of the shipping material been removed from the inside of the cabinet?
10. Has the bin and cabinet been wiped clean and sanitized?
11. Has the Customer Evaluation & Warranty Registration form been filled out? Check for correct model and serial numbers from the nameplate, then mail the completed form to Scotsman.
12. Has the owner/user been given the name and telephone number of the authorized Scotsman Service Agency serving that location?
13. To start up machine, follow the directions on page 10. For more information on the unit, turn to the next page.

Removal of the Cabinet

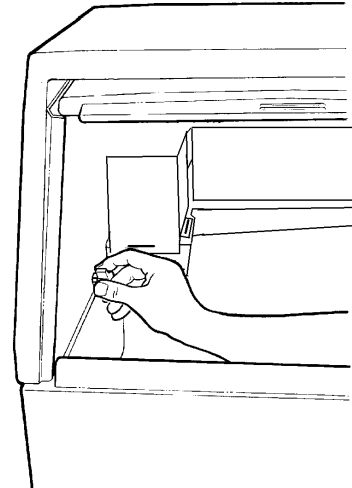
One of the most useful features of this ice machine is the ability to remove the cabinet from the ice machine without removing the ice machine from its installed position.

To Remove:

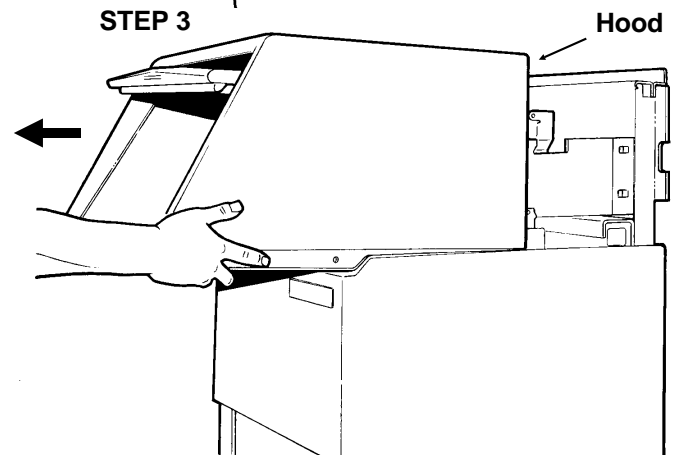
1. Switch the master switch to OFF. Be certain the ice machine has been switched off.
2. Open the bin door and unscrew the knobs at the left and right inside of the ice storage bin. Unscrew the knobs all the way out.
3. Pull the hood and door assembly straight out until it can be lifted up. Caution: the door will be free to come out the back of the hood when removed from the cabinet base.
4. To remove the cabinet base the hood must be removed first.
5. Remove 4 screws and the two grills at the front of the base.
6. In the area exposed when the grills are removed are two knobs similar to those removed in step 2. Unscrew and remove the two knobs.
7. Locate bin drain. Loosen hose clamp holding drain tube to fitting and pull the drain tube off of the fitting.
8. Lift up the front of the base and rotate the base up and off of the ice machine.

The machine is now exposed for service.

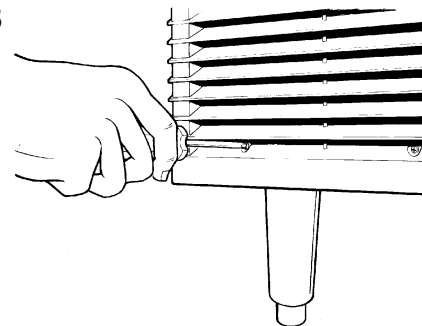
STEP 2



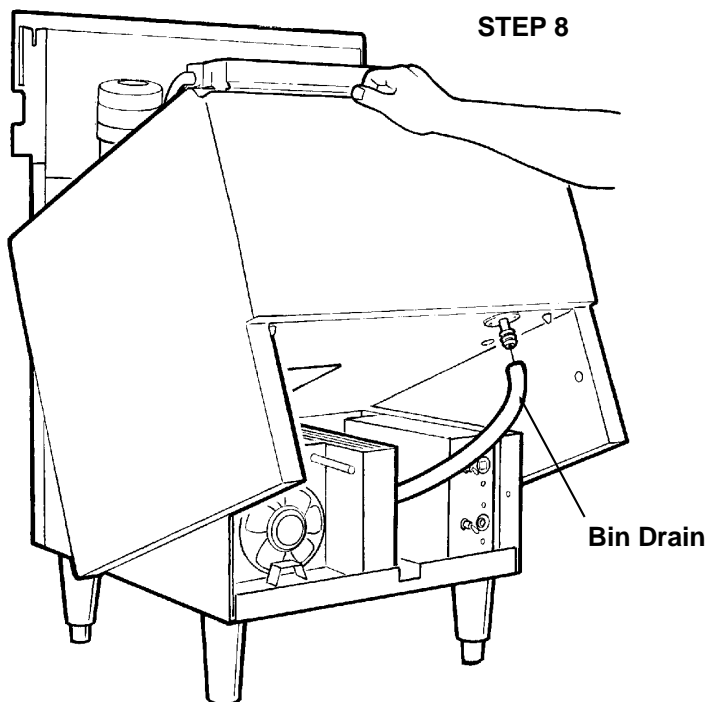
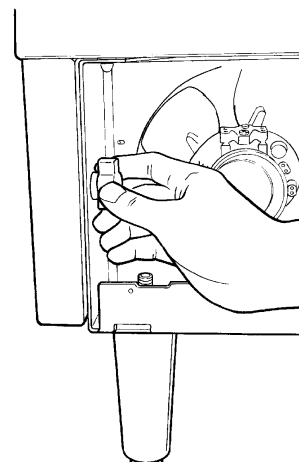
STEP 3



STEP 5



STEP 6



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Component Location

The ice machine is designed for front service. Many components are serviceable from the front without removing the cabinet. With the cabinet removed, nearly all components are serviceable.

In the bin area can be found:

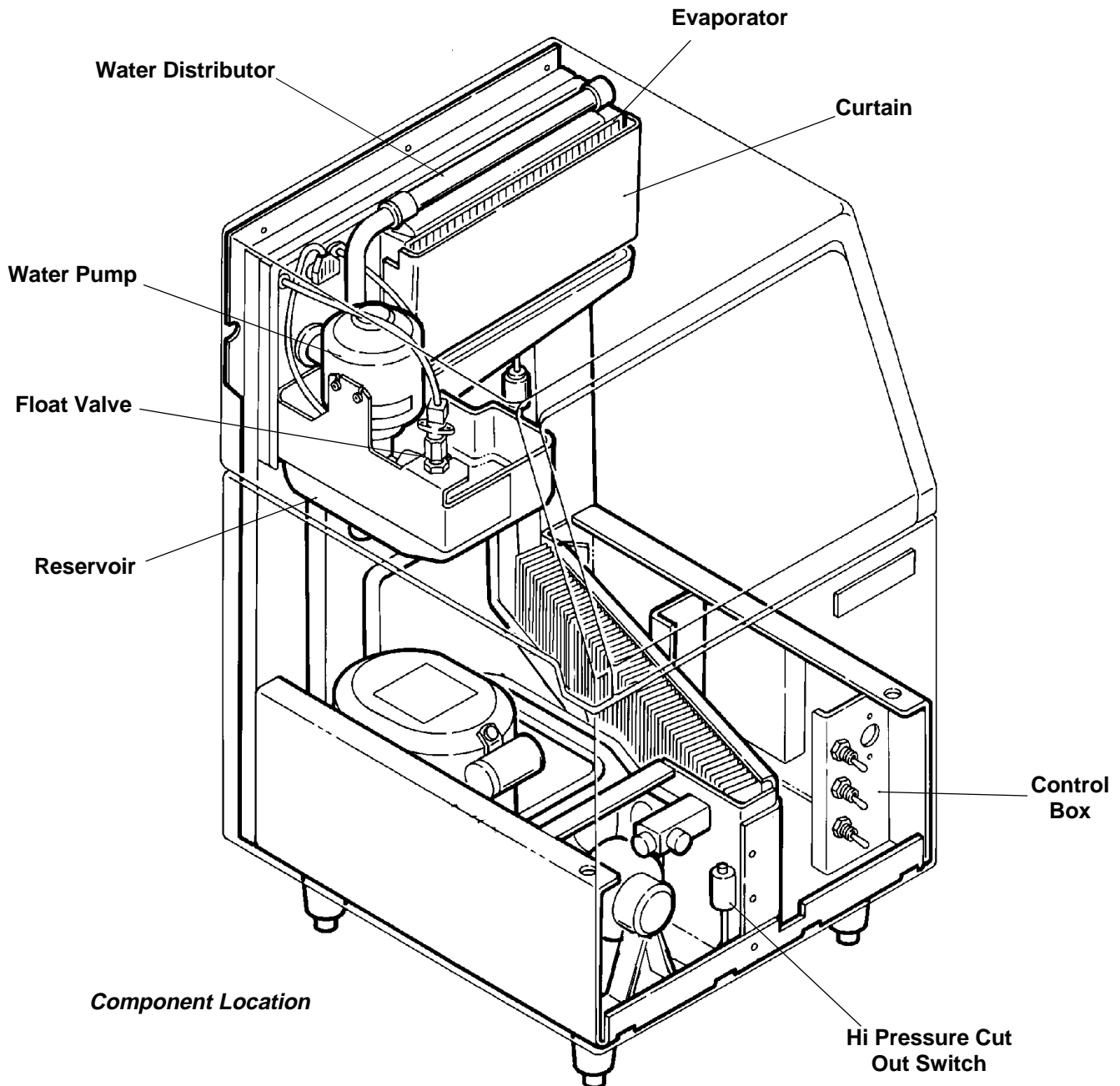
- Water pump
- Float valve
- Reservoir
- Evaporator
- Curtain
- Water distributor

Behind the right front grill on the front edge of the control box:

- Control box with cube size control adjustment
- ON/OFF/CLEAN switch
- Manual Harvest switch
- Purge switch

Inside the control box is control system for the ice machine.

When the bin is removed, the condensing unit is visible.



Component Location

Component Description

Water Pump

During the freeze cycle, the water pump moves the water from the reservoir to the water distributor at the top of the evaporator. During the harvest cycle, the water pump moves water from the reservoir to the purge valve and down the drain.

Float

The float valve controls the water flow into the reservoir. When the water level drops in the reservoir, the float also drops and opens the valve. Note: water flow to this ice machine is controlled by a flow control within the float valve.

Shut Off Valve

There is a water shut off valve located just above the float valve. Pushing the valve button controls the water flow to the float valve.

Reservoir

The place where the water pump picks up water to pump, and a return trough for water flowing from the evaporator.

Curtain

There is a curtain to cover the ice making side of the evaporator. The curtain keeps water from flowing into the ice storage bin, and, through the curtain sensor, controls the harvest time and on/off operation of the ice machine. There are two indicator lights for the curtain on the control board. Both lights will be ON when the curtain is fully closed.

Note: If the unit is in the Freeze Cycle, the Curtain can be moved/removed without disturbing the operation of the machine.

Water Distributor

The water distributor is an assembly of two tubes (one inside the other) that evenly distributes water over the evaporator.

Purge Valve

The purge valve opens during the harvest cycle, allowing the water pump to pump reservoir water down the drain. This dilutes the reservoir's concentration of minerals that remain after water is made into ice.

High Pressure Cut Out

This is a switch that opens to stop the ice machine when the internal refrigeration pressures become too high (over 450 PSIG). It is a manual reset on all water cooled machines and all air cooled machines built prior to October 1998, after that the air cooled models use an automatic reset switch.

