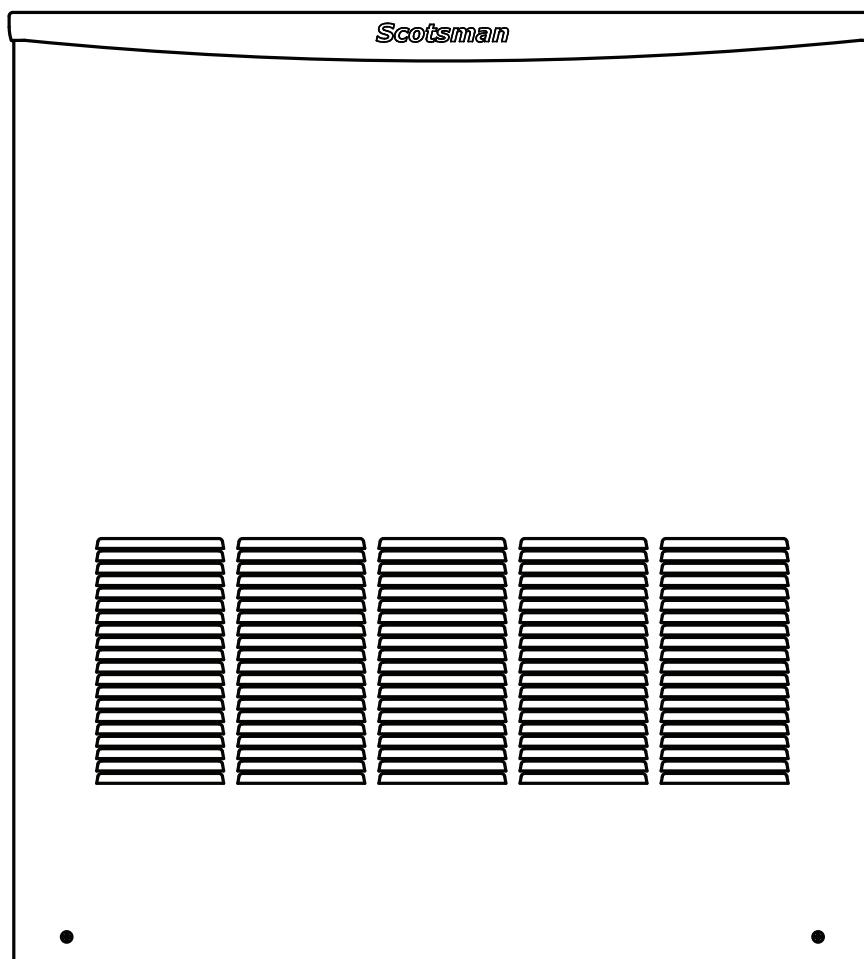




Service Manual for model BC0530



BC0530 Service Manual

Introduction

Observe any caution or warning notices. They are important and provide notice of potential hazards.

Keep this manual for future reference.

If additional technical information is needed, go to Scotsman's website, www.scotsman-ice.com.

Scotsman Ice Systems are designed and manufactured with the highest regard for safety and performance. They meet or exceed UL563, verified by a nationally recognized safety authority such as UL or ETL.

Table of Contents

Specifications	Page 3
Back View	Page 4
Plan and Cabinet Drawings	Page 5
Placement and Guidelines	Page 6
Installation: Assembly	Page 7
Installation: Water	Page 8
Installation: Electrical	Page 9
Installation Check List	Page 10
Initial Start Up	Page 11
Condenser Cleaning	Page 12
Cleaning Water System	Page 13
Component Location	Page 14

Operational Information	Page 15
Mechanical Components	Page 16
Controller	Page 19
Error-Code Troubleshooting	Page 21
Sequence Of Operation	Page 25
Ice Bin Full/Cleaning Mode	Page 26
Description of Each Process	Page 27
Start Methods	Page 28
Compressor Test Procedure	Page 29
Service Diagnosis	Page 35
Wiring Diagram	Page 41



WARNING

Observe the Caution and Warning notices. They are indicators of important safety information. Keep this manual for future reference.



CAUTION



WARNING: Cancer and Reproductive Harm
www.P65Warnings.ca.gov

BC0530 Service Manual

Specifications

This ice maker is designed to be installed indoors, in a controlled environment. Although it can operate in a wide range of air and water temperatures, it will provide the best performance if not subject to extremes.

Air Temperature Limitations

- Maximum: 90° F or 32° C
- Minimum: 50° F or 10° C

Ambient temperatures less than 15°C (60°F) may cause erratic bin level control operation.

Ambient temperatures higher than the maximum specification will result in reduced capacities and high system pressures.

Water Temperature Limitations

- Maximum: 90° F or 32° C
- Minimum: 45° F or 7° C

Water Pressure, Potable

- Maximum: 80 PSI or 5.5 BAR
- Minimum: 30 PSI or 2 BAR

Potable Water Inlet Flow Rate

- 2.5 gpm

Voltage 115 volt models

- Maximum 126 VAC
- Minimum 104 VAC

Operating the machine outside of any of the above limitations is considered abuse and any resulting damage is not covered by warranty and could cause a complete loss of warranty coverage.

