

## INTRODUCTION

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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 service this ice system.

The CME650R uses HP62 as the refrigerant, and polyolester oil for compressor lubrication.

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**Parts Lists and Wiring Diagrams are located in the center of this manual, printed on yellow paper.**

Keep this manual for future reference.

This manual was printed on recycled paper.

# CME650R

## FOR THE INSTALLER

The CME650R will fit the following Scotsman ice storage bins:

- \*BH550
- \*HTB500, HTB350, HTB250
- BH800 (with bin top KBT23)
- BH900 (with bin top KTB22)
- BH1360

It will also fit these Scotsman Dispensers:

- CD200
- IS150 (with adapter kit KADCM1)
- RS150 (with adapter kit KADCM1)

\*These smaller bins are recommended.

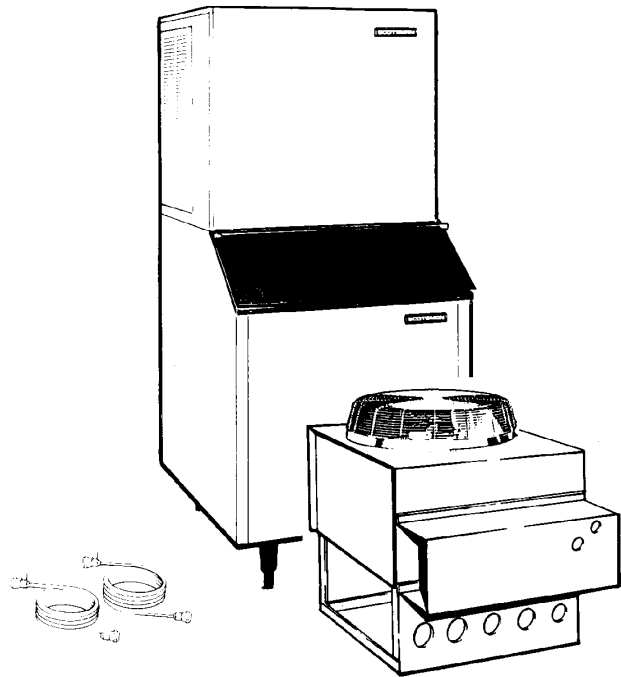
Scotsman Ice Systems are designed and manufactured with the highest regard for safety and performance. They meet or exceed the standards of U.L., N.S.F., and C.S.A.

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 parts 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 designs are subject to change without notice.

A remote condenser and precharged tubing kit are required to assemble this ice system.

The normal finish for the machine is enamel. An optional stainless steel panel kit (SPKCMD-1) can be field installed. It contains a stainless steel top, side panels, service panels, and front panel.



Model Number	Dimensions (without bin) W" x D" x H"	Basic Electrical	Minimum Circuit Ampacity*	Maximum Fuse (or HACR Circuit Breakers) Size	Refrigerant Charge** HP62 (R-404a)	Condenser Type
CME650RE-32A	30 X 24 X 27	208-230/60/1	16.9	20	208 oz.	Remote Air
CME650RE-3A	30 X 24 X 27	208-230/60/3	5.9	15	208 oz	Remote Air

\* Minimum Circuit Ampacity is used to determine wire size and type per the National Electric Code.

\*\* The unit is shipped with the full charge in the receiver. For re-charging purposes, if the nameplate charge is different than this number, go by the nameplate.

Use Scotsman remote condenser RCE651-32A, RCE652-32A or ERC201-32A or ERC402-32A. Use precharged tubing kit RTE25 (25') or RTE40 (40"). Fan relay kit KCMR230 required when two ice machines are powering 1 remote condenser.

This ice system (except remote condenser) is designed to be installed indoors, in a controlled environment.

	MINIMUM	MAXIMUM
Air Temperature	50 <sup>0</sup> F.	100 <sup>0</sup> F.
Water Temperature	40 <sup>0</sup> F.	100 <sup>0</sup> F.
Water Pressure	20 psi	80 psi
Voltage	-10%	+10%

## Installation

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### 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 dilutes 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.

*Even though there isn't one filter that will cure all water problems, a good filter combined with a polyphosphate feeder gives about the best overall performance.*

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.

Space is required for service access at the sides and utility connections at the back. 6 inch clearance is recommended.

**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.**

### 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 outlet of the ice bin. The water supply must have a hand shut off valve accessible when the unit is installed.

# CME650R

## Installation

### Assembly:

1. Attach the legs, or optional casters, onto the ice storage bin. Units that are stacked should only use legs, not casters.
2. Place the ice machine onto the storage bin.
3. Line up the ice machine, check that there is a good seal between the ice machine and the storage bin.
4. If on a Scotsman bin, attach the ice machine to the bin using the straps and bolts shipped with the ice machine. If on another brand bin, follow the directions included with that bin.

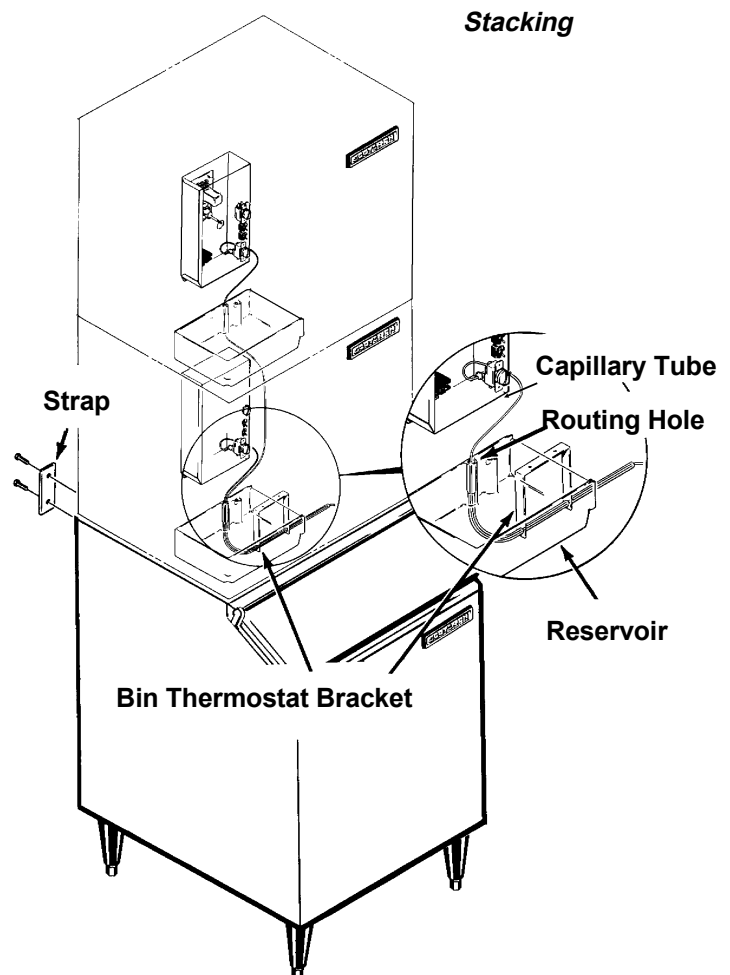
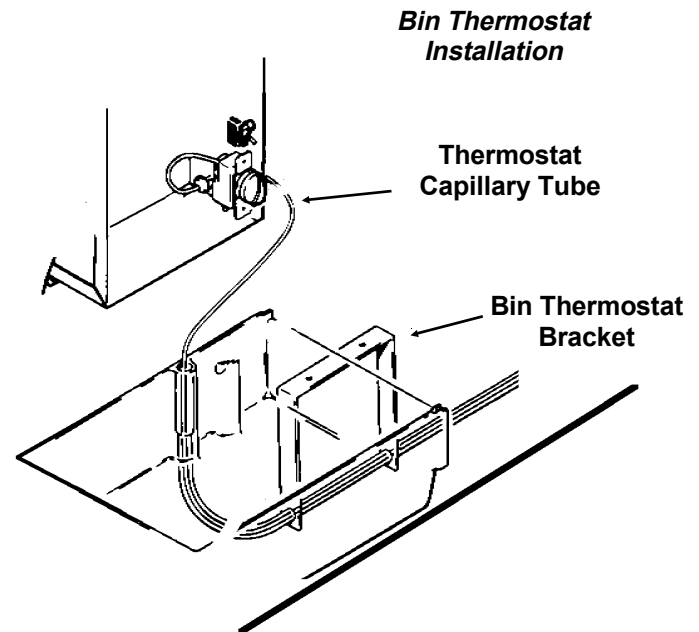
### Bin Thermostat Installation:

1. Remove rubber cap from the end of the thermostat bracket.
2. Attach the bin thermostat bracket to the bottom of the ice machine using the thumb screws provided. There are pre-drilled and tapped holes located just behind the cube drop area. The end of the bin thermostat bracket with the plastic tubing on it will fit into the hole in the base of the machine.
3. Locate and uncoil a portion of the bin thermostat capillary tube. Route the end of the capillary tube into and through the bin thermostat bracket tube. It should be inserted the full length of the tube, but not past the end.

### Stacking:

This machine will stack onto any CM250, CME250, CM450, CM500, CME500, CM650 or CME650 with the same cabinet depth (24").

1. Remove and discard the top panel from the lower unit.
2. Carefully lift the uncrated top unit onto the bottom unit. Use of a mechanical lift is recommended for this step.
3. Align the two ice maker cabinets.
4. Secure the top unit to the bottom one with the hardware and straps shipped with the upper machine.
5. Locate and uncoil all of the bin thermostat capillary tube.
6. Route the bin thermostat capillary tube from the upper unit, through the hole in the back of the reservoir, through the lower unit and into the bin thermostat bracket. Discard upper unit bracket.



## FOR THE INSTALLER: Remote Condenser

**Locate the condenser as near as possible to the interior location of the ice maker.**

Location of the condenser is limited by the specific length of precharged refrigerant tubing supplied for the application. The pre-charged tubing connects the icemaker to the remote condenser. The condenser must be above the ice maker.

Select the best available location, protecting the condenser from extremes of dirt, dust, and sun.

**Meet all applicable building codes.**

### Roof Attachment:

Install and attach the remote condenser unit to the roof of the building, using the methods and practices of construction that conform to the local building codes, including having a roofing contractor secure the condenser to the roof.

### Precharged Line Routing

////////////////////CAUTION////////////////////

Do not connect precharged tubing until all routing and forming of the tubing is complete. See the coupling instructions for connecting instructions.

////////////////////

1. Each set of precharged refrigerant lines consists of a 3/8 inch diameter liquid line, and a 1/2 inch diameter discharge line. Both ends of each line have quick connect couplings, the end without access valves goes to the icemaker.

Note: The openings in the building ceiling or wall, listed in the next step, are the minimum sizes recommended for passing the refrigerant lines through.

2. Have the roofing contractor cut a minimum hole for the refrigerant lines of 1.75". Check local codes, a separate hole may be required for the electrical power to the condenser.

////////////////////CAUTION////////////////////

DO NOT KINK OR CRIMP REFRIGERANT TUBING WHEN INSTALLING IT.

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3. Route the refrigerant lines through the roof opening.

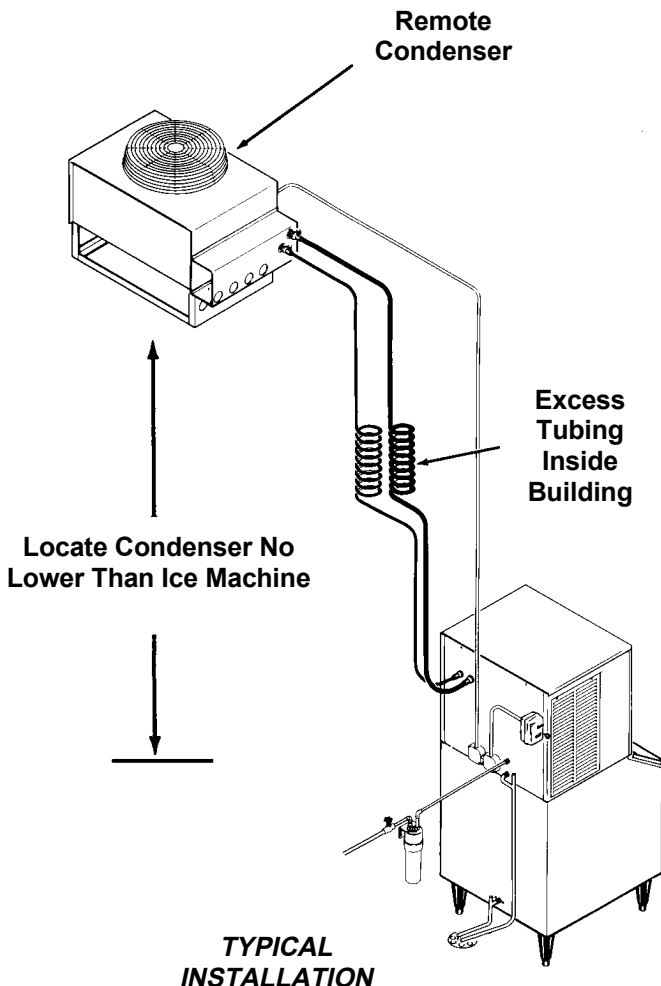
Follow straight line routing whenever possible.