ON/OFF/CLEAN Switch

This switch is the main manual control for the ice machine.

Purge Switch

This switch operates the purge valve ONLY when the ON/OFF/CLEAN switch is in the Clean position. Used when cleaning the ice machine.

Manual Harvest Switch

This switch puts the machine into the harvest cycle, used when cleaning or servicing the machine.

Cube Size Control

The cube size control is a reverse-acting thermostat that controls the start of the timed freeze cycle. It must be set properly to provide the correct size cube bridge. When it is Closed, an indicator light on the control board will be ON.

Strainer

There is a strainer in the inlet water line to keep large particles that may be in the water supply from plugging up the float valve. The strainer may be cleaned if it becomes restricted.

Hot Gas Valve

The hot gas valve is a refrigeration component used to by-pass the condenser and force warm refrigerant into the evaporator during the harvest cycle.

Evaporator

Where the ice is formed. It is a vertical, 5 row by 26 column, all copper, nickel-plated evaporator.

The outside edges of the evaporator are enclosed in plastic to keep water out.

Thermostatic Expansion Valve

The thermostatic expansion valve is used to meter liquid refrigerant into the evaporator, adjusting the flow of refrigerant as required to make ice.

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Initial Start Up

After the final check list has been gone through, the ice machine may be started up.

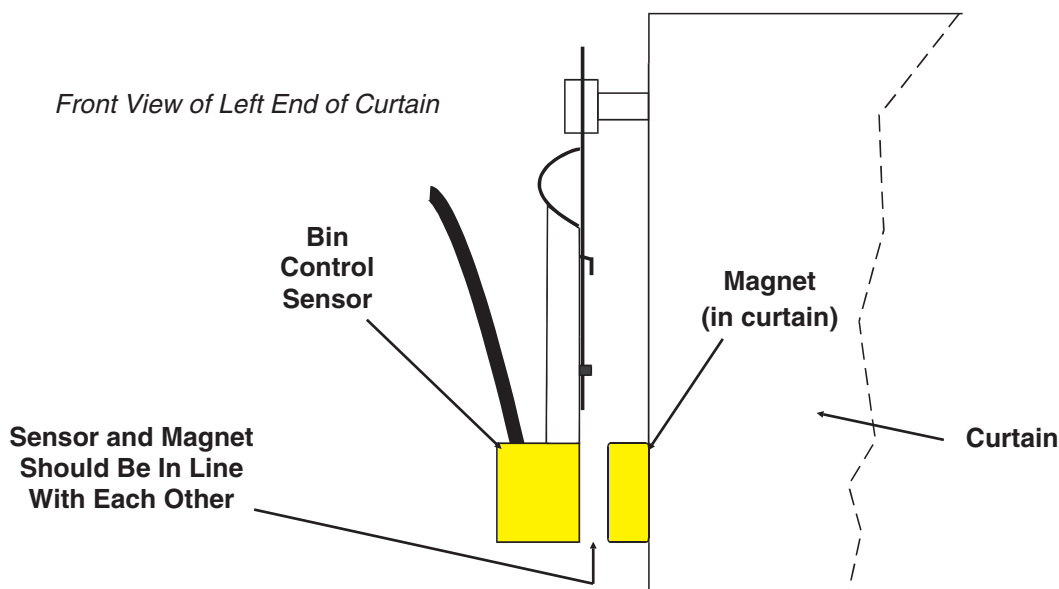
1. Open the bin door, open the water shut off valve and watch the reservoir fill with water. The water level should be about 1 5/8" from the top front edge of the reservoir when the valve shuts off. Adjust water level only if more than 1/4" off normal.

2. Pull open and release the curtain to check that it moves freely and closes completely. Check that bin control sensor is in line with the magnet in the curtain. Reposition curtain and/or sensor to their normal positions to bring these two components in line.

8. The water temperature in the reservoir will soon be 32°F, and ice should begin to form on the evaporator. Note: In most cases some slush will form in the reservoir. This is temporary and normal.

9. Allow the ice machine to operate for about 15-20 minutes. The ice should be fully formed and should be harvested within a few minutes.

Note: The machine may make a "cracking" noise a few minutes before harvest. This is the normal sound of the ice expanding.



3. Remove two screws and the right grill.

4. Switch the ON/OFF/CLEAN switch to CLEAN.

5. Move the Purge Switch, check that the machine pumps water out thru the purge drain. If no water flows out, correct drain and/or check valve.

6. Switch the ON/OFF/CLEAN switch to ON.

7. On air cooled models the fan motor will begin to turn, and warm air will be discharged from the left front of the ice machine.

On water cooled models warm water will begin to flow from the condenser drain.

Initial Start Up

10. When the cubes are about the correct size, the unit will automatically go into a "harvest" cycle. The purge and hot gas valves will open and on air cooled models, the fan will stop. **To operate properly, the machine must harvest a complete sheet of cubes. The falling ice sheet must open the curtain and the curtain must re-close before another freeze cycle can begin.**

11. After harvest, check the thickness of the ice.

- The connecting ice bridge between cubes should be about $\frac{1}{8}$ - $\frac{3}{16}$ inch thick.
- The "dimple" in most of the cubes must **not** be deeper than $\frac{1}{16}$ inch.

If needed, adjust the bridge thickness by rotating the adjustment screw of the cube size control. Rotate the adjustment screw $\frac{1}{8}$ turn at a time. Turn it clockwise to make the bridge thicker, and counterclockwise to make the bridge thinner.

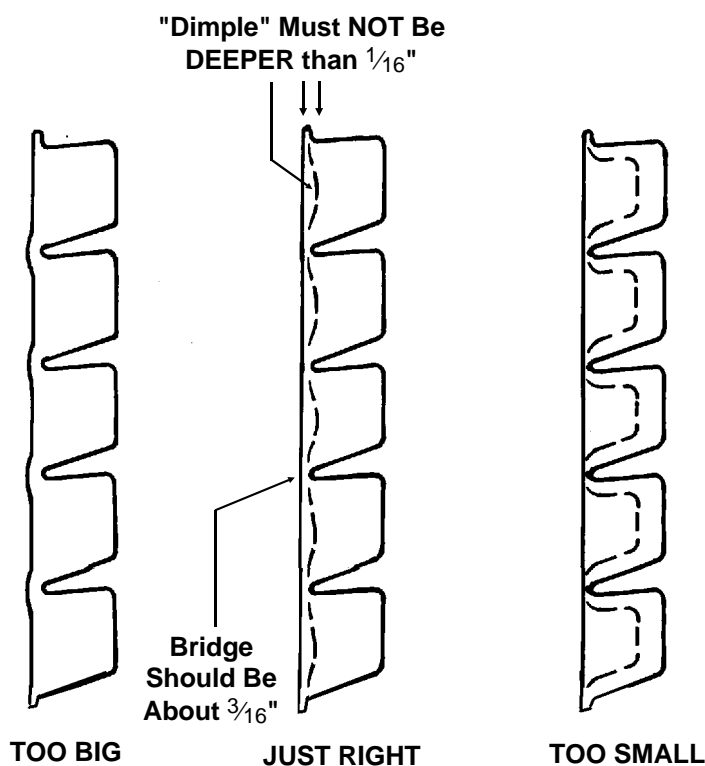
Although the machine is not designed to harvest individual cubes, the ice should break up into smaller groups of cubes in the bin. Bridge thickness may be adjusted thinner to make ice break-up easier, but the ice **must** fall as a sheet.

Note: Tapping a recently harvested ice sheet with the back of a scoop should break it up.

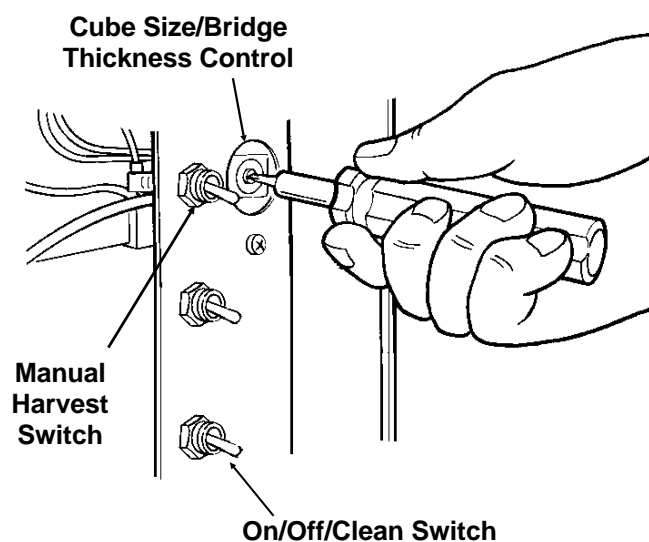
12. Check the operation of the bin control circuit: push the manual harvest switch down, release it and then hold the curtain open. This simulates the bin being full of ice and after a few seconds with the curtain open the ice machine should switch itself off. Release the curtain and the machine will restart.

13. Replace the grill and close the bin door. The ice machine is now ready for automatic operation.

Cube Size or Bridge Thickness, Side View



Note: Batch Weight Should Be Between 1.6 and 1.8 lb.



Adjustment of Cube Size (Bridge Thickness)

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Electrical Sequence

This describes the sequence through a complete cycle.

Freeze Cycle (curtain closed):

When the ON/OFF/CLEAN switch is at the ON position, power is connected to the primary of the transformer, which supplies power to the:

- Control board and curtain sensor. If the curtain is closed, the control board connects power to:
- The compressor contactor coil. When the contactor is energized, it connects power to the compressor.
- The control board also operates the water pump and, if air cooled, the fan motor.

Timed Freeze:

After some ice has built up on the evaporator and the suction line temperature has fallen, the cube size thermostat contacts close, resulting in:

1. The Timed Freeze indicator light on the control board glowing.
2. Power being connected to the freeze timer (in the control board). After 4 minutes this internal timer starts the harvest cycle by shutting power off to the fan motor (if air cooled) and connecting power to the:
 - Hot gas valve coil, opening the valve.
 - Purge valve coil, opening the valve.

Note: Both curtain indicator lights glow when the curtain is completely closed. Timed freeze indicator light glows when cube size control closes.