Warranty Information

The warranty statement for this product is provided separately from this manual. Refer to it for applicable coverage.

In general, warranty covers defects in material or workmanship. It does not cover maintenance, corrections to installations, or situations when the machine is operated in circumstances that exceed the limitations printed above.

Product Information:

The BC is available in a single cube size. The ice size cannot be changed significantly. It is a modular cuber and the ice is stored in separate insulated bin with ice level automatically maintained by the control system.

A back flow preventer may be required by local plumbing codes.

Air flow is in the back and out the front and sides.

For available options and kits, see sales literature.

Storage Bins

The ice machine will likely be too deep to fit properly on a typical ice storage bin. Scotsman B530 bins will require attachment bracket that is included with the ice machine.

Dispensers

The BC0530 is NOT COMPATIBLE with any dispenser. Do not attempt stacking onto a dispenser or using the ice in a dispenser..

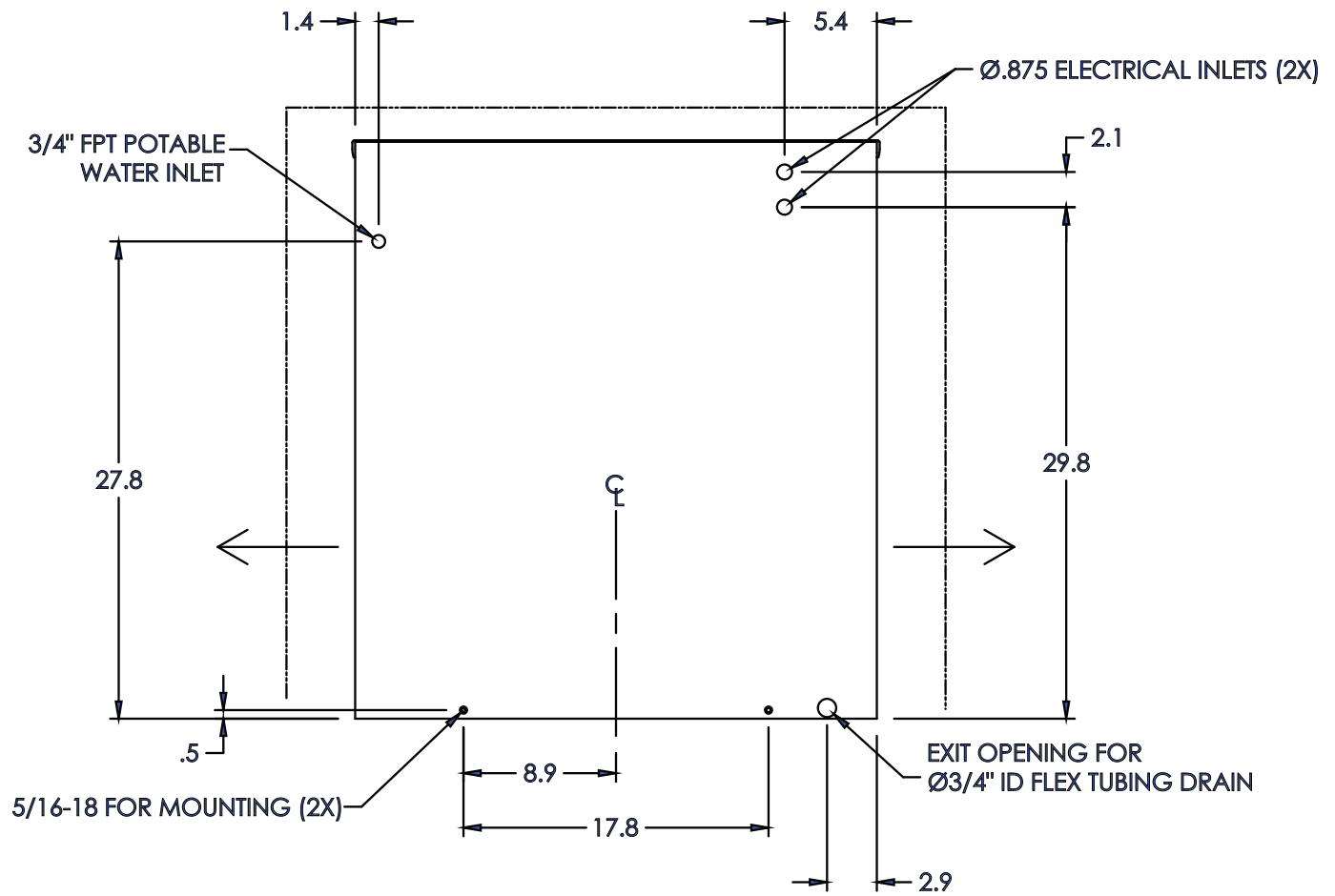
Model	Electrical (Volts/Hz/Phase)	Condenser	Cube Size	Maximum Fuse Size or Breaker (Amps)	Minimum Circuit Ampacity	Power Cord Termination
BC0530A-1A	115/60/1	Air	Large	25	19.6	Not supplied

Always refer to the dataplate for electrical information.