Any excess tubing **MUST** be retained within the building.

4. Spiral any excess length of pre charged tubing inside the building. Use a horizontal spiral (as illustrated) to avoid any traps in the lines.

Note: Spiral need not be as tight as illustrated.

5. Have the roofing contractor seal the holes in the roof per local codes.



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## FOR THE INSTALLER: Coupling Instructions

////////////////////CAUTION////////////////////

The couplings on the sets of precharged lines are self sealing when installed properly. Carefully follow the instructions:

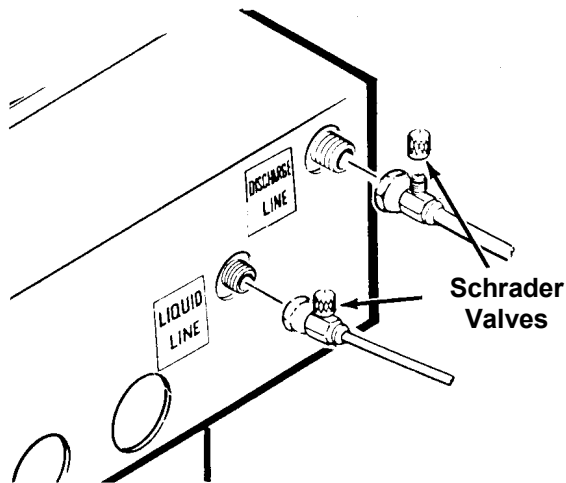
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### Initial Connections:

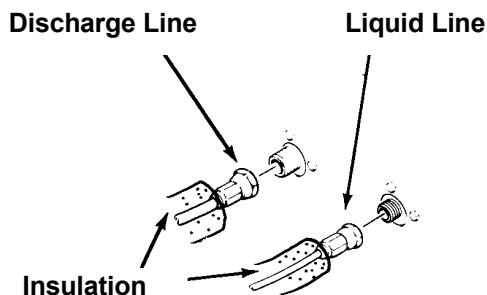
1. Remove the protector caps and plugs. Wipe the seats and threaded surfaces with a clean cloth to be certain that no foreign matter remains on them.

2. Lubricate the inside of the couplings, especially the O-Rings with refrigerant oil.

- The 1/2 inch discharge line (schrader valve end) goes to the remote condenser fitting marked "discharge line".
- The 3/8 inch liquid line (schrader valve end) goes to the remote condenser fitting marked "liquid line".



- The 1/2 inch discharge line goes to the icemaker fitting marked "discharge line".
- The 3/8 inch liquid line goes to the icemaker fitting marked "liquid line."



Ice Maker Connections

### Final Connections:

3. Begin tightening the couplings together by hand, then using two wrenches (it is important that ONLY the nut on the precharged lines be turned, the other parts of the couplings must NOT be allowed to turn or the process will tear out the diaphragms and they will be loose in the refrigeration system) tighten the coupling until it bottoms out or a definite increase in resistance is felt.

### TIGHTENING THE QUICK CONNECTS



4. Using a marker or pen, mark a line lengthwise from the coupling union nut to the bulkhead. Then tighten the coupling and additional 1/4 turn. As the nut turns, the line will show when 1/4 turn is made.

5. After all connections are made, and after the king valve has been opened, check the couplings for leaks.

Note: The system charge is contained in the receiver tank of the ice machine. Only "holding" charges are present in the "precharged" tubing or the condenser.

## FOR THE ELECTRICIAN

SEE NAMEPLATE for current requirements to determine wire size to be used for electrical hookup. When the cuber and the remote condenser are connected, each must be grounded to the other using the ground screws provided in the respective junction boxes. The cuber then requires a solid chassis to chassis earth ground wire. See Wiring Diagram.

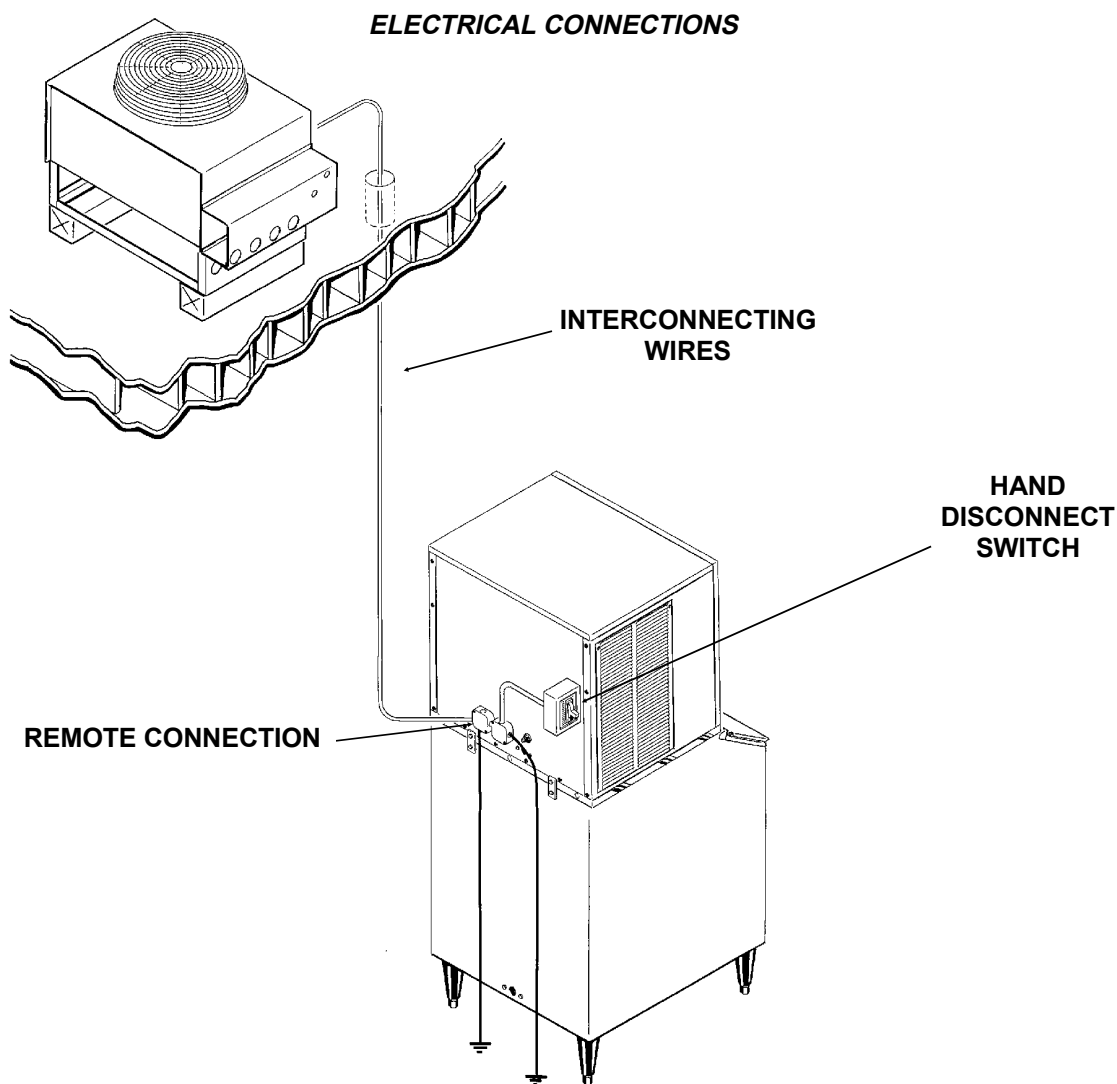
Be certain the cuber is connected to its own electrical circuit and individually fused. Voltage variation should not exceed ten percent of the nameplate rating, even under starting conditions. Low voltages can cause erratic operation and may be responsible for serious damage to the icemaker.

The remote condenser is designed to be powered from the ice machine. There is a separate electrical junction box at the back of the ice maker for the remote condenser. Wire the remote condenser to the ice maker in accordance with local and national electric codes. All outdoor wiring must be in rain proof conduit.

The condenser fan motor will run whenever the compressor is running.

**Electrical connections are made at the rear of the icemaker, inside the junction box.**

**All external wiring should conform to the national, state and local electrical code requirements. Usually an electrical permit and services of a licensed electrician will be required.**



# CME650R

## ELECTRICAL CONNECTIONS: KCMR230 Kit

When 2 ice machines are connected to 1 remote condenser and the fan motor is powered from the ice machines, a relay kit is required to maintain power to the fan motor.

All external wiring should conform to the national, state and local codes.

1. Attach the control box of the KCMR230 to a permanent location that is convenient for each ice machine's connection and for future service. Attach a solid earth ground wire to the Ground Screw.

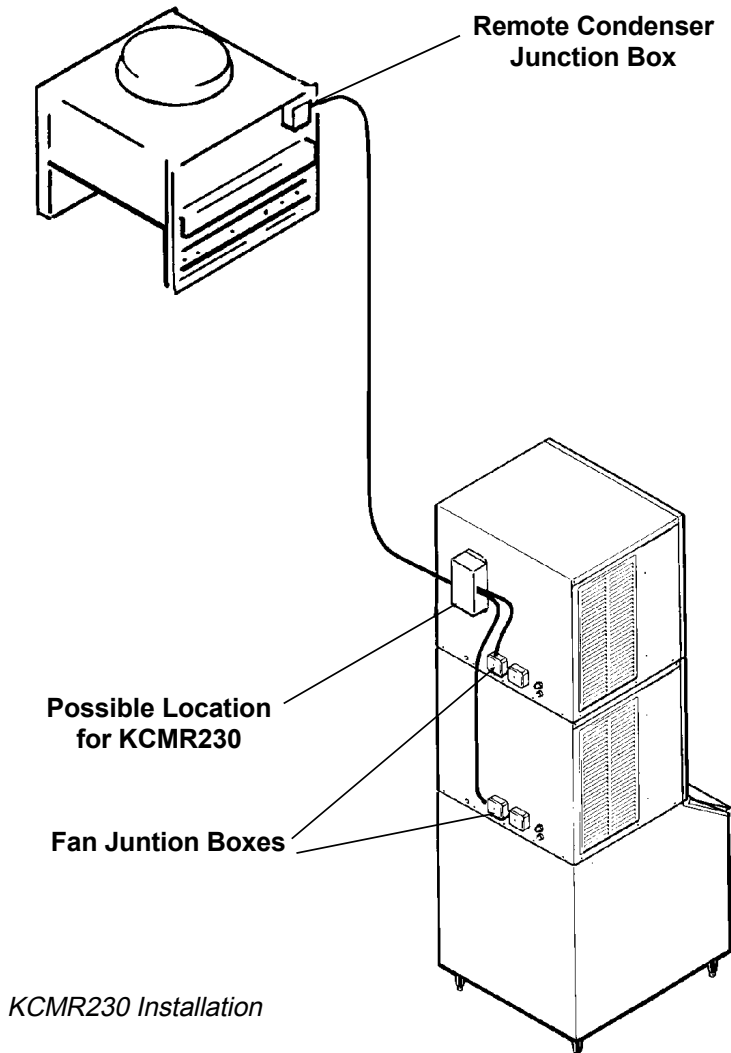
2. Route connecting wires from the first ice machine's fan junction box and connect to the relay kit terminal strip marked: No. 1 Ice Machine.

3. Route connecting wires from the second ice machine's fan junction box and connect to the relay kit terminal strip marked: No. 2 Ice Machine.

4. Attach wires at the KCMR230 terminal strip marked: To Remote Fan, and route them to the remote condenser junction box.