Harvest/Shut Off:

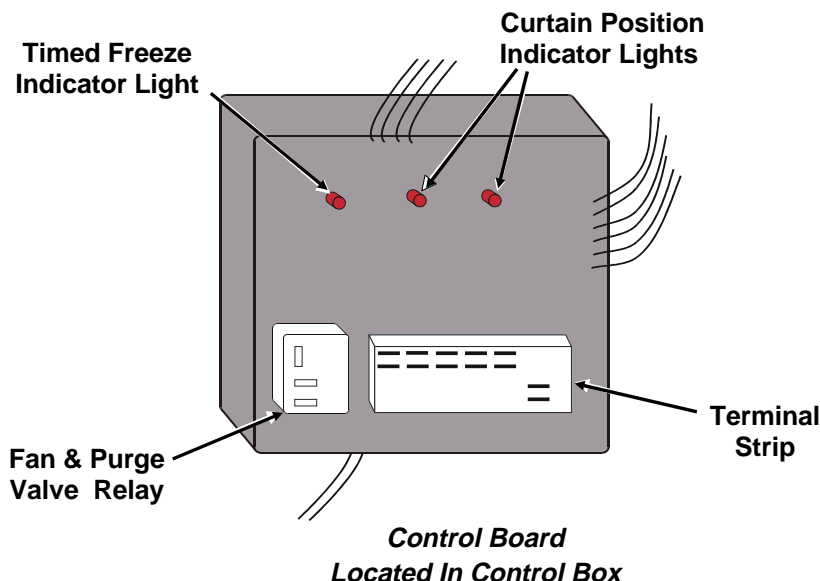
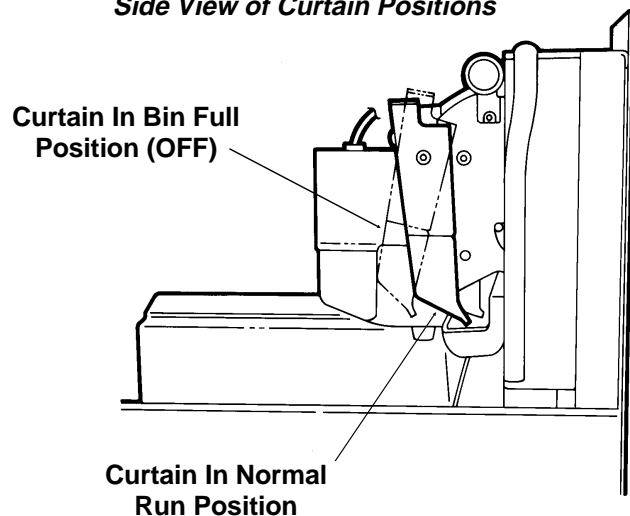
The machine stays in the harvest cycle until the curtain is opened by the passage of the ice sheet, or until 7 minutes have passed. If after 7 minutes of harvest time the curtain has not opened, the control board switches the machine back into the freeze cycle.

After the curtain has opened, the control board keeps the machine in the harvest cycle for 7 additional seconds.

If the curtain re-closes, the machine goes back into another freeze cycle.

If the curtain does not re-close, the bin control board opens the circuits to all components except the control circuit, stopping ice making.

Side View of Curtain Positions



Maintenance and Cleaning

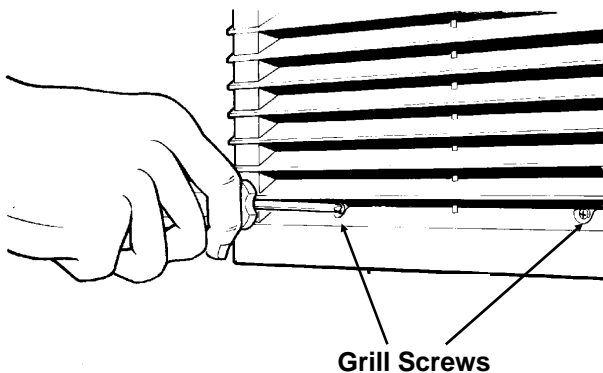
Cleaning Schedule:

- Scrub the door and frame edges once a week with soap and water.
- Sanitize the bin interior once a month.
- Clean the water system and air cooled condenser a minimum of twice per year. If in an area of high mineral concentration in the water supply, clean water system 4 times a year.

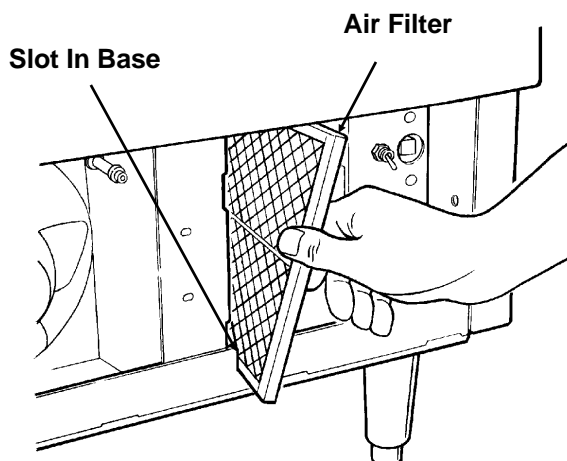
This ice machine will perform at its best when kept clean. There are two areas to keep clean: The water system including the water reservoir, distributor tube and evaporator surface; and the air cooled condenser filter and the condenser itself.

Air Filter (air cooled only):

1. Remove the grills on the front of the unit.
2. Remove two screws and the bracket holding the filter to the condenser.



3. Pull the filter forward and twist it slightly to pull it through the slot in the front base of the ice machine.



4. Wash the surface of the filter off with cold water, or, if torn or so dirty it can't be cleaned, replace with a new filter.
5. Return the filter to its installed position.
6. Replace the bracket removed in step 2.
7. Replace the grills. Do not operate the unit without the filter in place.

Note: If the unit has been operated without the filter in place, the fins of the condenser will become fouled with dirt, and must be cleaned. Scotsman recommends that only the surface of the condenser be cleaned with the bin in place. A vacuum cleaner with a soft brush attachment will extract most loose dust stuck to the surface of the condenser fins. If there is any doubt about dirt inside the fins of the condenser, the cabinet should be removed and a qualified service agent should clean the condenser.

Water cooled units:

The water cooled condenser may, over time and under certain water conditions, become internally restricted by minerals. These will have to be dissolved by acid or the condenser replaced. Only a qualified service agent should attempt this type of service.

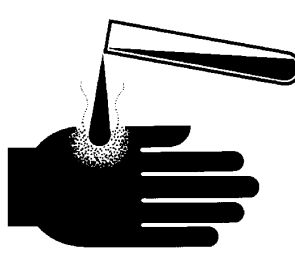
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Sanitizing and Water System Cleaning

Cleaning Water System:

The water system is cleaned by pumping a mixture of water and **nickel safe type ice machine cleaner** through the water distributor, over the evaporator and back to the reservoir.

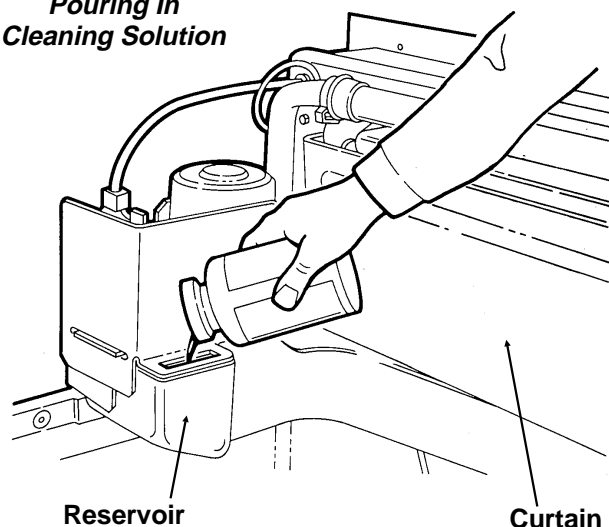
1. Open the door and empty the bin of ice.
2. Remove the right front grill.
3. Locate the Harvest switch; activate harvest cycle for 2 minutes or until ice falls from the evaporator.
4. Locate and move the ON/OFF/CLEAN switch to CLEAN.
5. Open and close the curtain to release any cubes.
6. Mix a solution of 1 quart of warm (95⁰F. - 115⁰F.) water and 1 ounce of **nickel safe ice machine cleaner, such as Scotsman Nickel-Safe.***

<p>Ice Machine Cleaner contains acids. These compounds may cause burns.</p> <p>If swallowed, DO NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately. In case of external contact, flush with water.</p> <p>KEEP OUT OF THE REACH OF CHILDREN.</p>	<p>⚠ WARNING</p> 
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7. Locate the purge switch, push it to ON and hold it ON until the reservoir is nearly empty.

8. Immediately pour the cleaning solution into the reservoir and allow it to circulate through the water system for 20 minutes.

Pouring In Cleaning Solution



9. Either A) Move the purge switch ON and hold it until the reservoir is nearly empty; **or** B) Remove the drain plug, drain the reservoir & replace the plug.

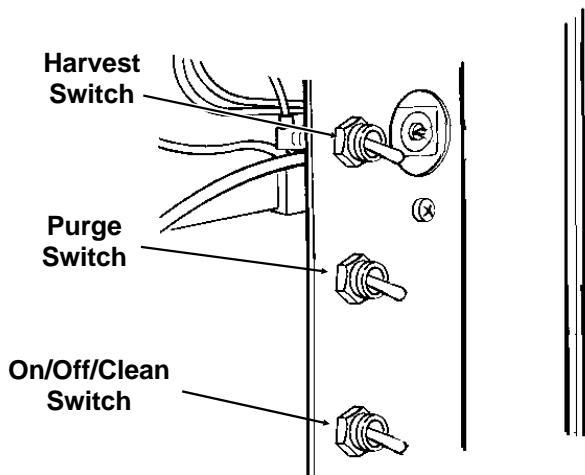
10. Open the curtain and check the condition of the evaporator surface, if it appears clean proceed to the next step. If mineral scale is still present, repeat steps 6-9 one more time.

Note: The ice making portion of the water system should be sanitized after cleaning by repeating steps 7-9, except substitute an approved sanitizing solution (such as a mixture of 1 oz. of household bleach to 2 gallons of warm {95⁰F. - 115⁰F.} water) for the cleaning solution.

Note: Sanitizer need only circulate water system for 2 minutes, or the time on the sanitizer instructions. Retain the balance of the sanitizer solution for sanitizing the bin interior.

11. After the reservoir refills, move the purge switch up until the reservoir is nearly empty. Allow the reservoir to refill. Repeat 4 times.
12. Move the ON/OFF/CLEAN switch to ON and replace the grill.
13. Discard the next batch of cubes.
14. The unit is now ready for automatic operation or sanitizing of the ice storage bin.

* Scotsman Nickel Safe Cleaner is available by ordering part number 19-0636-06 (8 oz bottle).



Sanitizing and Cleaning

Water Distributor:

Note: The water distributor may need to be cleaned separately.

1. Remove right front grill.
2. Switch master switch to OFF.
3. Open bin door.
4. Locate hood fasteners at the left and right inside walls of the hood, and remove the hood.
5. Remove the curtain.
6. Locate wing-nuts at the top of the water distributor and remove them.
7. Remove inlet hose from water distributor.
8. Pull water distributor forward and out of the ice machine.

The distributor may be pulled apart and any mineral accumulation washed out. Sanitize the water distributor and curtain after cleaning. Reverse the above steps to reassemble.

The storage bin must be cleaned regularly to maintain a sanitary environment. Once a week cleaning of the door and door frame with soap and water, a hot water rinse and an air dry is a basic procedure. Scale that may form on the plastic liner can be removed by scrubbing the surface with a mixture of Scotsman Ice Machine Cleaner and hot water. Remove any scale prior to cleaning.

To Remove Scale:

1. Mix a cleaning solution of 4 ounces of Ice Machine Cleaner to 4 pints of hot (95⁰F.-110⁰F.) water.
2. Using rubber gloves, dip a nylon scouring pad into the cleaning solution and scrub the scale off the liner.
3. After the scale has been removed, rinse all surfaces inside the bin with clean, potable water.

To Sanitize The Bin Interior:

The hood must be removed from the storage bin so that the joint between the two can be cleaned and sanitized.

To remove the hood:

1. Open the storage bin door and locate the knobs at the right and left inside wall.
2. Unscrew and remove the two knobs.
3. Pull the hood assembly and door straight out from the ice machine. Note: the door may be then be removed from the back of the hood.

Use an approved sanitizer and follow the directions and warnings of that sanitizer or use the following instructions for use of household bleach, if it meets local codes:

1. Mix sanitizing solution of 1 ounce of household bleach to 2 gallons of water.
2. Using clean rubber gloves and a clean cloth, wipe all interior surfaces of ice storage bin, hood and door with sanitizing solution. Be sure and wipe the joint between the hood and bin with the sanitizing solution. Use a clean brush or spray bottle to thoroughly swab/spray all interior surfaces with the sanitizing solution.
3. Reassemble and allow to air dry.

Stainless Steel Components Inside Bin

The stainless steel parts in the bin also require periodic cleaning. Chemicals in the water supply, such as chlorine, cause brown stains to appear on the surface of the stainless steel parts.

1. General Cleaning - staining is usually removed by washing the parts with ordinary cleaning powder such as Bon-Ami or Copper-Glo and water. After cleaning, rinse with clear water.
2. Water treatment. The chlorine enters the machine from the municipal water supply. It can be removed from the water supply by using a charcoal or activated carbon water filter to treat the water to the ice machine. If staining is severe, filters of this type are recommended.

Exterior Cabinet Cleaning:

The exterior cabinet may be cleaned by scrubbing with soap and water. Do not use cleaners containing petroleum products.

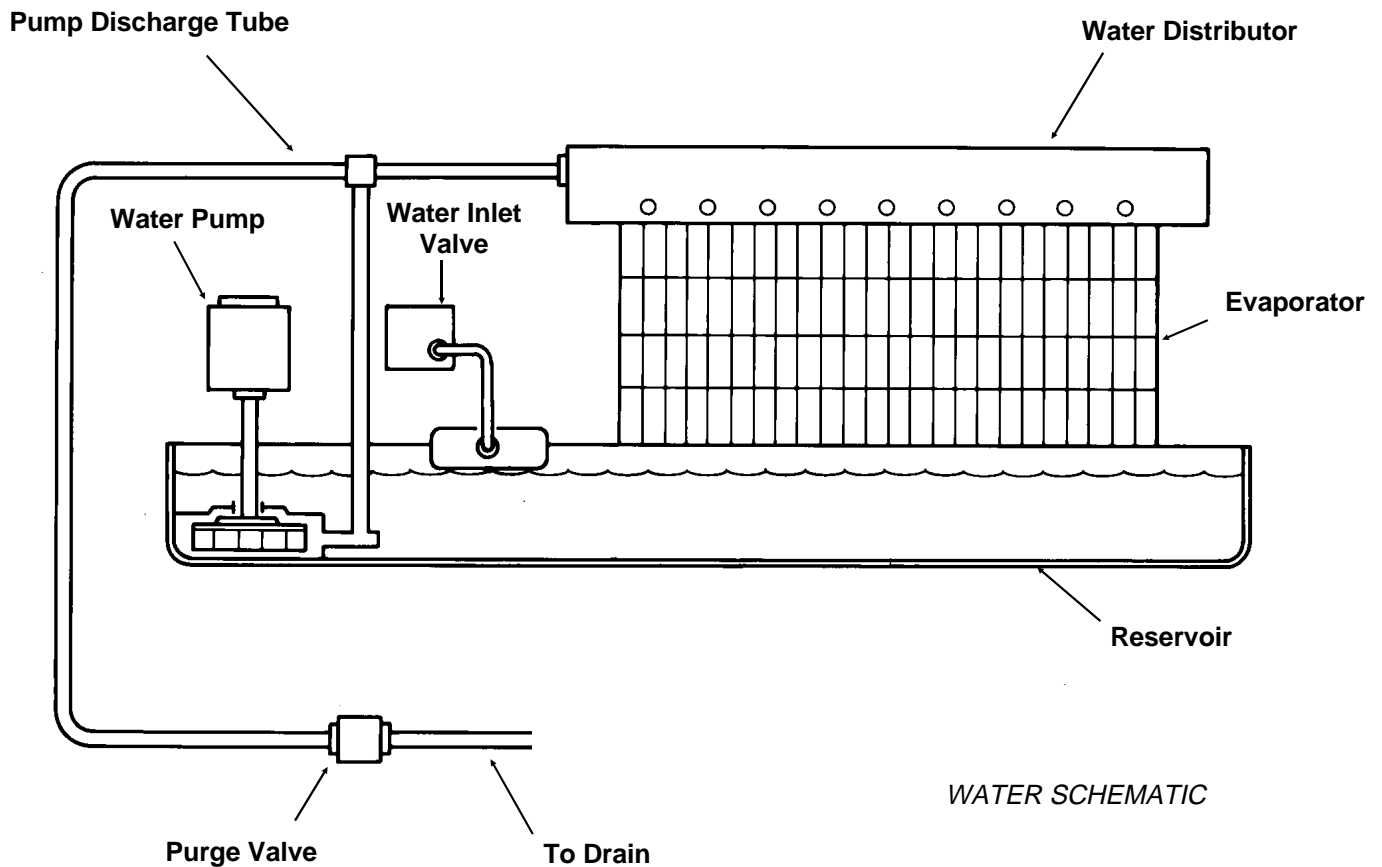
A nylon type brush may be used to scrub stubborn deposits.

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Water Schematic:

Water flows into the ice machine from its inlet connection at the back of the cabinet, through the float valve and into the reservoir. The water in the reservoir is pumped up and through the water distributor tube at the top of the evaporator. From there, the water flows over freezing surface of the evaporator and back into the reservoir. Melted ice and water spills into the bin flow through a drain in the base of the bin to the exterior drain connection at the back of the cabinet.

During the Harvest Cycle, the Purge valve opens, allowing the water pump to discharge water from the reservoir to the drain. At the same time water re-enters the reservoir. Very little water will flow across the evaporator during this time.



Refrigeration Schematic:

Freeze Cycle:

From the compressor, hot discharge gas is pumped to the condenser, either air or water cooled.

At the condenser, heat from the refrigerant flows into the cooling medium, either air or water, and the refrigerant condenses into a liquid. From the condenser the liquid refrigerant flows through the liquid line to the metering device - a thermostatic expansion valve.

At the externally equalized thermostatic expansion valve, the liquid refrigerant passes from a high pressure zone to one of relatively low pressure, and in the low pressure zone it evaporates. The low pressure zone where the refrigerant evaporates is the evaporator. When the refrigerant evaporates, it absorbs heat from the metal parts of the evaporator and the water flowing over it.

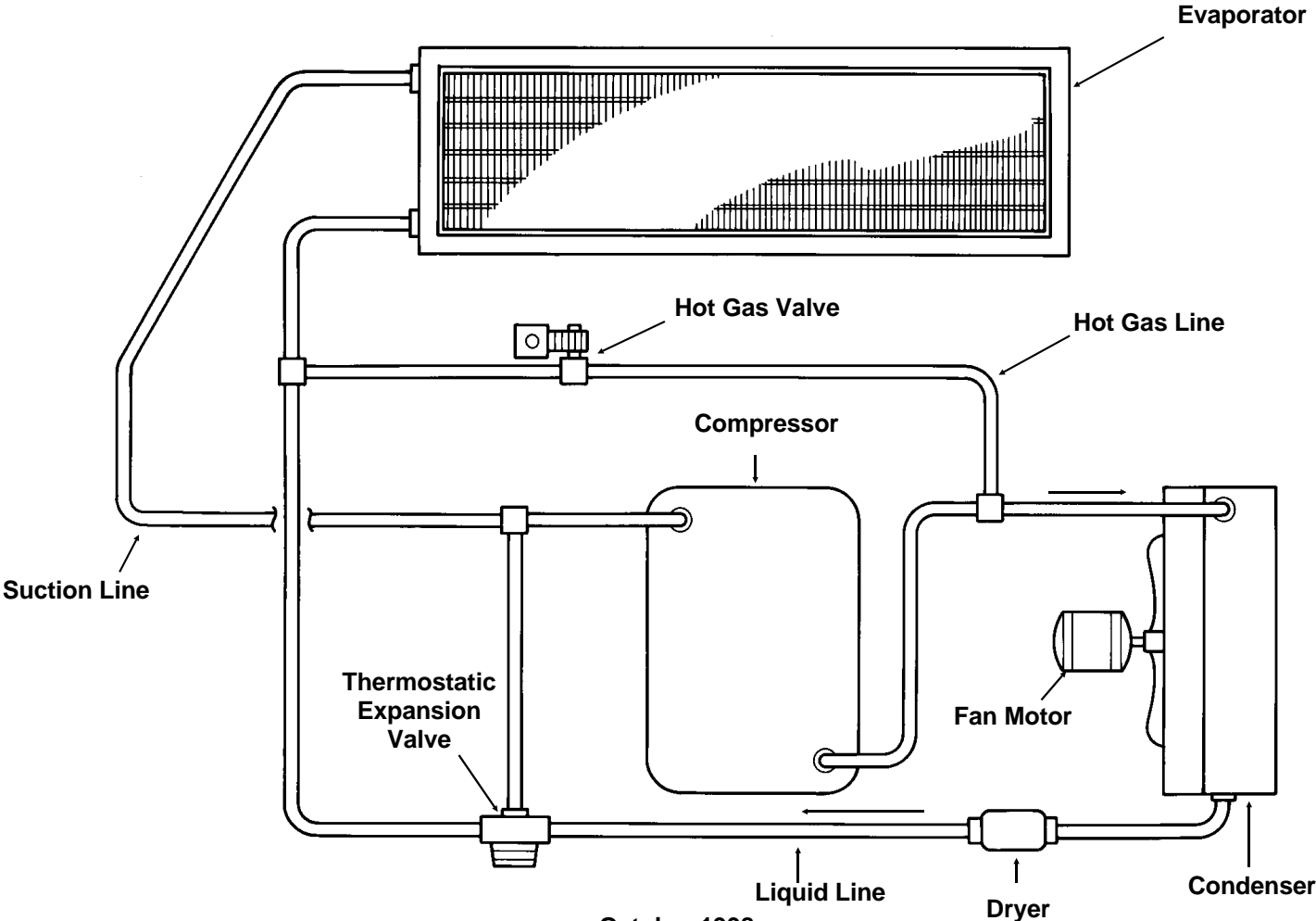
From the evaporator, the refrigerant flows back to the compressor through the suction line.

Harvest Cycle:

During the harvest cycle, the refrigerant flows from the condenser, through the discharge line to a branch in the line containing the Hot Gas Valve. This valve is Open during the harvest cycle, allowing the hot discharge gas to bypass the condenser and enter the evaporator at its inlet.

The hot discharge gases warm up the evaporator enough to allow the surface of the ice frozen to the evaporator to melt. The remaining ice will then fall off into the bin.

REFRIGERATION SCHEMATIC:



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Technical Characteristics

Typical Cycle Time

- 15 - 20 minutes (time depends upon how clean unit is, plus the air and water temperatures).

Typical Harvest Ice Weight

- 1.6 to 1.8 lb. ice harvested per cycle.

Typical Low Side Pressure

- 25 PSIG just before harvest

Typical Freeze Cycle Discharge Pressure

- Air cooled: 300 PSIG declining to 210 PSIG
- Water cooled: 245 PSIG

Refrigerant Type / Charge

- Air Cooled: R-404A / 17 ounces A series, 16 ounces B and C series
- Water Cooled: R-404A / 9 ounces A series, 11 ounces B series and 10 ounces C series

Harvest Time:

- Varies with ambient, usually about 1.5 - 2 minutes. Unit is in harvest until the curtain opens. The unit may remain in harvest a maximum of 7 minutes, after which the machine returns to the freeze cycle.