5. Make the proper electrical connection at the junction box.

**Conform To All Applicable Codes**





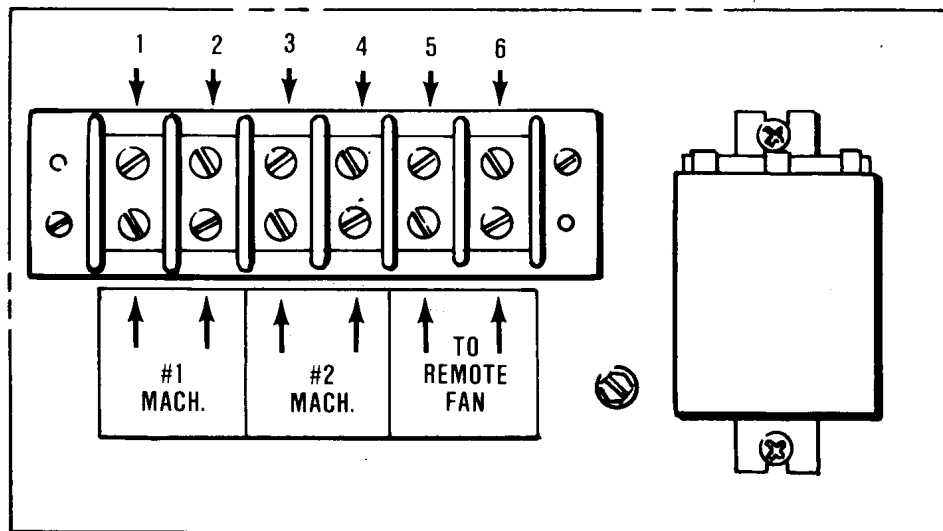
## KCMR230: Phasing Check

Check the phasing of the fan relay electrical circuit as follows:

Note: 3 phase machines must have the same "leg" or line connected to L3 on BOTH ice machine's contactors and if there is "Wild Leg" current, it must be connected to L3 on BOTH ice machines.

A. **Before initial start up:** Compare the illustration of the KCMR230 terminal strip to the connections at the KCMR230.

- Terminals #1 and #3 must be connected to the same side of the line (such as L1).
- Terminals #2 and #4 must be connected to the same side of the line (such as L2).



B. After initial start up, test with a volt meter (compressors must be operating for this test).

1. Switch on ice maker #1, then ice maker #2.
2. Test with a volt meter between terminals #2 and #4, then between terminals #1 and #3.

Compare the data to that in this table.

Test Terminals	Correct Voltage Readings
1 - 2	Full Voltage (208-230)
1 - 3	No Voltage
2 - 3	Full Voltage
2 - 4	No Voltage
3 - 4	Full Voltage
1 - 4	Full Voltage

If there is full voltage where there should be No voltage:

- Switch off ice maker #2 (compressor switch also), and then switch off ice maker #1.
- Reverse the connections at the KCMR230 terminal strip marked ice maker #1 (put the wire that was on 1 on 2 and the wire that was on 2 on 1).

**Do all wiring with the electrical power disconnected to BOTH ice makers at the source.**

# CME650R

## FOR THE PLUMBER

The recommended water supply line is a 3/8-inch O.D. copper tubing with a minimum operating pressure of 20 PSIG and a maximum of 80 PSIG.

Connect to cold water supply line with standard plumbing fittings, with shut off valve installed in an accessible place between the water supply and the cuber. In some cases a plumber will be required.

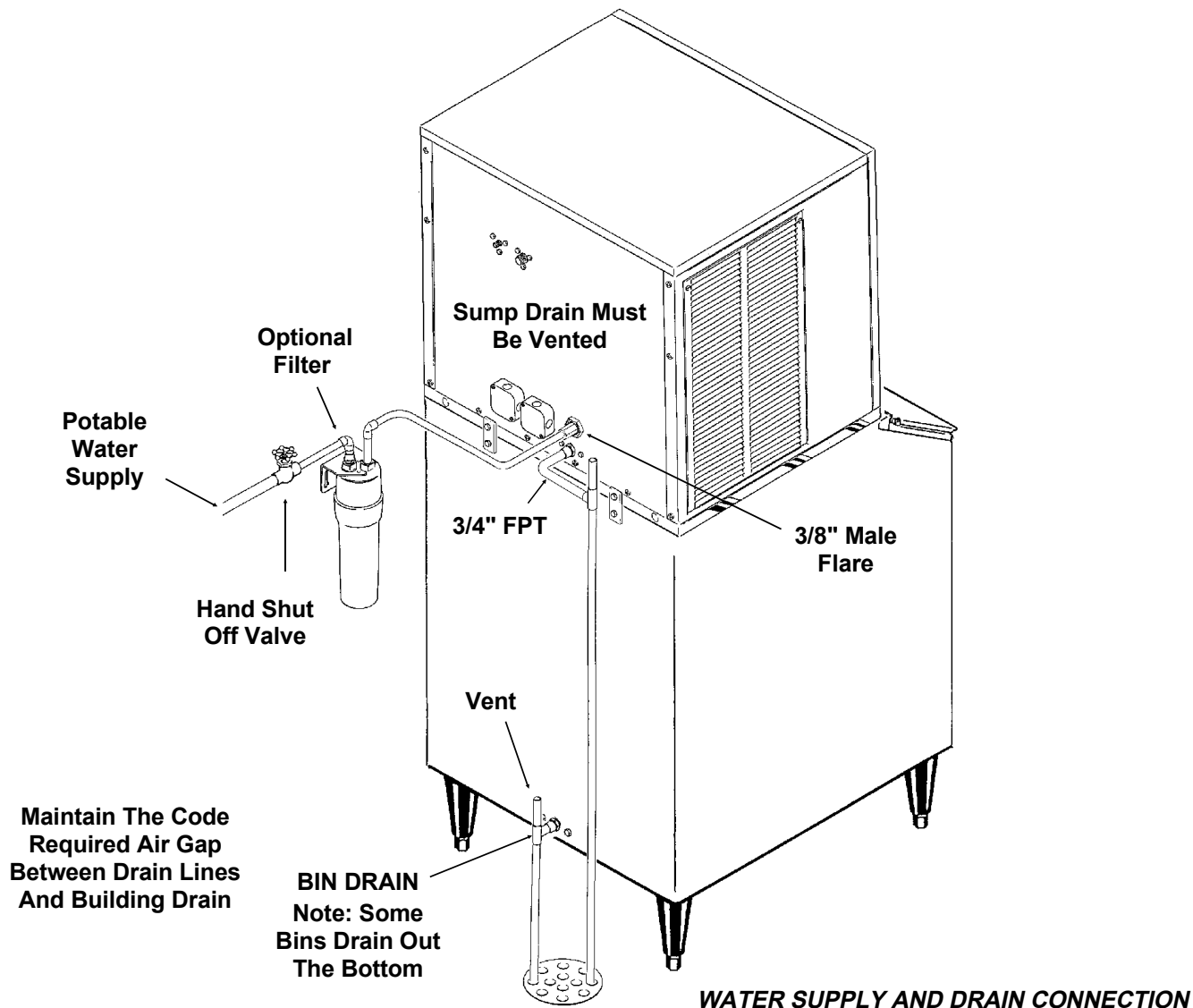
### Water Limitations:

An ice machine is a food manufacturing plant, it takes in a raw material, water, and turns it into a food product, ice. The purity of the water is very important in obtaining pure ice and in maximizing product life. Even though there isn't one filter that will cure all water problems, a good filter combined with a polyphosphate feeder gives about the best overall performance.

### DRAIN

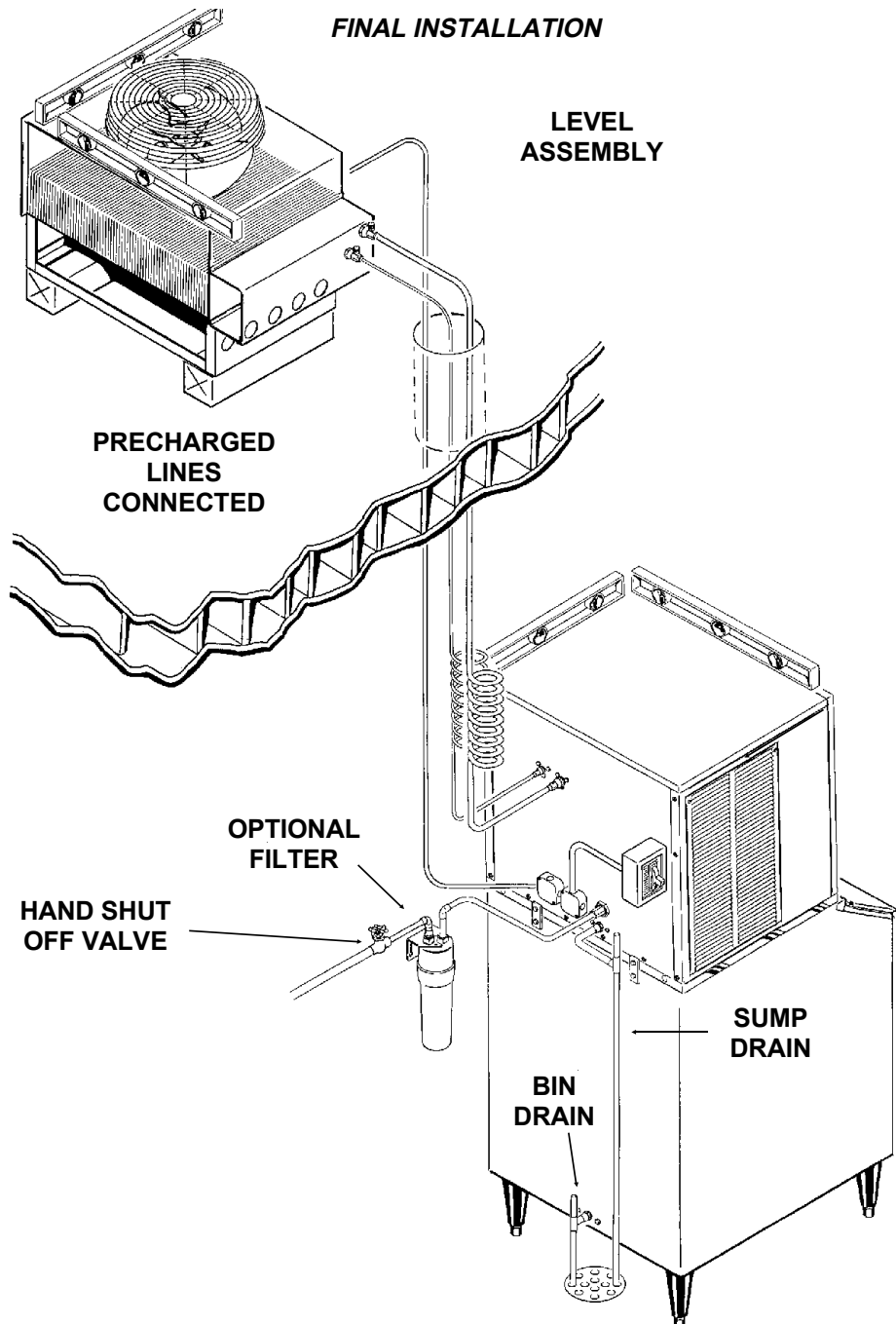
Connections: All drains are gravity type and must have a minimum of 1/4-inch fall per foot on horizontal runs. The drains to be installed to conform with the local plumbing code. Install a vertical open vent on drain line high point to insure good draining. The ideal drain receptacle is a trapped and vented floor drain. Recommended bin drain is 5/8 inch O.D. copper tubing and should be vented and run separately. Insulation for high humidity areas is recommended.

The ice machine sump drain is 3/4" FPT. There must be a vent at this connection for proper sump draining.



## FINAL CHECK LIST

1. Is the cabinet in a room where ambient temperatures are within the minimum and maximum temperatures specified?
2. Is there clearance at the left and back sides of the cabinet for service access?
3. Has water supply pressure been checked to insure a minimum of 20 PSIG and a maximum of 80 PSIG operating pressure?
4. Is the cabinet level?
5. Check that any shipping material has been removed from inside the cabinet.
6. Check that the bin thermostat bracket has been installed, and the bin thermostat capillary tube has been routed thru the bracket.
7. Have all electrical, water and drain connections been made?
8. Is the water supply line shut off valve installed and electrical wiring properly connected?
9. Check all refrigerant lines and conduit lines, to guard against vibration or rubbing and possible failure.
10. Have the bin and cabinet been wiped clean?
11. Has the Manufacturers Registration form been properly filled out? Check for correct model and serial numbers from Serial nameplate, then mail to the SCOTSMAN factory.
12. Has the owner/user been given the Service Manual and instructed how to operate and maintain the icemaker?
13. Has the owner been given the name and telephone number of the authorized SCOTSMAN Service Agency serving him?



# CME650R

## COMPONENT LOCATION

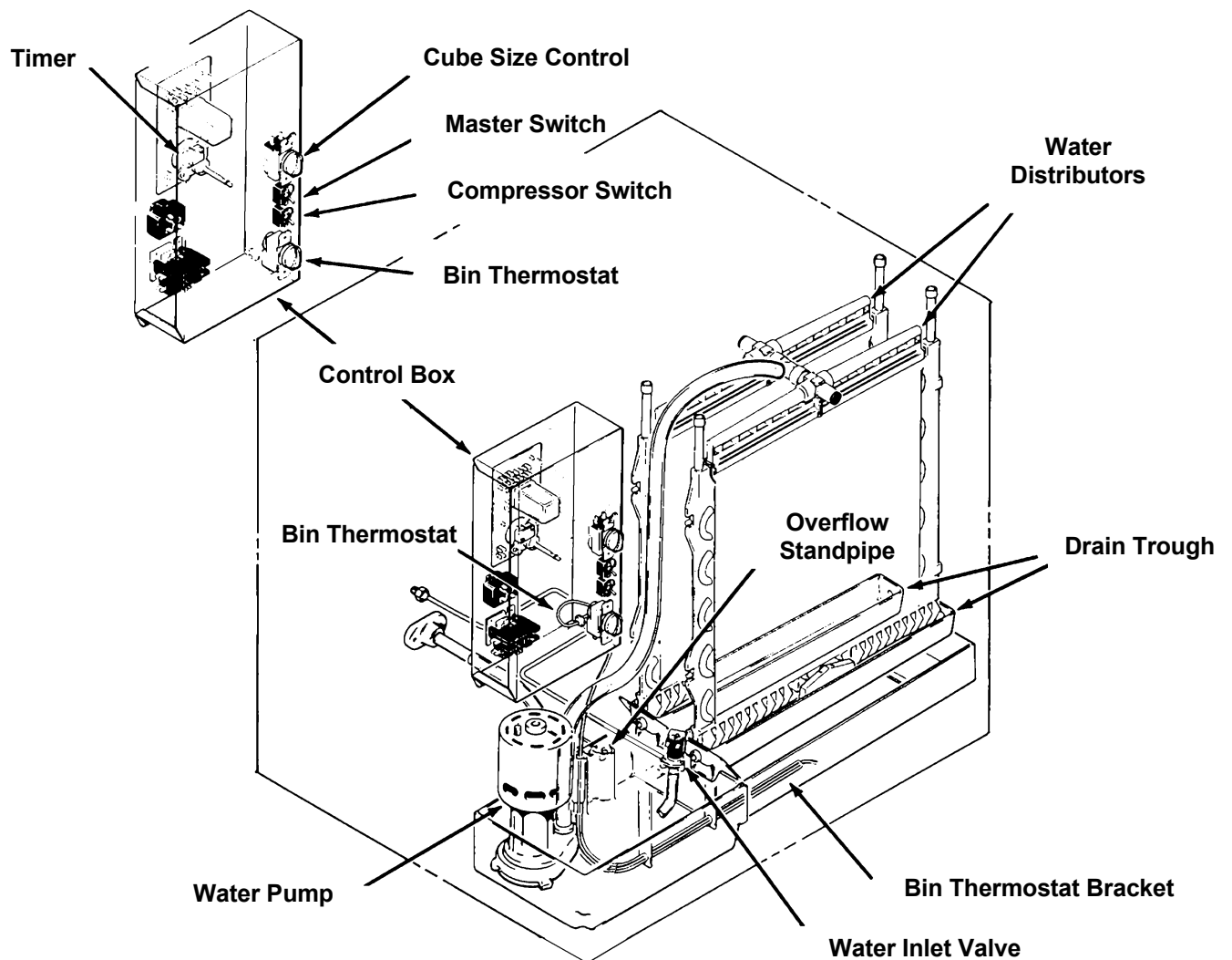
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The ice machine is designed for front service. Many components are serviceable from the front without removing the side panels:

Behind the front panel:

- Water pump
- Inlet water valve
- Reservoir
- Evaporators
- Water distributor
- Control box with cube size control adjustment
- ON/OFF switch
- Compressor switch

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



*Component Location*

## COMPONENT DESCRIPTION: Control System

### Cube Size Control

This reverse acting thermostat controls the length of the freezing cycle. It is sensing the temperature of the suction line. When the suction line gets cold enough, the cube size control closes (on temperature fall) and starts the timer. A change in either ambient air or incoming water temperature will affect the efficiency of the refrigeration system, and this will vary the length of time it takes the evaporator to reach the temperature at which the cube size control is preset to close. See CUBE SIZE ADJUSTMENT BEFORE attempting to adjust the control.

### Relay

The multi-function, three pole, double throw, plug-in relay is installed directly into a receptacle on the printed circuit board in the control box. The relay functions in part to by-pass the bin thermostat control to prevent the icemaker from shutting OFF, when the bin thermostat opens during the freezing cycle. The bypass action serves to ensure full-sized ice cubes with each harvest cycle.

### Timer - Timer & Switch Assembly

The function of the timer begins when activated by the cube size control. The outer surface, or large diameter lobe of the timer cam, determines the timer cycle for finish freezing of the ice cubes, while the inner surface, or small diameter lobe, determines the time cycle for the harvest cycle.

When the microswitch button is pushed in there is power connected to the coil of the relay, and the unit is in the freeze cycle. When the microswitch button is released, the power to the relay is stopped, and the unit goes into harvest. The microswitch is actuated by a cam assembly directly connected to the timer motor.

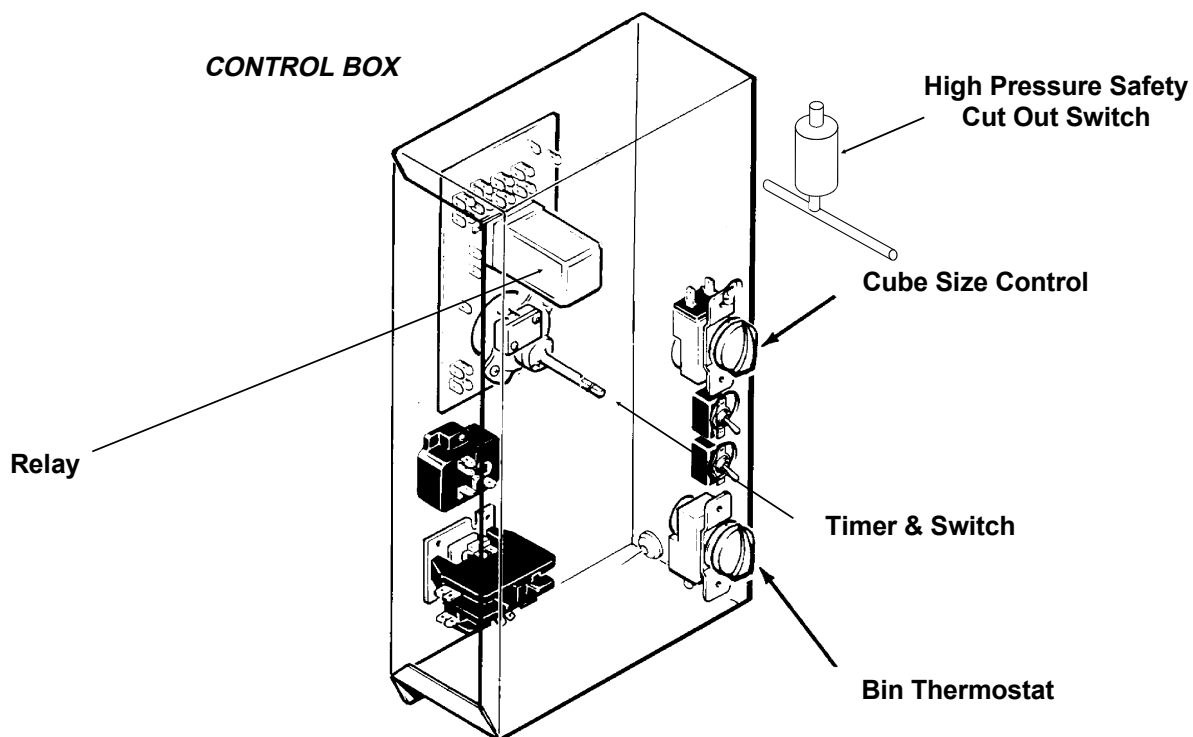
One complete rotation of the cam will take eight minutes. Harvest is preset at two and 2 thirds minutes, but is adjustable.

### High Pressure Safety Cut Out Switch

This is a manual reset control that shuts down the icemaker, should the discharge pressure ever reach 450 PSIG. Located next to the control box.

### Low Pressure Control (Pump Down)

This pressure control connects power to the compressor contactor coil. Its Cut In is 30 PSIG and its Cut Out is 15 PSIG. Located behind the control box.



# CME650R

## COMPONENT DESCRIPTION: Water System

### Water Inlet Solenoid Valve

The water inlet solenoid valve controls the flow of water to the reservoir. It fills the reservoir with water and excess water overflows out the standpipe and down the drain. This action fills and rinses the reservoir during each harvest cycle. The flow rate is .75 g.p.m.

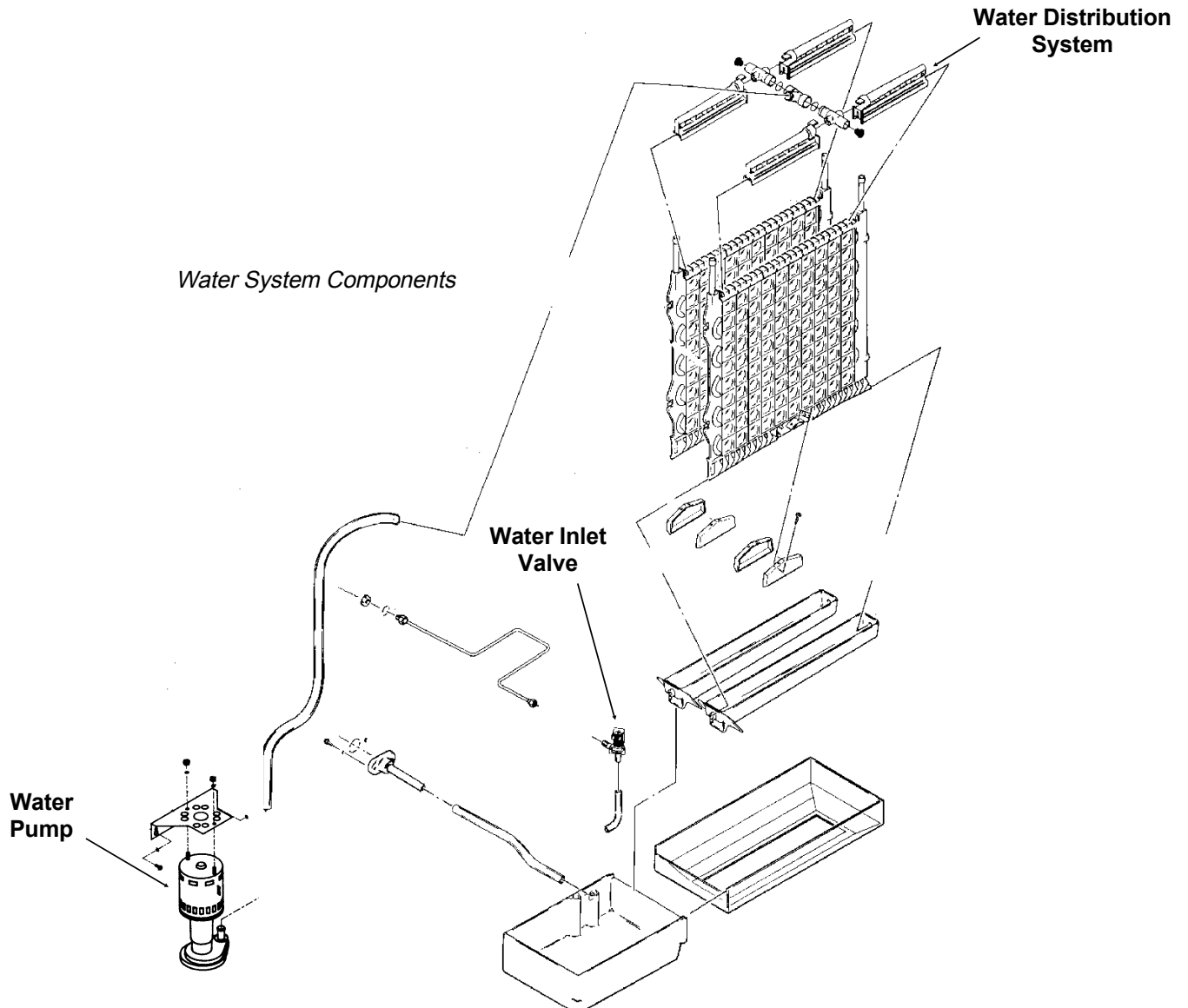
### Water Pump

The water pump operates whenever the ice machine is making ice. It picks up water from the reservoir and forces it to the top of the evaporator, where it enters the water distribution system.