Typical Low Side Pressure, in harvest

- 85 - 100 PSIG

Typical Discharge Pressure in harvest

- 195 - 210 PSIG

Hi Pressure Cut Out

- Cuts Out at (450 PSIG air cooled, 350 PSIG water cooled); Cuts In at 350 PSIG (air cooled)

Typical Compressor Amp Draw

- Freeze: 6-7
- Harvest: 7-8

Superheat

- 4-6° F. 10 minutes into freeze cycle. TXV is not adjustable.

Finish Freeze Time

- 4 minutes after cube size thermostat closes (indicator light on control board is ON in Timed Freeze)

Air cooled fan motor

- 16 watt rating; 1500 RPM; CW. Stops during harvest.

Compressor

- Copeland hermetic, capacitor start, induction run.

Water Pump Motor

- 4 pole, unit bearing type.

Cube Size Control

- Adjustable Cut In temperature as needed to obtain correct ice bridge thickness, about 8°F. - 10°F.
- Cut In at about 31 PSIG (with normal heat load)

Service Diagnosis

Proper service diagnosis begins with observation, comparing the complaint to the operation of the unit. Ice machine service diagnosis should proceed from water, to electrical and then to refrigeration.

SYMPTOM	POSSIBLE CAUSE	PROBABLE FIX	
No ice is made	No water due to water turned off.	Reconnect water supply.	
	No water due to float valve plugged up.	Clean out float.	
	No water due to float stuck in closed position.	Replace float.	
	No water due to purge valve leaking water down drain.	Replace purge valve.	
	Water in reservoir, no flow over evaporator due to water leak at discharge hose.	Repair leak.	
	Water in reservoir, no flow over evaporator due to pump not operating.	Replace pump.	
	Water in reservoir, no flow over evaporator due to water distributor plugged up.	Clean water system.	
	Unit in CLEAN or Harvest cycle	Switch ON/OFF/CLEAN switch to OFF and then ON.	
No ice is made, nothing operates.	No power	Reconnect power.	
	ON/OFF/CLEAN switch in OFF position	Switch ON/OFF/CLEAN switch to ON.	
	Curtain in open position	Check for obstruction keeping the curtain open. Check that curtain is properly mounted. Check curtain sensor & indicator light.	
	High pressure cut out open, reset and check:	Air cooled: check fan motor for stalling, condenser/filter for dirt, loose fan blade.	
		Check water cooled unit for proper water supply	
		If overcharged or there are non condensables in refrigeration system, replace refrigerant with correct charge.	
		Replace H.P. cut out if it opens at too low a pressure.	
Unit may have stuck in harvest cycle in a very warm ambient, check operating conditions.			
Control board open	Replace control board.		
Unit does not shut off.	Curtain sensor does not work.	Check curtain sensor and control system.	

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Service Diagnosis

SYMPTOM	POSSIBLE CAUSE	PROBABLE FIX
Unit shuts off before bin is full.	Ice hangs up between curtain and reservoir.	Check action of curtain, check cube size.
Makes ice, but cubes are mal-formed.	Water distributor is dirty.	Clean water system.
	Cube size set wrong.	Adjust cube size control.
	Refrigerant leak. Cubes will be smaller or missing beginning at the top half of the evaporator.	Locate leak, repair, replace dryer, evacuate and weigh in nameplate charge
Cubes/bridge too thick.	Cube size control set too cold.	Adjust cube size control.
	Refrigerant leak, causing suction line temperature to be warm, keeping unit in the freeze cycle.	Locate leak, repair, replace dryer, evacuate and weigh in nameplate charge
Cubes too small, unit may stay in harvest because ice will not push curtain open.	Cube size control set too warm.	Adjust cube size control.
	Short freeze cycle caused by slush.	Some slush is normal. Check purge valve for leak-thru.
Machine goes into harvest, but ice on evaporator will not defrost - freezes up.	Cube size set too small.	Adjust cube size control.
	Cube size set too large.	Adjust cube size control.
	Hot gas valve will not open.	Coil of valve open, replace. Valve will not open, replace.
Unit freezes, but will not try to harvest.	Cube size control will not close; to check: Unplug water pump, switch unit Off and then ON, in about 2 minutes the Timed Freeze Light on control board should be ON	If timed freeze light does not go ON, replace cube size control.
	Timed freeze light glows, but after 4 minutes unit does not power hot gas nor purge valves.	Replace control board
	Very low on refrigerant	Check pressures
Low capacity/long freeze cycle.	Extreme hot location	Relocate the unit.
	Air cooled condenser or filter dirty.	Clean condenser/filter.
	Cubes too big.	Adjust cube size control.
	Water leak from reservoir.	Repair leak.
	Float valve does not shut off.	Replace float.
	Water temperature very high	Advise user
	Purge valve leaks by slowly.	Replace purge valve.
	Overcharged with refrigerant.	Evacuate and weigh in nameplate charge
	Hot gas valve leaks thru	Check hot gas valve. There should be frost on line between evaporator and valve during the freeze cycle.
Long harvest cycle	Cube size set too large	Adjust cube size
	Sticking in harvest	Check cube size or for slush

Service Diagnosis

SYMPTOM	POSSIBLE CAUSE	PROBABLE FIX
Machine operates, no ice is formed.	Unit stuck in harvest cycle.	Check for curtain stuck closed. Cubes too small, adjust bridge thickness, see Cube Size/Bridge thickness section
	Refrigerant leak	Locate leak, repair, replace dryer, evacuate and weigh in nameplate charge
	Compressor will not operate	Check compressor contactor coil.
		Check compressor.
		Check compressor start circuit
	Hot gas valve stuck open.	Replace hot gas valve.
	Refrigerant leak.	Locate leak, repair, replace dryer, evacuate and weigh in nameplate charge.
	Hot gas valve and purge valve stay on after curtains close and both curtain indicator lights are on.	Replace control board.
Purge valve leaks thru.	Clean or replace purge valve	
Compressor cycles on and off.	Compressor overheats.	Low on refrigerant. Repair leak, evacuate and weigh in nameplate charge
		Air cooled - fan not blowing, repair fan.
		TXV not letting enough refrigerant into evaporators, replace TXV.
		Mechanical fault with compressor, replace compressor.
		Check start capacitor
		Check start relay
Frost on compressor	Some frost will not hurt.	Do nothing.
	TXV meters too much refrigerant.	Replace TXV.
To check bin control system:		
When curtain is closed, BOTH curtain indicator lights on the control board in the control box should be ON, if not:	Curtain not closed properly	Check action of curtains
	Sensor not in correct position	Place sensor assembly in correct position
	Curtain missing	Replace curtain
	Curtain sensor has failed.	Replace sensor assembly.

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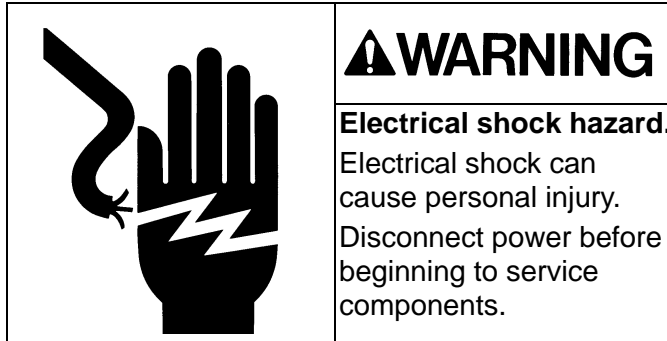
Removal and Replacement: Cube Size Control

Control Box Service

The control box may be lifted up from its normal position to improve service access.

To Move Control Box

1. Disconnect electrical power.



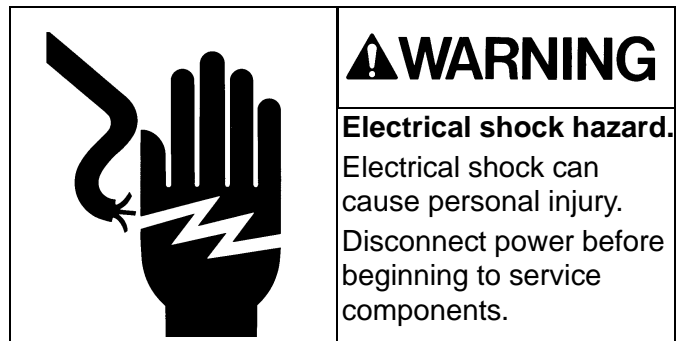
2. Go thru the steps to remove the hood, door and bin.
3. Locate and remove the 3/8" hex head screw holding the control box to the base, just below the purge switch.
4. Pull the control box forward about an inch.
5. The control box may now be moved up the height of the control box, be careful not to kink any capillary tubes.
6. After service, replace the control box in its normal position.

Cube Size Control (bridge thickness):

Before replacing the cube size control, it should be positively determined that it is at fault.

Check the operation of the cube size control by unplugging the water pump, removing the right front grill and control box cover, and watching the Timed Freeze Light. With no ice on the evaporator, switch the ice machine to ON. The temperature of the suction line where the cube size control bulb is located should be about 8-10° F. about 2 minutes into the freeze cycle (with the water pump unplugged). Or the low side pressure should be about 31-32 PSIG. The cube size control should then close its contacts and cause the Timed Freeze Light on the control board to be ON. If it cannot be adjusted to close at that point, or if it does not open when warm, replace it.

1. Disconnect electrical power.



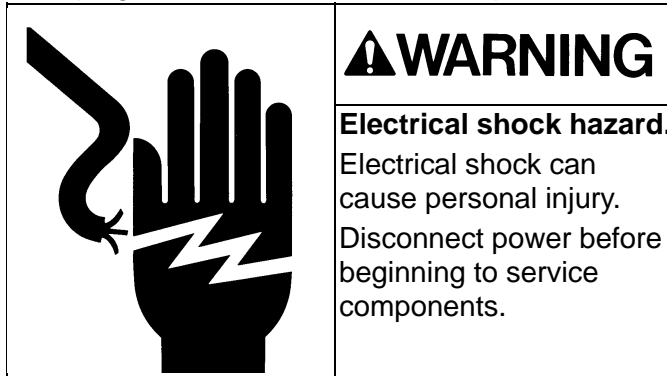
2. Remove the hood, door and ice storage bin.
3. Remove the control box cover.
4. Locate the cube size control.
5. Remove the two screws holding the control to the control box, and lift the control out.
6. Pull the two wires off the posts of the cube size control.
7. Follow the capillary tube of the cube size control and remove it from the grommet in the back of the control box.
8. Locate bulb on suction line and remove insulation covering bulb.
9. The end of the cube size control is inserted in a socket attached to the suction line. Pull it out of the socket.
10. Replace the cube size control with the proper part number, following the above steps from 9-1. Be sure to re-insulate the cube size control bulb.

Removal and Replacement: Water Pump

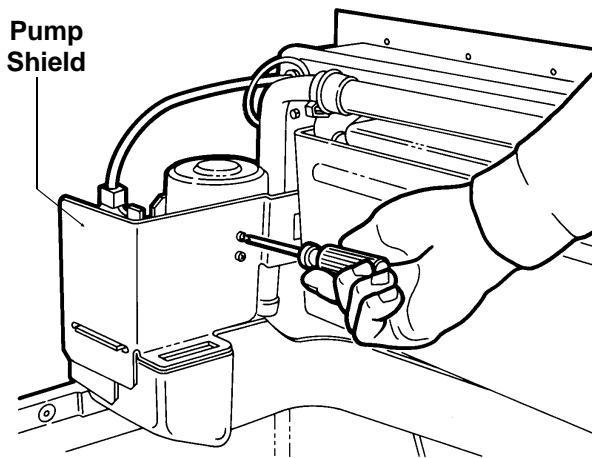
Water Pump

The pump provides the force to move the water from the reservoir to the freezing surface. The pump does not need oil, but if it becomes noisy, overheats, or will not pump it should be replaced. Be certain to confirm electrical faults with a voltmeter or ohmmeter before replacing the pump. The pump should operate with the compressor.

1. Unplug or disconnect the electrical power.

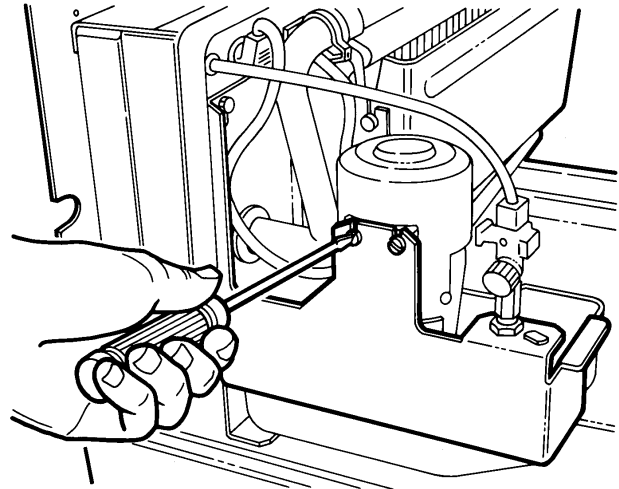


2. Open the bin door and unscrew the knobs holding the hood to the bin.
3. Pull the hood off the bin. Note: the bin door will come out the back of the hood when the hood is removed from the bin.
4. Remove screw and pump shield.



5. Unplug the pump from its connection at the back of the stainless steel wall.
6. Loosen the two fasteners holding the pump to the bracket.

Note: The two pump fasteners are hex head screws. When the unit is built in, they can be loosened using a 1/4" socket.



7. Pull discharge hose from pump discharge port.
8. Remove pump from ice machine.
9. Reverse above steps to replace.

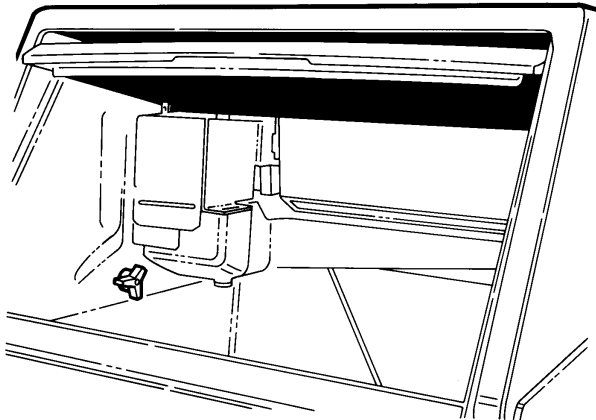
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Removal and Replacement: Float Valve

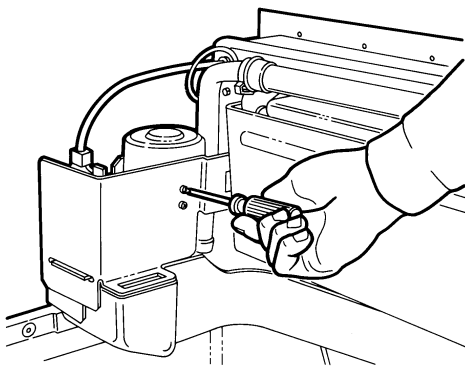
Float Valve

The float valve allows water to enter the reservoir but not overflow it. If the float sinks, or the valve will not seat, the float valve should be replaced. The float may plug-up from minerals in the water, and may be cleaned rather than replaced.

1. Shut off the water supply.
2. Open the bin door.

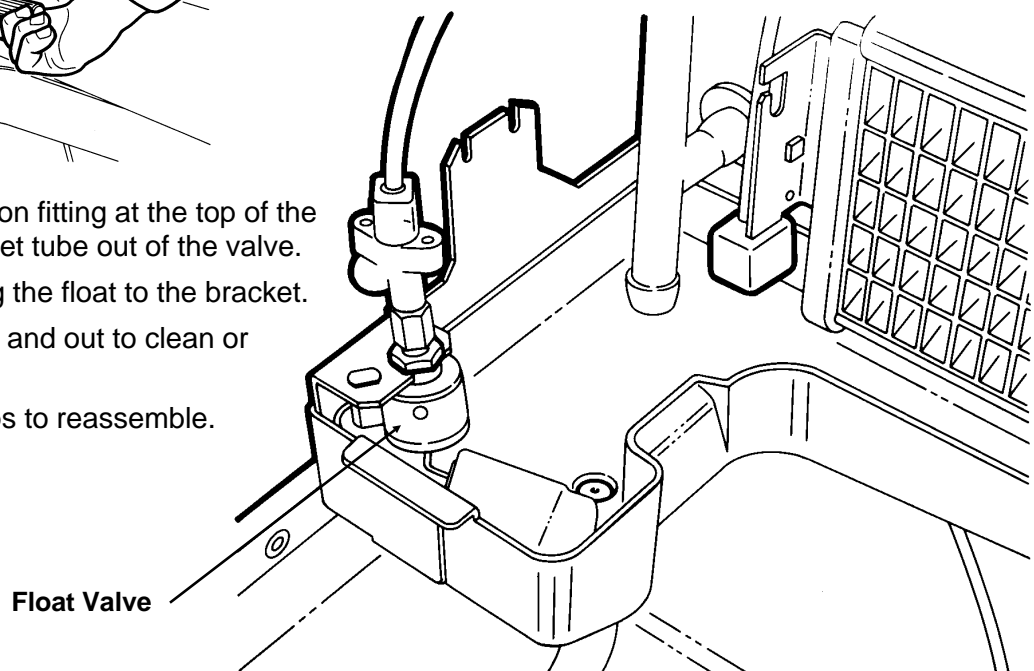


3. Remove the pump shield.



4. Unscrew the compression fitting at the top of the float, and pull the water inlet tube out of the valve.
5. Loosen the nut securing the float to the bracket.
6. Pull the float to the right and out to clean or replace.
7. Reverse the above steps to reassemble.

Note: This illustration shows the pump removed. It is NOT necessary to remove the pump to remove the float.



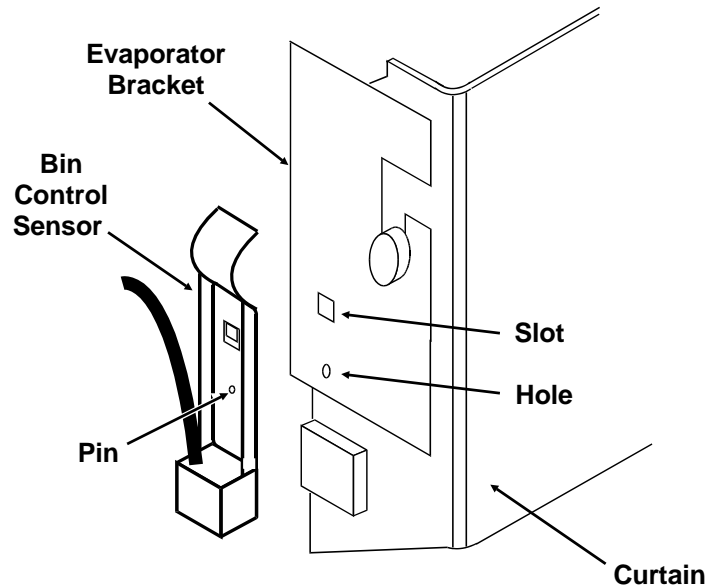
Removal and Replacement: Curtain & Bin Control

Bin Control Sensor

The bin control sensor should only be changed if it has been determined that it has failed. An easy check is to remove the right grill and the control box cover. Then, with no ice near the curtains and the machine plugged in (& switched on), move the curtain in and out. The light on the board in the control box should go on and off with the motion of the curtain. If not, replace the bin control sensor.

1. Disconnect electrical power.
2. Remove the hood, door and ice storage bin.
3. Locate bin control sensor on the left end of the evaporator.
4. Move the bottom of plastic sensor housing left until the pin is clear of the hole in the evaporator bracket.
5. Pull the sensor housing up and out of the slot in the evaporator bracket.
6. Trace wires to plug connection near control box, unplug and remove assembly from unit.
7. Reverse to reassemble. Note: Bin control sensor must be full seated in the slot and the pin snapped into the matching hole in the bracket.

Removal/Replacement of Bin Control Sensor



Curtain

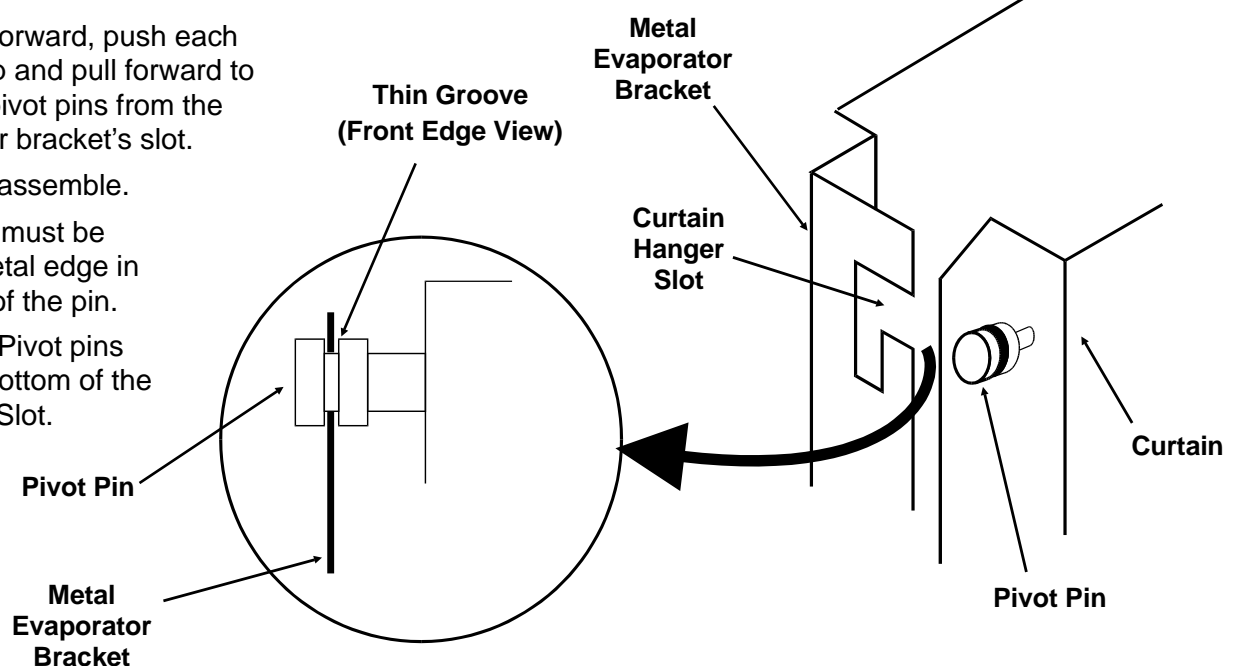
The Curtain has a magnet embedded in the left end. The location of this magnet is used by the bin control sensor to determine harvest and bin full. To replace the curtain:

1. Open the bin door.
2. Pivot curtain forward, push each end of curtain up and pull forward to remove plastic pivot pins from the metal evaporator bracket's slot.
3. Reverse to reassemble.