### Water Distribution System

The water distribution system evenly supplies water to all cells of the evaporator plates. The water pump pumps water from the sump up the vertical tygon tube to the tee.

From there water is channeled through the water manifold to the water distributors, above each evaporator plate, and from six holes within each distributor, water flows to the cells of each side of the evaporator plates. Gravity flow returns the unfrozen excess portion of water to the sump reservoir for recirculation.



## INITIAL START UP

### Before Start Up:

1. Check that the Master ON-OFF switch and the Compressor ON-OFF switch are in the OFF position.
2. Switch on the electrical power. Electrical power must be supplied to the ice machine for 4 hours before starting the compressor for the first time.

The crankcase heater will now warm up the compressor's oil. The oil is warmed to evaporate any refrigerant that may have collected in it. If there is refrigerant in the oil when the compressor starts, the oil will foam and will not lubricate the compressor properly, shortening its life.

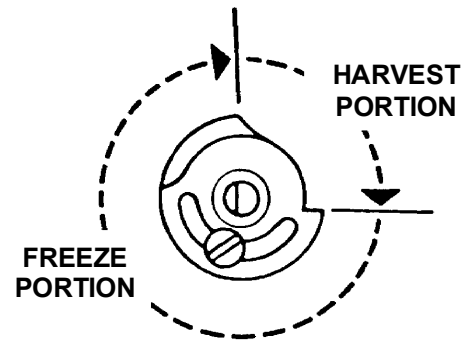
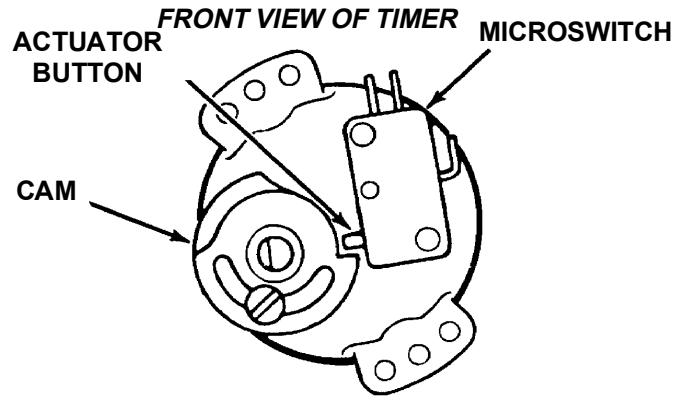
**Do not start the compressor for the first time unless the dome of the compressor is warm.**

### Start Up:

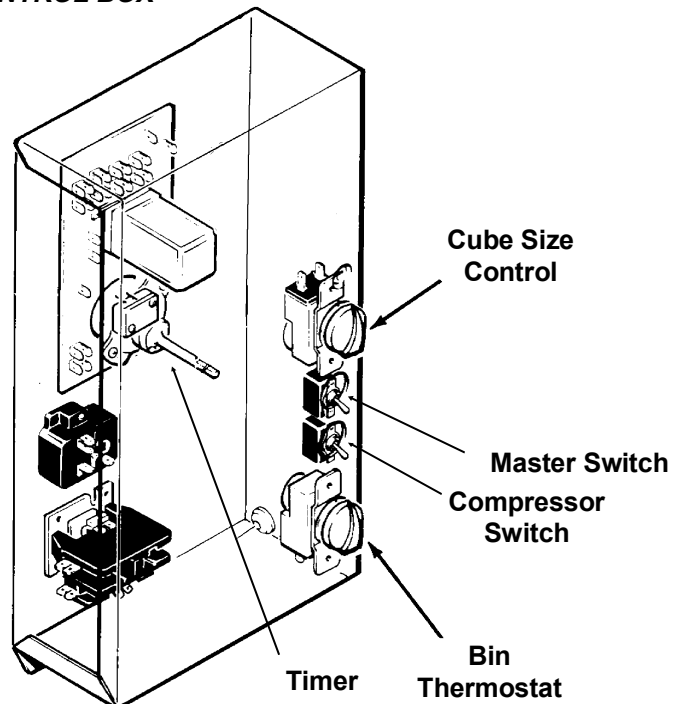
1. Remove front panel.
2. Remove two screws and the control box cover.
3. OPEN the water supply line shut off valve.
4. Open the "king" valve on the receiver.
5. Inside the control box is the shaft of the timer and switch assembly. Rotate the shaft of the timer and switch assembly clockwise to start the timer. The timer starts when the actuator arm on the microswitch drops off outer cam into cam slot. See "Front View of Timer".
6. Move the Master ON-OFF switch to the ON position.
7. Allow the reservoir to fill. If needed, rotate the timer clockwise a to begin another "harvest" cycle to add more water to the reservoir.

Note: Some water will drip off the evaporators, this is normal and there will be a reduction in water dripping after several cycles of ice.

8. When the sump has filled, move the compressor ON-OFF toggle switch, to the ON position.
9. Check operation of the freezing cycle: As the icemaking process begins the water temperature falls and very shortly ice begins to form. Tubing will become frosted at the top of the evaporator plate. Freezing time will range between 13 and 16 minutes. Longer time for temperatures above 70 degrees F. and shorter time required when temperatures are below 70-degrees F. Average complete cycle time is about 16 minutes.



### CONTROL BOX



# CME650R

## INITIAL START UP

### 10. Check Cube Size

To produce SMALLER sized ice cube:

Locate cube size control knob, in the front of the control box. Rotate one eighth of a turn COUNTER Clockwise. Observe size of the ice in the next ice cube harvest and adjust in one eighth turn or less increments, until correct ice cube is achieved.

To produce LARGER ice cube:

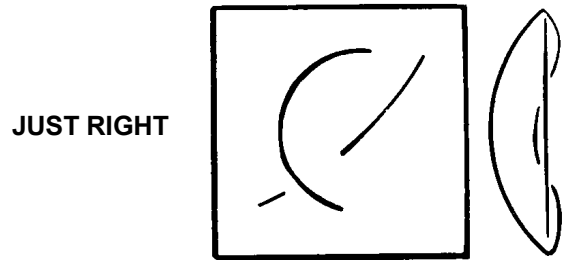
Locate cube size control on the front of the control box Rotate the adjusting knob one eighth of a turn Clockwise. Observe size of ice cubes in the next cube harvest and adjust in one eighth turn or less increments, until correct ice cube size is achieved.

### 11. Check harvest time. The machine will have to harvest all of the cubes before it goes back into the freeze cycle.

Increase the Harvest Time if there is less than 15 seconds of harvest time after the last cube has fallen into the bin.

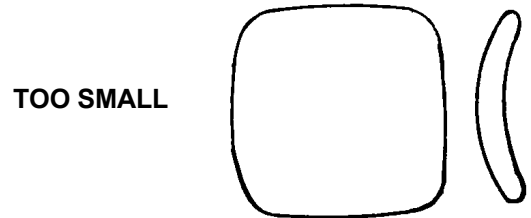
Decrease the Harvest Time if there is much more than 15 seconds of harvest time after the last cube has fallen into the bin. Note: Harvest time is dependent upon the water and air temperatures at the ice machine. Colder air and water will result in faster ice making, but longer harvest cycles. Do NOT adjust harvest time too short, as this will cause a freeze up of the evaporators.

CUBE SIZE DIAGRAM



When the cubes are the correct size, they will be connected together vertically, and drop off in strips.

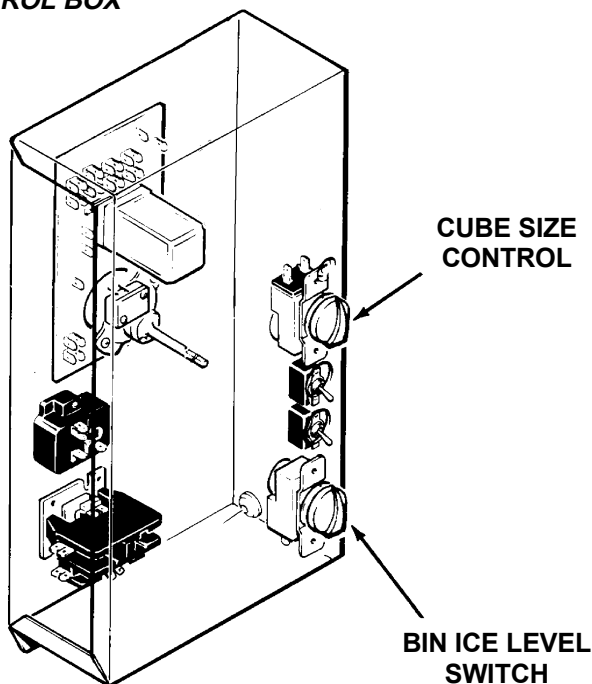
Typical batch weight is 5.5 lb.



### To Adjust Harvest Time:

- Disconnect electrical power.
  - Locate timer cam in the control box.
  - Loosen set screw holding the two halves of the cam together, and rotate the front half to increase or decrease the harvest portion of the cam (low part).
  - Re-tighten the set screw.
  - Reconnect power and check the cube size after the next cycle (cube size may need adjustment).
- Replace control box cover and all cabinet panels and screws.
  - Check operation of the bin control by holding ice on the bin control tube in the bin. The machine should shut off at the end of the harvest cycle.
  - Thoroughly explain to the owner/user the significant specifications of the icemaker, the start up and operation, going through the procedures in the cleaning instructions. Answer all questions about the icemaker by the owner; and inform the owner of the name and telephone number of the local authorized SCOTSMAN Distributor, or service agency.

CONTROL BOX





## FREEZING CYCLE OPERATION

Water from the sump assembly is pumped to the water distributor system at the top of each evaporator plate. From the water distributor the water cascades by gravity over all cells of the plate and to the sump assembly below.

At the beginning of the freezing cycle, the electrical circuit is completed to the compressor and the water pump. The water pump operates continuously, through both the freezing cycle and the harvest cycle.