Note: Pivot pins must be installed with metal edge in the thin groove of the pin.

When installed, Pivot pins must be at the bottom of the Curtain Hanger Slot.

Removal/Replacement of Curtain

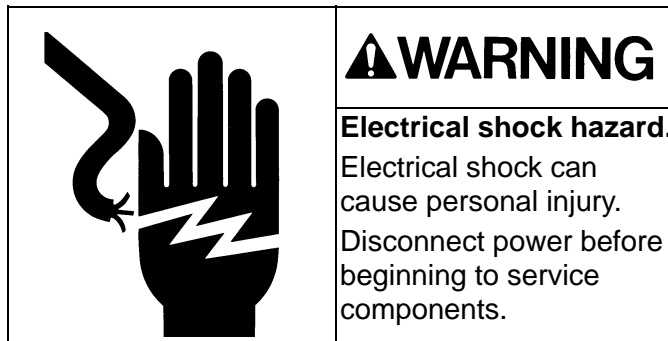


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Removal and Replacement: Purge Valve

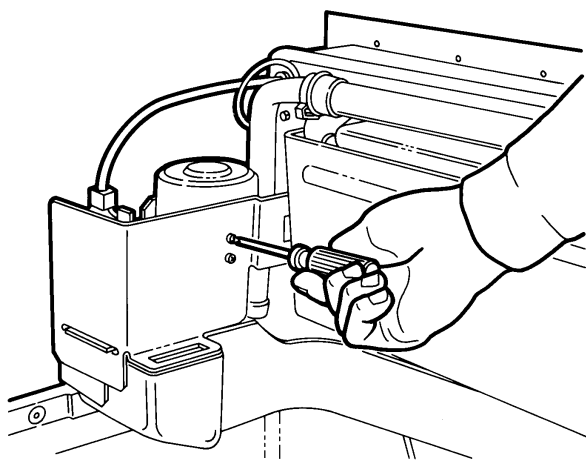
Removal:

1. Unplug unit.

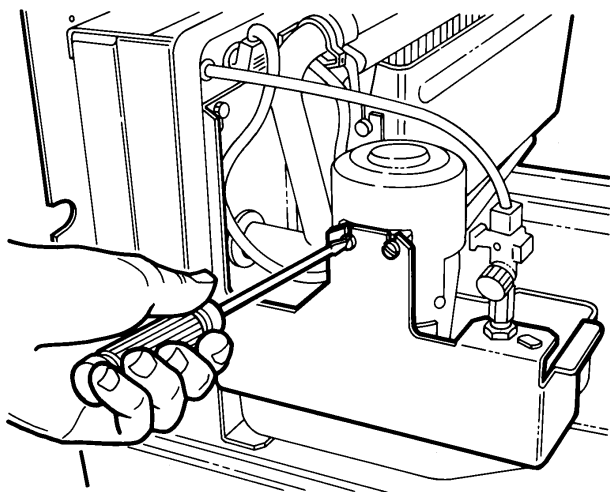


2. Open bin door, remove hood fasteners and pull hood from ice machine.

3. Remove one screw and pump shield.



4. Loosen 2 screws (1/4" hex head) holding pump to bracket.



5. Disconnect discharge hose from pump, water distributor and valve.

6. Pull pump up and out of the machine. Retain for re-installation.

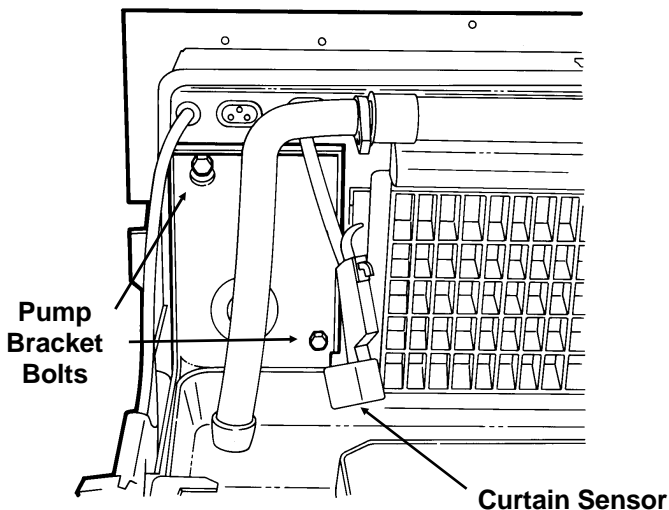
7. Remove curtain, set aside for re-installation.

8. Shut water off.

9. Loosen float valve retaining nut, slide float valve to the right and allow to hang by the incoming water line.

10. Remove plug from under reservoir and drain the reservoir.

11. Unclip curtain sensor.

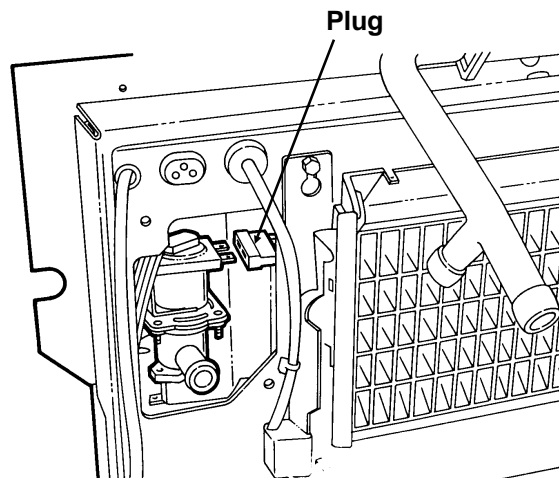


12. Remove reservoir support fastener from left end of reservoir.

13. Remove lower pump bracket bolt, and **loosen** upper pump bracket bolt.

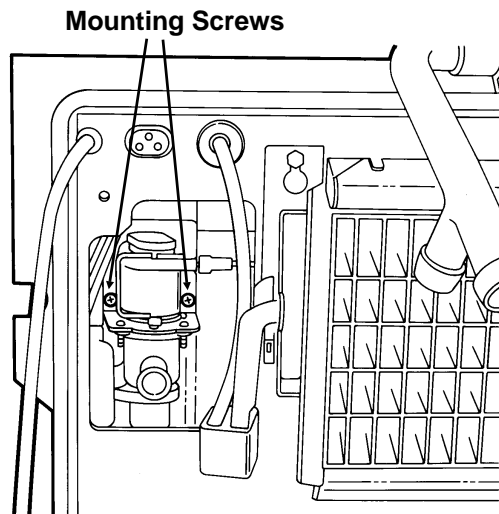
14. Remove pump bracket and set aside; lower reservoir into bin.

15. Locate electrical power plug to purge valve coil, remove plug.

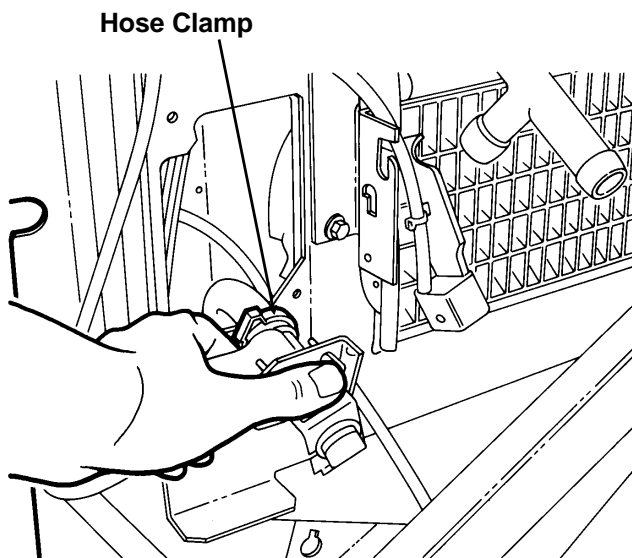


Removal and Replacement: Purge Valve

16. Unscrew the two screws holding the purge valve to the ice machine.



17. Pull the purge valve forward until the discharge hose clamp is accessible.



18. Loosen hose clamp and pull purge valve from ice machine.

Service:

19. Remove coil:

Flip plastic retainer up and slide off valve.

Pull coil up and off valve.

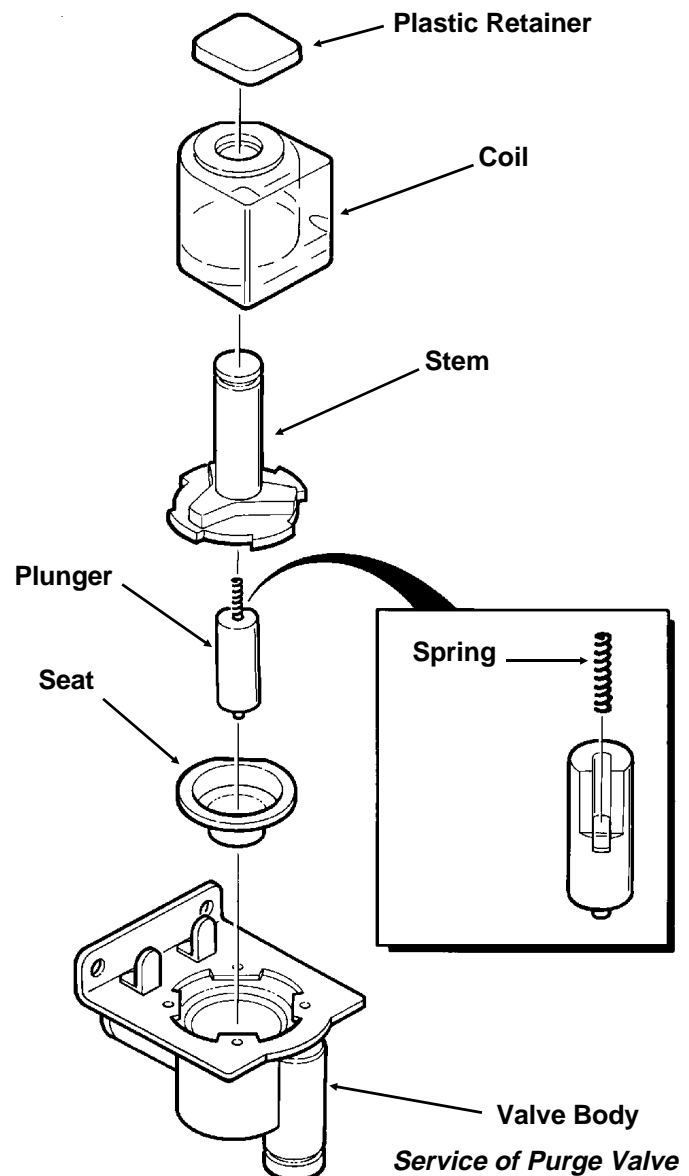
20. Open valve:

Rotate stem CCW as far as it goes.

Lift stem up and off valve.

Pull up on plunger - do not loose spring.