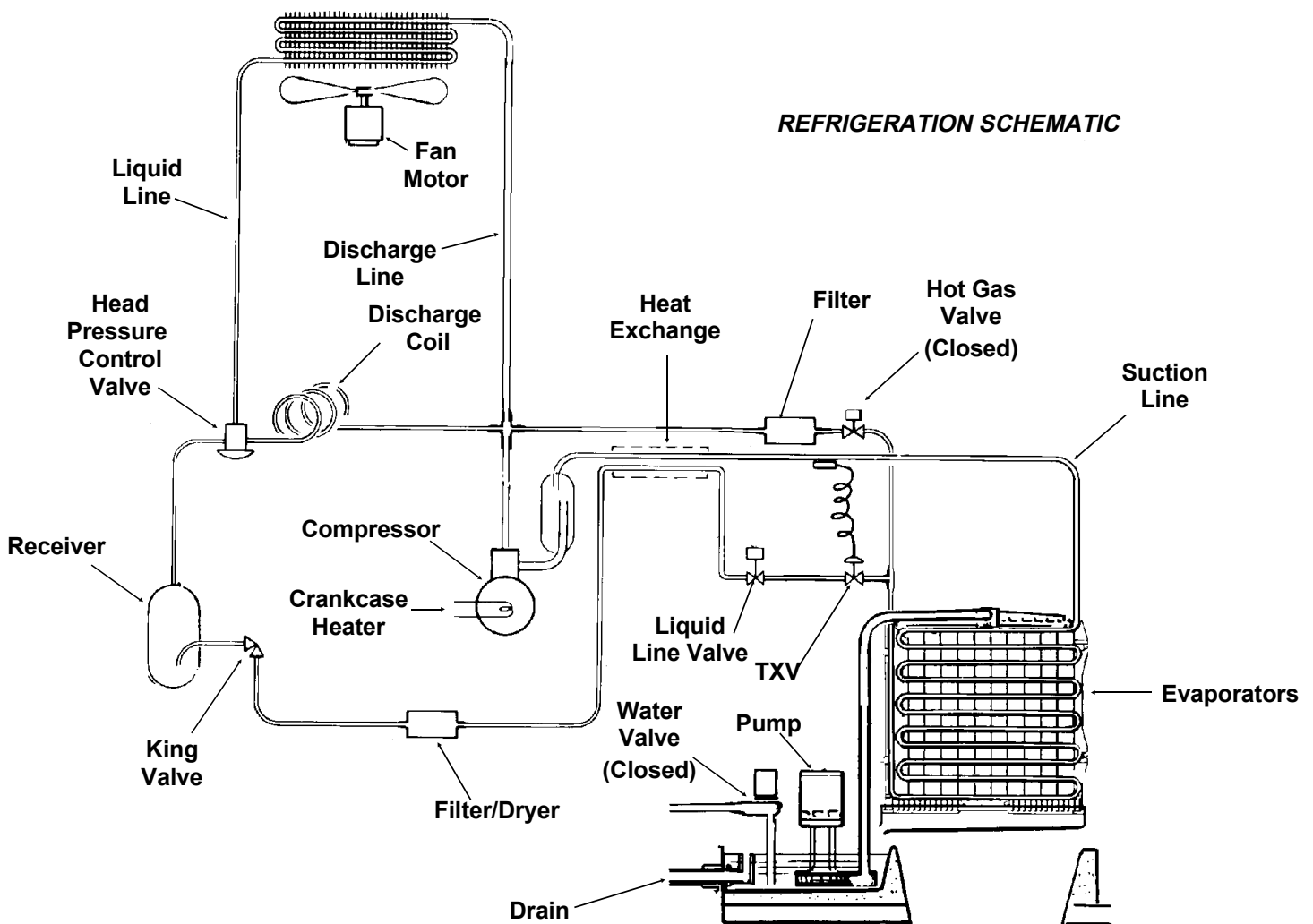
During the freezing cycle, the hot gas solenoid valve is CLOSED and the water inlet solenoid valve is CLOSED. When the ice cubes are partially formed, the cube size control will sense the temperature at which it is preset to CLOSE. This will complete the electrical circuit to the timer. The timer then controls the remainder of the freezing cycle.

The timer will keep the icemaker operating in the freezing cycle for a selected length of time. This will give the ice cubes time to fully form. After that selected length of time, the timer will switch the icemaker into the harvest cycle, through the contacts of the timer assembly microswitch.

### Low Temperature Freeze:

When the outside air temperature is low, the Head Pressure Regulator will close off the liquid line to the receiver, causing liquid refrigerant to back up into the condenser until the head pressure builds up to 240 PSIG. While this is occurring, the head pressure regulator passes discharge gas into the receiver to keep the refrigerant flowing.

REFRIGERATION SCHEMATIC



# CME650R

## HARVEST CYCLE - HOT GAS BYPASS

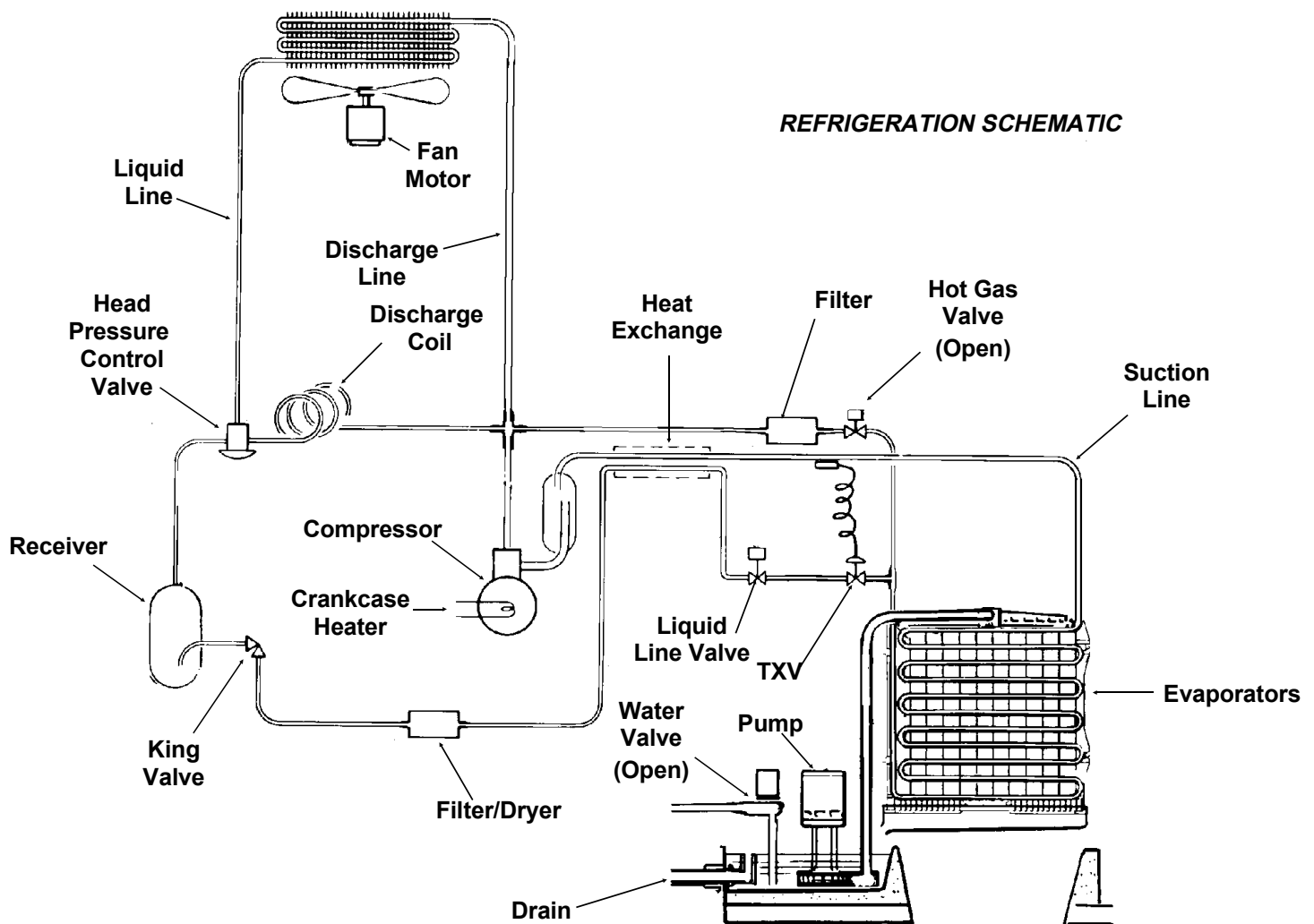
When the timer switches the icemaker into the harvest cycle, high pressure, high temperature refrigerant gas discharged from the compressor flows through the hot gas solenoid valve into each evaporator plate. During this cycle, the refrigerant bypasses the condenser. In the electrical circuit, both the compressor and the water pump are operating. Both the hot gas solenoid valve and the water inlet solenoid valve are OPEN.

The finished ice cubes are released from the sides of each evaporator plate by the warming effect of the hot gas condensing in each evaporator plate and the water cascading over the ice cubes. The released ice cubes drop into the ice storage bin below. At the end of the harvest cycle, the timer cam will push the actuator arm to the microswitch IN. If the ice level control is still CLOSED, a whole new cycle will begin. If the ice level control is OPEN, the icemaker will begin to shut OFF.

### Pump Down Cycle:


When the ice level control is open at the end of the harvest cycle, power is removed from the liquid line valve coil, and the pump down cycle begins. The compressor will continue to run until the pump down control, sensing low side pressure, opens at 15 PSIG.

REFRIGERATION SCHEMATIC

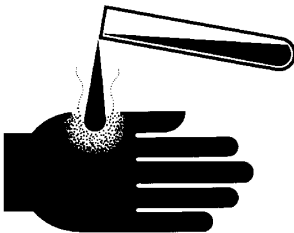


**CLEANING & SANITIZING**

1. Remove front panel.
2. Remove control box cover, and turn the timer cam clockwise until the unit is in a harvest cycle. At the end of the harvest cycle switch the master and compressor switches to OFF. Replace the control box cover.

	<p><b>⚠ WARNING</b></p>
	<p><b>Electrical Shock Hazard.</b> Electrical shock can cause personal injury. Cleaning procedures are done with the power ON.</p>

3. Remove all ice from the bin.
4. Remove 4 thumbscrews and the evaporator cover.
5. Remove water pump discharge hose from evaporator water inlet, direct hose into bin or bucket and switch the master switch ON until reservoir is empty of water. Replace hose on inlet.
6. Replace evaporator cover.
7. Mix 8 ounces of Scotsman Ice Machine Cleaner with 1 gallon of warm (95°F. - 115°F.) water and pour into the reservoir until full.

	<p><b>⚠ WARNING</b></p>
	<p><b>Scotsman Ice Machine Cleaner contains acids. These compounds may cause burns.</b> If swallowed, DO NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately. In case of external contact, flush with water. <b>KEEP OUT OF THE REACH OF CHILDREN.</b></p>

8. Switch the master switch ON, and operate the unit for 20 minutes, then switch the unit OFF.
- 9 Repeat steps 4 and 5.
10. Wash the plastic and stainless liners of the freezer section with a solution of household bleach (1 ounce of bleach to 2 gallons of water) and warm (95°F. - 115°F.) water. Allow to air dry.

11. Pour 1/2 gallon of the solution mixed in step 10 into the reservoir. Replace the evaporator cover.
12. Switch the master switch back ON, operate the unit for 5 minutes. Switch unit OFF.
13. Repeat steps 4, 5 and 6.
14. Pour about 1/2 gallon of clean potable water into the reservoir, and switch the master switch ON. After 5 minutes switch the master switch OFF and repeat steps 4, 5 and 6.
15. Switch master and compressor switches ON.
16. Replace the front panel
17. Discard the next batch of cubes to make sure all of the acid & sanitizer is gone.

//////////////////////**CAUTION**////////////////////////////////////

**DO NOT use ice cubes produced from the cleaning or sanitizing solutions. Be sure none remain in the bin.**

////////////////////////////////////

18. Pour hot water into the storage bin to melt the cubes and also clean out the bin drain.
19. Wash the bin liner with a solution of household bleach (1 ounce of bleach to 2 gallons of water) and warm (95°F. - 115°F.)water. Allow to air dry.
20. The unit will now continue automatic operation.

**Water Distributor:**

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

1. Remove evaporator cover.
2. Remove water distributor assembly by pushing the assembly to the right until the left end clears the retaining tab.
3. Lift up the left end of the water distributor assembly and pull the assembly to the left.
4. Un-snap the water distributors from the "T", and inspect for mineral deposits. Clean as required.
5. Reverse above steps to reassemble. Be certain that water distributors are in place and secure.

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.

# CME650R

## CLEANING

### Remote Condenser

1. Shut off the ice machine.

<b>⚠ WARNING</b>	The fan blade can cause personal injury. Disconnect power before beginning to clean condenser.
------------------	--

2. Remove dirt and debris that might be under the condenser.
3. Brush off the bottom of the condenser fins. Do not use a wire brush.
4. Check to see that the inside of the condenser is clean; light should be visible through the fins. If not, clean the internal parts by vacuum, pressure washer and/or coil cleaner.

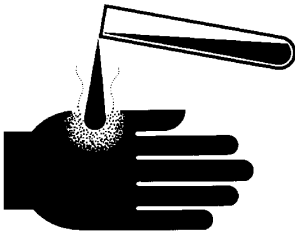
### Ice Storage Bin

The interior liner of the bin is in contact with a food grade product: ice. The storage bin must be cleaned regularly to maintain a sanitary environment. Scale that may form on the plastic liner of a bin may be removed by scrubbing the surface of the line with a mixture of Scotsman Ice Machine Cleaner and hot water. Remove any scale prior to sanitizing.

*Note: Some ice storage bins have Stainless Steel liners. They may become stained from chlorine gases released from the water. These stains must be removed by regular cleaning to prevent pitting of the metal liner. To prevent the staining, an activated charcoal filter should be added to the ice machines incoming water supply line; activated charcoal removes the chlorine. This may require more frequent sanitation.*

### To remove scale:

1. Mix a cleaning solution of 4 ounces of Scotsman Ice Machine Cleaner to 4 pints of hot (95<sup>0</sup> F. to 110<sup>0</sup>F.) water.

<b>⚠ WARNING</b>	<b>Scotsman Ice Machine Cleaner contains acids. These compounds may cause burns.</b>
	If swallowed, DO NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately. In case of external contact, flush with water. <b>KEEP OUT OF THE REACH OF CHILDREN.</b>

2. Remove all ice from the bin.
3. Using rubber gloves, dip a nylon scouring pad into the cleaning solution, and scrub the scale off of the liner.
4. After the scale has been removed, rinse all of the surfaces inside the bin with clean, potable water.

### To sanitize the bin and ice machine:

Follow local codes for frequency of sanitizing. 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. Remove all ice from the bin.
2. Mix a sanitizing solution of 1 ounce of household bleach to 2 gallons of water.
3. Using clean rubber gloves and a clean cloth, wipe all interior surfaces of the ice machine and ice storage bin with the sanitizing solution. Immerse any small parts in the sanitizing solution and wash the parts, flushing the solution thoroughly in, over and through all parts and surfaces of the parts being cleaned.
4. Allow to air dry.

## SYSTEM SPECIFICATIONS

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The following numbers can be used as a guideline. There will be some variation from unit to unit.

### Typical Cycle Time

- 14-16 minutes @ 0°F. condenser, 70°F. air and 55°F. water
- 15-17 minutes @ 90°F. condenser, 90°F. air and 70°F. water

### Typical Harvest Ice Weight

- 5-6 lb.

### Typical Low Side Pressure (at the end of freeze)

- 27 PSIG

### Typical Freeze Cycle Discharge Pressure

- 250 - 270 PSIG @ 90°F. condenser, 90°F. air and 70°F. water
- Discharge pressure control valve rated for 240 PSIG

### Refrigerant Charge

- 208 ounces of R-404A

### Harvest Time

- Preset at 2.66 minutes, may be adjusted to suit local conditions

### Typical Suction Pressure in Harvest

- 90 - 95 PSIG @ 70°F. air and 50°F. water
- 100 - 110 PSIG @ 90°F. air and 70°F. water.

### Typical Compressor Amp Draw

- 7 - 8 freeze, 9 - 10 harvest

### High Pressure Cut Out

- Cuts out at 450 PSIG, manual reset

### Pump Down Pressure Switch

- Closes at 35 PSIG
- Opens at 15 PSIG

### Compressor

- Copeland CS12K6E

### Bin Thermostat

- Adjustable: C.I. range between 38.5°F., and 43.5°F.; C.O. range between 33.5°F., and 38.5°F.

### Timer

- 1 revolution takes 8 minutes

### Cube Size Control

- Cut In adjustable between 0°F. and +24°F.

### Remote Condensers:

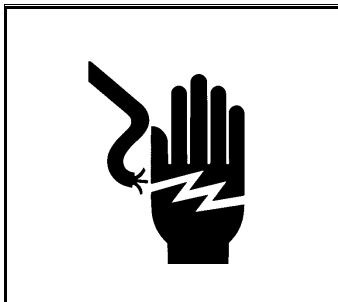
- RTE651-32A: 2 ton, 1 circuit, 208-230 volt.
- RTE652-32A: 2 ton, 2 circuit, 208-230 volt

### Thermostatic Expansion Valve

- Not adjustable

# CME650R

## ADJUSTMENTS



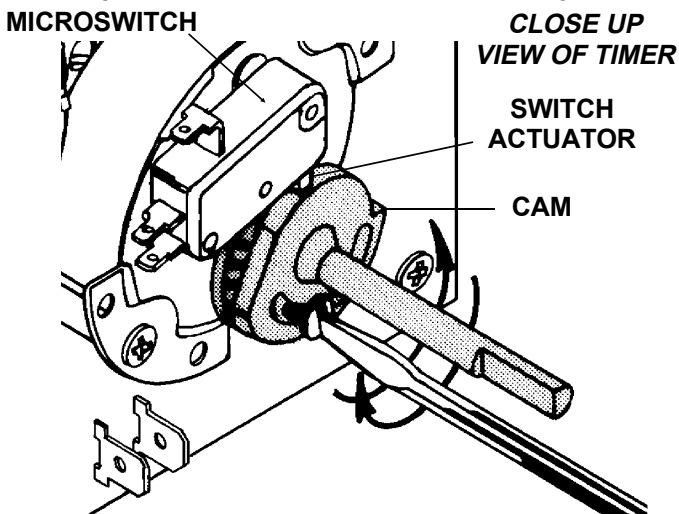
### **⚠ WARNING**

Electrical power present in the control box can cause personal injury. Disconnect power before beginning to adjust timer.

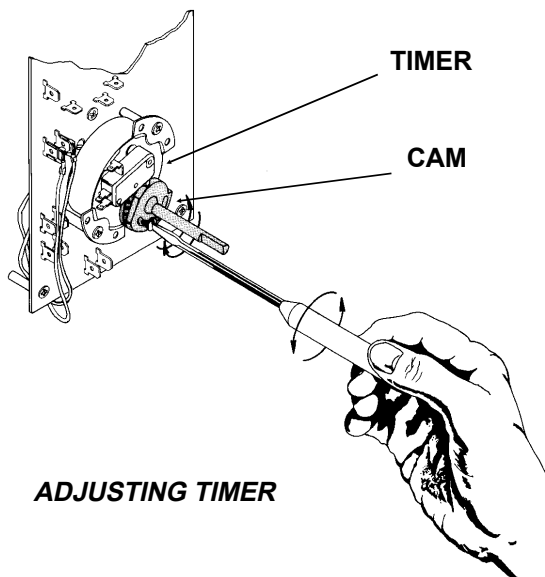
### **Adjustment Of The Timer & Switch Assembly**

One complete revolution of the cam on the timer takes eight minutes. The machine ships with the harvest time set at  $2 \frac{2}{3}$  minutes. It is important that the length of the harvest cycle allow enough time for all the ice cubes to fall from the evaporator. Too short of a time will cause the evaporator to freeze up and stop ejecting ice into the bin. Too much time wastes icemaking capacity, energy and water. Adjustment of the harvest cycle may require a corresponding adjustment of the cube size control. Rotating the shaft of the timer cam clockwise will allow putting the machine into either the freezing cycle or harvest cycle, as required in the cleaning instructions.

### **To Adjust The Timer & Switch Assembly:**



The length of the harvest cycle can be changed by loosening the set screw on the cam, and then rotating the shaft so that the opening between the cams change. More of an opening between the cams = more harvest time.



**SERVICE DIAGNOSIS: Water**

<b>SYMPTOM</b>	<b>POSSIBLE CAUSE</b>	<b>PROBABLE FIX</b>
No ice is made	Inlet water valve will not open or is dirty	Clean inlet screen, check coil, replace valve if required
	No water being pumped over evaporators.	Check pump motor, replace pump if motor will not run.
		No water in reservoir, check inlet water valve, check reservoir for leak.
	Water inlet valve leaks thru at high rate	Replace inlet water valve
Cubes are not uniform in shape	Water distributors are dirty	Clean water system
Long Freeze Cycle	Inlet water valve leaks through	Replace inlet water valve
	See electrical/adjustment	See electrical/adjustment
Makes thick ice/freezes up	Water inlet valve restricted	Clean or replace valve
	Low water pressure	Check water filter or supply
Cubes too large	Inlet water valve leaks through	Replace inlet water valve
	See electrical/adjustment	See electrical/adjustment
Low Capacity	Incoming water very warm	Check water temperature to building
	Lack of water	See unit runs out of water
Unit runs out of water	Reservoir leaks	Repair leak
	Inlet water valve restricted	Clean or replace valve
	Short harvest cycle	Adjust timer
	Water pressure too low	Check supply

# CME650R

## SERVICE DIAGNOSIS: Electrical and/or Adjustments

SYMPTOM	POSSIBLE CAUSE	PROBABLE FIX
Machine does not operate	No power	Reconnect power
	High pressure control open	Reset, check machine
	High temperature cut out open	Hot gas valve leaks thru, replace
	P. C. Board Open	Replace board
	Master switch open	Test/replace
	Timer contacts open	Replace timer
	Bin thermostat holding machine off	Test thermostat, replace if contacts stuck open.
Makes thick ice/freezes up	Harvest Cycle too short	Adjust timer
	Low water pressure	Check water filter or supply
		Check inlet water valve screen and flow control.
	Hot gas valve defective	Replace hot gas valve
	Cubes too small	Adjust cube size
	Cube size control stuck open	Replace cube size control
Runs, makes no ice	Pump problem or water leak in reservoir	Check water system and pump
	Water inlet valve either lets in no water or leaks through	Replace inlet water valve
	Timer stuck	Replace timer
	Relay does not energize; unit stuck in harvest	Replace relay
Long freeze cycle	Water inlet valve leaks through	Replace inlet water valve
	Water temperature too high	Advise user
Cubes too small	Cube size set wrong	Adjust cube size
	Cubes size control stuck closed	Replace cube size control
Cubes too large	Water inlet valve leaks through	Replace inlet water valve and adjust cube size control
Compressor cycles on and off on pump down control	Low refrigerant charge	Locate leak, repair, replace drier, evacuate and weigh in nameplate charge.
	Liquid line valve or drier restricted	Check and replace
	TXV restricted	Check and replace
	Head pressure control valve not working (low condensing temp.)	Check/replace head pressure control valve
Compressor will not run	Low pressure control will not close	Check pump down control for proper operation
	Contacting coil open	Check/replace contactor
	Compressor windings open	Check replace compressor
Unit cycles on and off anytime in any cycle	Loose connection in PC board	Replace PC board

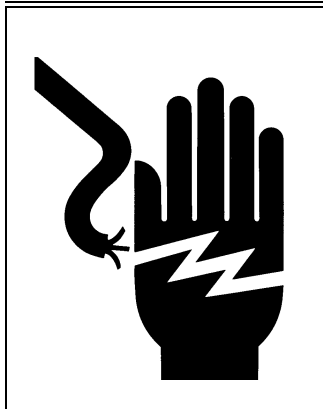


**SERVICE DIAGNOSIS: Refrigeration and/or Mechanical**

<b>SYMPTOM</b>	<b>POSSIBLE CAUSE</b>	<b>PROBABLE FIX</b>
Poor harvest	Hot gas valve does not open	Check for power to the coil, check for not opening, replace
	Head pressure control valve does not maintain enough head pressure.	Replace head pressure control valve.
Unit cycles off during freeze or harvest	Hi temperature switch opens and closes	Hot gas valve leaks thru, replace it
Low capacity	High head pressure, from dirty condenser, faulty fan motor	Clean condenser, repair fan motor
	Non condensable gas in the system	Purge system, evacuate and weigh in nameplate charge
	Extreme hot location	Relocate the cabinet
	Overcharge of refrigerant	Evacuate and weigh in nameplate charge
	Hot gas valve leaks thru	At the end of the freeze cycle there should be frost on the evaporator end of the hot gas tubes, if not replace the hot gas valve
	Liquid and discharge lines are in contact with each other	Separate and insulate them
Unit shuts off before bin is full	Bin thermostat adjusted to open too soon.	Rotate knob on the thermostat clockwise to a colder setting.
Compressor cycles on and off	Low pressure control opening and closing	Check low side pressure, liquid line valve must open and low side pressure raise over 35 PSIG before pump down control will close to run compressor
	Compressor overheats	TXV not letting enough refrigerant into evaporators, adjust or replace TXV Mechanical fault with compressor, replace compressor
Frost on compressor	Some frost will not hurt	Do nothing
	TXV meters too much refrigerant	Adjust or replace TXV

# CME650R

## REMOVAL AND REPLACEMENT



### ⚠ WARNING

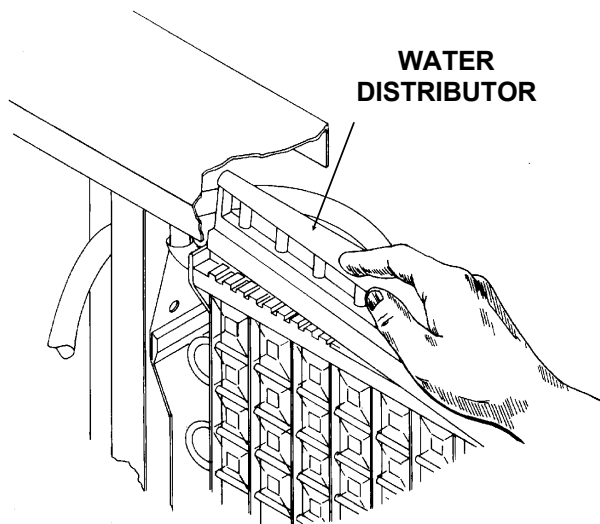
#### Electrical Shock Hazard.