21. Examine seat & plunger for dirt/damage. Clean and reassemble. If damaged, replace valve.



22. Reverse above steps with original parts or new valve to reassemble.

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Water Distributor

The water distributor tube will typically not require any service beyond removal for cleaning. If needed, remove the water distributor by:

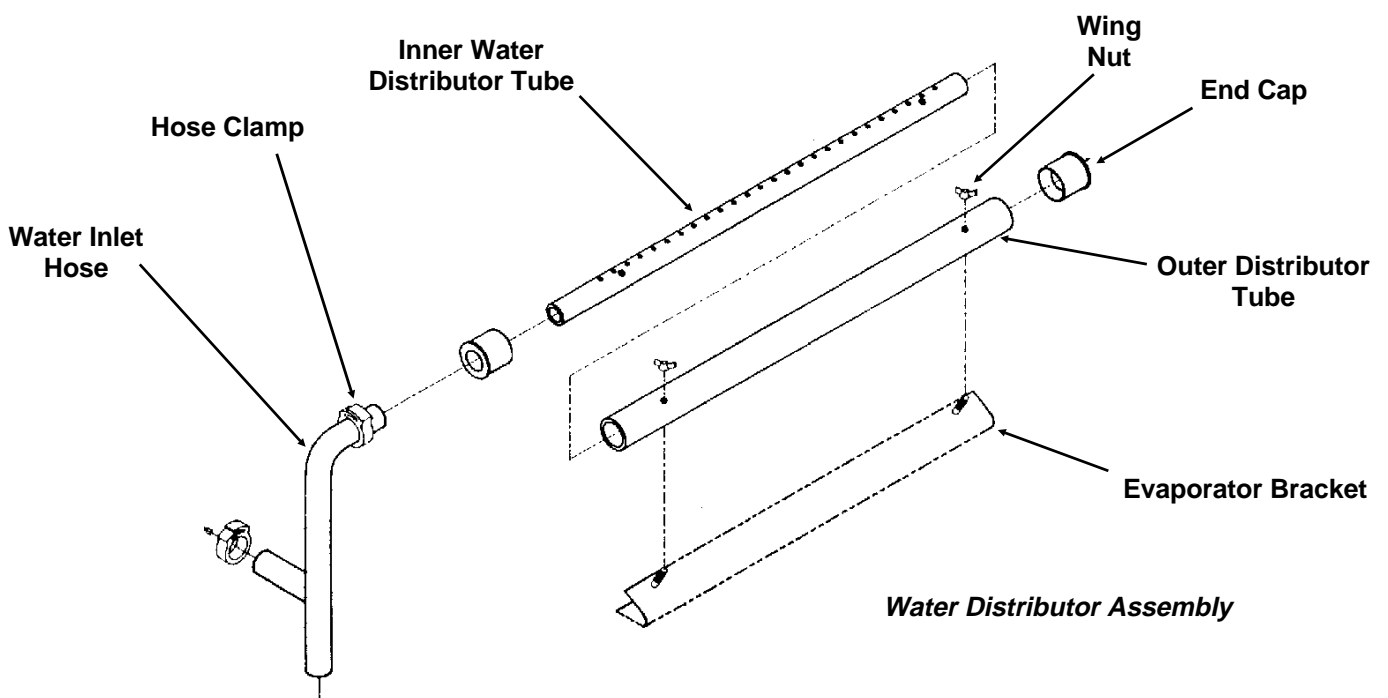
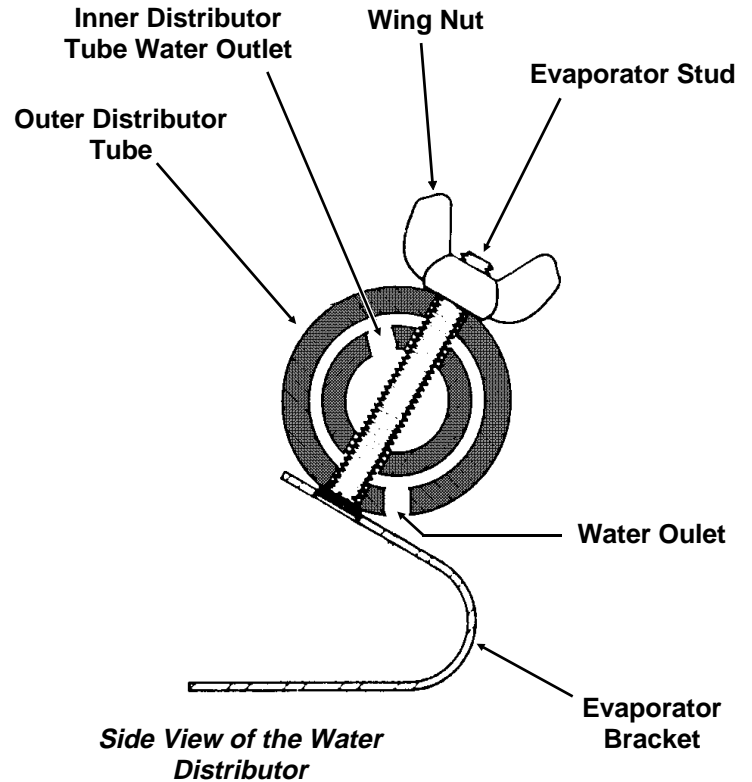
1. Remove the hood.
2. Remove lower right front grill.
3. Switch master switch to OFF.
4. Loosen hose clamp at water distributor inlet (on left).
5. Remove the two wing nuts holding the distributor to the evaporator.
6. Lift water distributor off the studs.
7. Pull the inner distributor tube out of the outer distributor tube and clean out all holes.

To reassemble.

8. Align the tube so that the inner distributor tube's holes are opposite the outer distributor tube's holes.
9. Place the end caps onto the water distributors.
10. Place the distributor tube onto the mounting studs:

NOTE: The Outlet Holes Face Down, Towards The Evaporator.

11. Replace the wing nuts, hose and hose clamp.
12. Switch the machine back on and check the water flow.
13. Replace the hood.



Refrigeration System Service: HP62 (R-404A)

Pressure-Temperature Chart for HP62

This ice machine uses R-404A refrigerant and polyolester oil. Do NOT use mineral oil in this refrigeration system.

- R-404A is a "Near Azeotrope" so liquid charging is required:
 - ▣ Weigh in as liquid as much of the charge as possible into the discharge line.
 - ▣ Install a sight glass between the manifold and the suction side hose and carefully meter liquid into the suction side, using the manifold valve to "flash off" the liquid before it enters the ice machine. Do this until the proper amount of refrigerant has been weighed into the system.
- When the system is serviced, a special liquid line drier is required. It is included with replacement compressors.
- HP62 is not compatible with mineral oil, so these ice machines use Polyolester oil. Polyolester oil absorbs water very easily. When one of these refrigeration systems is opened for service, it must be re-sealed as soon as possible (15 minutes maximum).
- Special leak detection equipment is required to locate small refrigerant leaks. Usually a leak detector capable of detecting a Halogenated refrigerant or HFC-134A will work. Check with the leak detector manufacturer if in doubt.

VAPOR		VAPOR	
TEMP.	PRESSURE	TEMP.	PRESSURE
(DEG F)	(PSIG)	(DEG F)	(PSIG)
-20	17	70	146
-18	18	72	150
-16	20	74	155
-14	21	76	161
-12	23	78	166
-10	24	80	171
-8	26	82	177
-6	28	84	182
-4	29	86	188
-2	31	88	194
0	33	90	200
2	35	92	206
4	37	94	212
6	39	96	219
8	41	98	225
10	43	100	232
12	46	102	239
14	48	104	246
16	50	106	253
18	53	108	260
20	55	110	268
22	58	112	275
24	60	114	283
26	63	116	291
28	66	118	299
30	69	120	307
32	72	122	316
34	75	124	324
36	78	126	333
38	81	128	342
40	85	130	351
42	88	132	360
44	91	134	370
46	95	136	379
48	99	138	389
50	102	140	399
52	106	142	409
54	110	144	420
56	114	146	430
58	118	148	441
60	123	150	452
62	127	152	464
64	132	154	475
66	136	156	487
68	141	158	499

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Liquid Charging

Instructions for R-404A

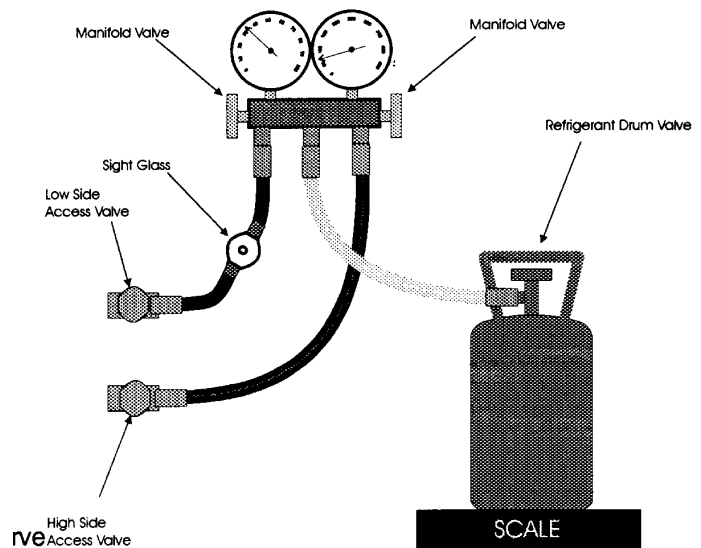
In preparation for charging, the low side hose should have a sight glass, and/or a restrictor device (such as a "Charge Faster") installed in it for metering liquid into the low side of the system.

1. After a thorough evacuation to at least 200 microns, shut off the manifold valves and switch off the vacuum pump.
2. Place a drum of R-404A onto an electronic scale.
3. Attach the charging hose to the drum.
4. Open the valve on the drum and purge the charging hose.
5. Zero out the scale.
6. Shut the low side access valve at the ice machine.
7. Open the discharge manifold valve full open.
8. Watch the scale, when the correct charge is shown, shut the manifold valve.

Note: If all of the charge will not "go in" the discharge side:

- A. Shut the discharge access valve at the ice machine.
- B. Switch the machine on.
- C. Open the low side access valve at the ice machine.
- D. Open the low side manifold valve and observe the sight glass to be certain that only gas is flowing into the system.
- E. When the proper charge is indicated on the scale, shut off the manifold valve(s).

9. Shut off the valve on the refrigerant drum.
10. Re-open the manifold valves until all liquid has flowed out of the hoses.
11. Shut the low side access valve on the ice machine.
12. Remove hoses from ice machine and replace all caps.



Hose Connection Schematic for Liquid Charging

Refrigeration Service

General Information:

Work on the refrigeration system should only be done when it is certain that the system needs repair.

- **Refrain from checking refrigeration pressures without reason.** Visual inspection of the water system, observation of the ice formation, amp draw, voltage, and other techniques will lead to proper diagnosis. Scotsman also recommends that, at the time of initial start up, gauges not be used.
- If gauges must be used, don't always check the high side pressure. If the condenser is clean and seems to be operating correctly, it most likely is. The low side pressure is more important on an ice machine than the high side.
- If gauges must be used, use very short hoses to minimize refrigerant discharged into the air.
- Refrigerant should not be added except as a way to determine the proper operation of the product. If the system was low on refrigerant, there is a leak, and it must be found and repaired.
- This system has a critical charge, it must be recharged with the correct amount of refrigerant as listed on the nameplate of the ice machine, or performance will suffer.
- Anytime the refrigeration system has been opened, the dryer should be replaced. **Note: Only a HFC type dryer should be used.**
- When brazing the tubing connections to components such as the TXV, the component must be protected by heat sink material.

Recover, reclaim or recycle refrigerant. The method chosen is up to the service company. Any refrigerant placed into a Scotsman ice machine must meet ARI spec 700-88. Reclaim programs are available through most refrigerant wholesalers.

Access Valves: To use the access valves:

Remove the cap from the stem, use a 3/16" allen wrench to check that the valve is CLOSED. Then remove the core cap.

Close the valve and replace the caps when the job is finished. The valve must be closed and the caps must be on or the valve will leak.