Electrical shock can cause personal injury. Disconnect power before beginning to service components.

### Water Distributor Tubes And Manifold Tubes

To remove the water distributor tube and manifold tube:

1. Remove the front panel.
2. Slide the water distributor tube to the front about 1/8-inch along the top of the evaporator plate, until the water distributor tube can be unsnapped from the flexible notch and lifted upward.
3. Unsnap and disconnect water distributor tubes

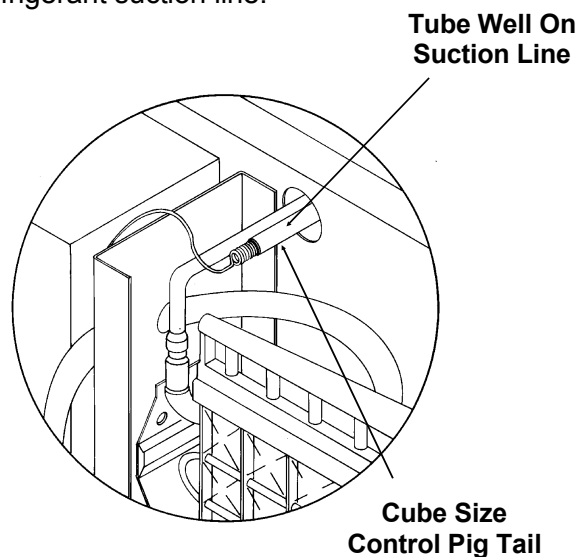


from the water manifold section. To replace the water distributor tubes and manifold tubes, reverse the removal procedure. BE SURE the notches in the water manifold tubes properly engage the alignment keys in the tee. BE SURE the water distributor tube is securely fastened at the notch at both sides of the evaporator plate. Check identical attachment for the left water distributor tube and notch; also, that the distributor/manifold connections at the top center of each evaporator plate is snug against the top of the plate.

### Cube Size Control

To remove the cube size control:


1. Remove front panel.
2. Remove cover from control box.
3. Trace capillary tube, from the cube size control to the refrigerant suction line.



### REPLACEMENT OF THE CUBE SIZE CONTROL

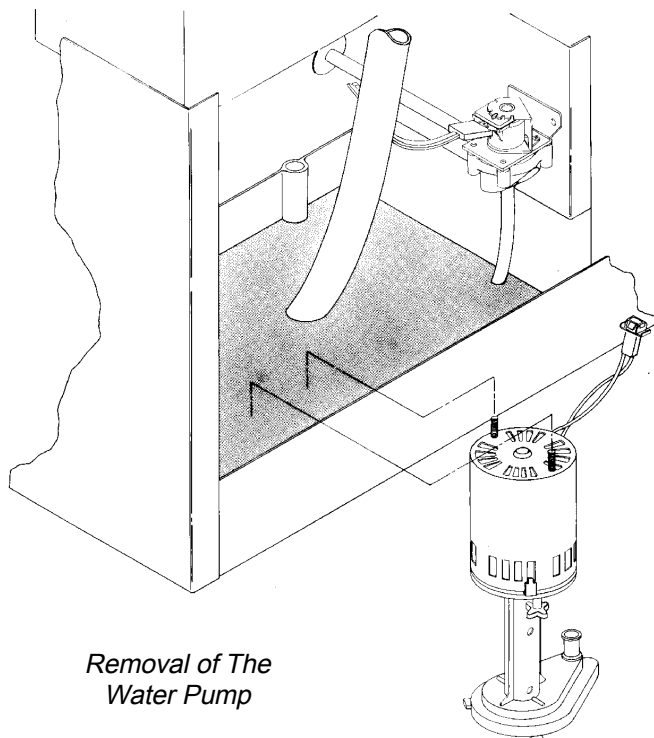
4. Remove the coiled capillary tube bulb from the tube well on the suction line.
5. Remove electrical leads from the cube size control.
6. Remove screws and pull the capillary tube through the notch in the back of the control box. Remove the cube size control. To replace the cube size control, reverse the removal procedure.

## REMOVAL AND REPLACEMENT

	<h3>⚠ WARNING</h3>
	<p><b>Electrical Shock Hazard.</b> Electrical shock can cause personal injury. Disconnect power before beginning to service components.</p>

### Water Pump

1. Remove front panel.
2. Unplug water pump electrical connection.
3. Drain water reservoir.
4. Use corbin clamp pliers to loosen and slide corbin clamps on hoses away from pump.
5. Remove screws retaining pump to bracket.
6. Pull pump out of ice machine.
7. Reverse to reassemble.
8. Replace front panel.
8. Reconnect electrical power.

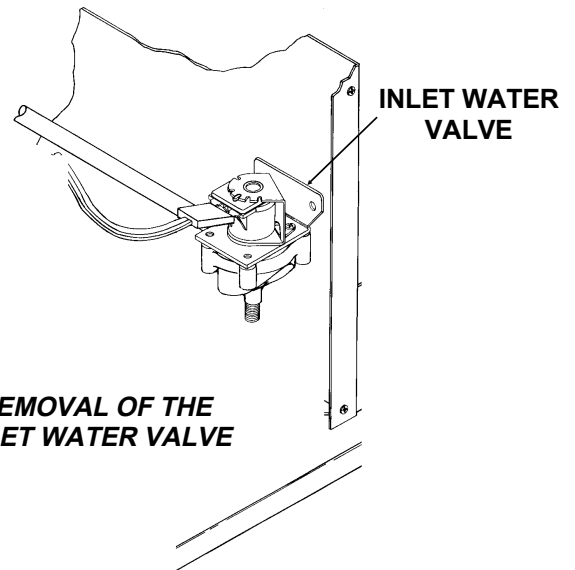


*Removal of The Water Pump*

### Inlet Water Solenoid Valve Assembly

To remove the inlet water solenoid valve assembly:

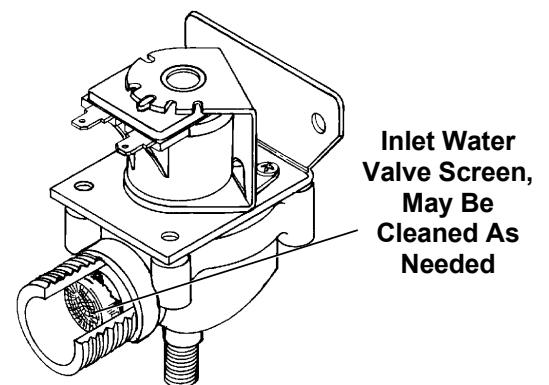
1. Shut OFF water supply to machine.
2. Loosen and remove outlet water line from the inlet water solenoid valve assembly.
3. Remove screws and pull the water solenoid



**REMOVAL OF THE INLET WATER VALVE**

valve out to gain access.

4. Pull electrical cord from solenoid coil terminals.
5. Remove inlet water fitting from the water solenoid valve. To replace the inlet water valve assembly, reverse the removal procedures.
6. Reverse to reassemble.



# CME650R

## REMOVAL AND REPLACEMENT

### Thermostatic Expansion Valve

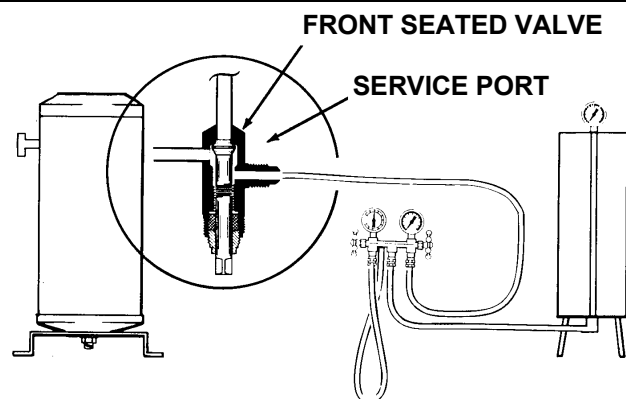
1. Before replacing this valve, be certain that the valve is the cause of the problem, and cannot be adjusted.
2. Remove the top, service and front panels.
3. Discharge and recover the refrigerant.
4. Locate the TXV bulb (on the suction line), remove the clamps and bulb from the tube.
5. With the refrigeration system open, unsweat the TXV from the tubing.
6. Place the new TXV in position.
7. Wrap the new TXV body with wet rags. Do not get any moisture in the valve.
8. Carefully braze the valve to the tubing. Examine the joints, if they look good proceed to the next step, if not, re-do them.
9. Install a new dryer, and braze it in place also.
10. Reattach the TXV bulb to the suction line in the same place as the old one.
11. Evacuate the system to 200 microns.
12. Weigh or measure the nameplate charge into the receiver.
13. If the machine has been off on the breaker there may be refrigerant trapped in the oil of the compressor, so do not restart until the compressor has been warmed by the crankcase heater for 12 hours. If the compressor was warm throughout the replacement process, the ice machine may be restarted without waiting to re-warm the compressor.

### Hot Gas or Liquid Line Valve.

1. Before replacing this valve, be certain that the valve is the cause of the problem.
2. Remove the top, service and front panels.
3. Discharge and recover the refrigerant.
4. Unplug the coil of the valve.
5. With the refrigeration system open, unsweat the valve from the tubing.
6. Place the new valve in position.
7. Wrap the new valve body with wet rags. Do not get any moisture in the valve.
8. Carefully braze the valve to the tubing. Examine the joints, if they look good proceed to the next step, if not, re-do them.
9. Install a new dryer, and braze it in place also.
10. Plug the power cord back onto the coil.
11. Evacuate the system to 200 microns.
12. Weigh or measure the nameplate charge into the receiver.
13. If the machine has been off on the breaker there may be refrigerant trapped in the oil of the compressor, so do not restart until the compressor has been warmed by the crankcase heater for 12 hours. If the compressor was warm throughout the replacement process, the ice machine may be restarted without waiting to re-warm the compressor.

### Refrigerant:

NO liquid refrigerant may be put into this system anywhere except the receiver. DO NOT use the valves at the front of the machine for weighing in the charge: use the "king" or receiver service valve. **All liquid HP62 must be weighed into the receiver through the "front seated" receiver outlet service valve.**



**REFRIGERATION SERVICE: R-404A**

**THIS ICE MACHINE USES HP62 REFRIGERANT AND POLYOLESTER COMPRESSOR OIL**

**DO NOT USE MINERAL OIL IN THIS REFRIGERATION SYSTEM.**

- HP62 is a "Near Azeotrope", and therefore liquid charging is required.
  - ☒ Weigh as much of the charge as liquid into the receiver as possible.
  - ☒ Install a sight glass between the suction service valve and the gage manifold. Use the manifold valve to "flash off" liquid before it enters the ice machine's refrigeration system.
- When the system is serviced, a special liquid line dryer is required (see parts list).
- Polyolester oil absorbs water very easily, and therefore when the system 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.
- As with any other refrigerant, do NOT mix HP62 with pressurized air when leak testing.

**Pressure-Temperature Chart for HP62**

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

# CME650R

## REFRIGERATION SERVICE

### General Information:

Scotsman recommends that any work on the refrigeration system only be done when it is certain that the system needs repair. **Use conservation minded service procedures:**

- **Refrain from checking refrigeration pressures without reason.** There are many ways to determine the proper operation of a Scotsman ice machine without using refrigerant gauges. 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, do not 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 much more important on an ice machine than is the high side.
- If gauges must be used, use very short hoses. Minimal refrigerant discharged into the hoses equals minimal 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 hot gas valve, the component must be protected by heat sink material.

**Recover, reclaim or recycle refrigerant.** The method chosen is up to the service company. There are various mechanical devices that may be used to recycle refrigerant at the field level, however, Scotsman requires that any refrigerant placed into a Scotsman ice machine 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. The 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.**