EQUIPMENT CLEARANCE REQUIREMENTS

Clearance must be provided for ventilation and maintenance access. Ventilation is especially important for models with air cooled condensers. Failure to provide adequate clearance may result in reduced capacities and high system pressures. The minimum clearances for proper ventilation and access are:

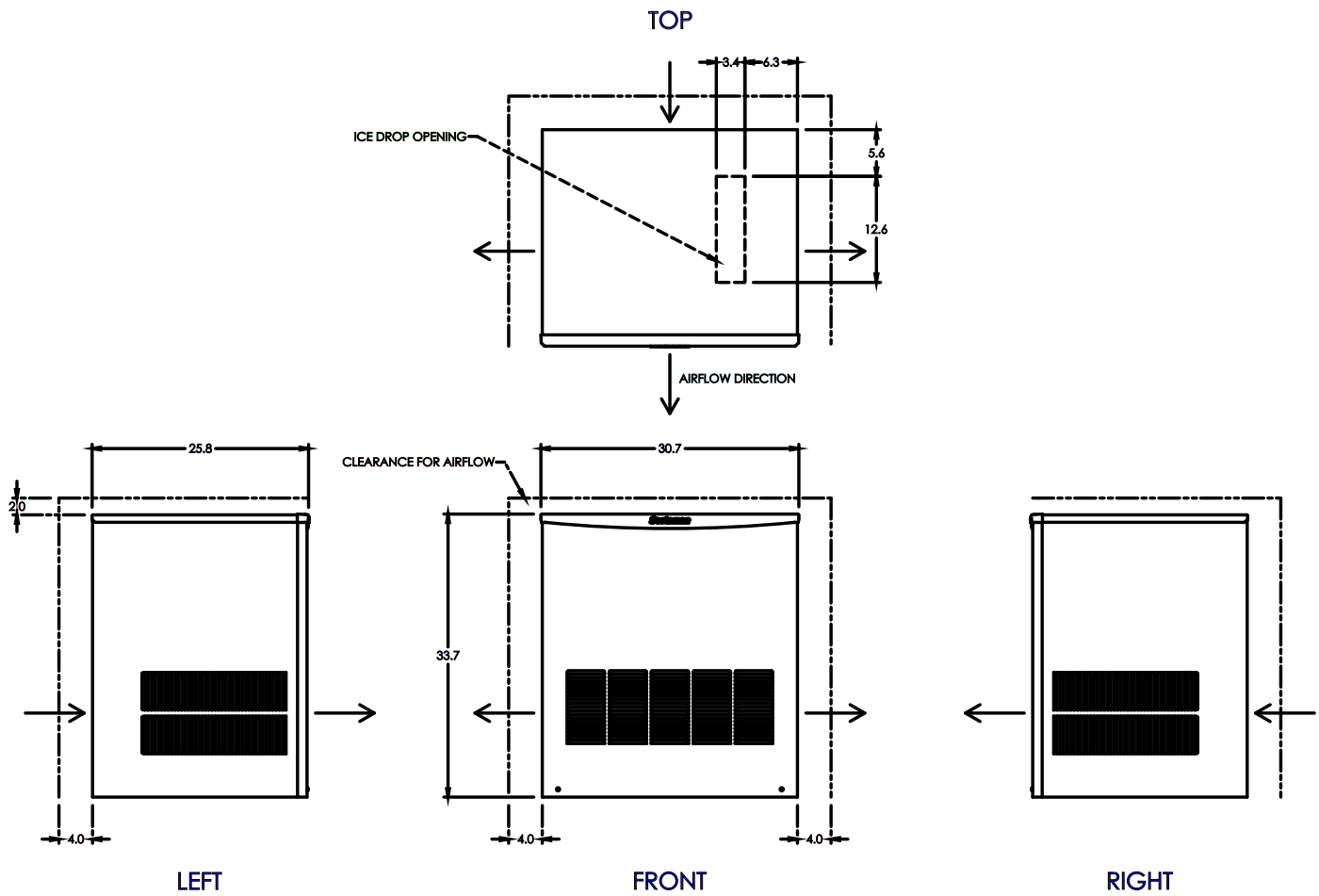
Model	Left Side	Right Side	Rear	Top
BC0530A-1A	4"	4"	4"	1"



Note: Model and serial are on the top front frame.

BC0530 Service Manual

Plan and Cabinet Drawings



Note: Do NOT install on a bin where the ice drop opening is blocked.

BC0530 Service Manual

Placement and Guidelines

The location of the equipment should be selected with care. Consideration should be given to allow adequate space for air cooled models to breathe.

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.

Scotsman assumes no liability or responsibility of any kind from 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.

Delivery:

Check for freight damage before proceeding with the equipment installation. Be sure to inspect the equipment carefully for any damage that may not be evident on the outside of the carton. Contact the freight carrier immediately to report any damage and file a claim.

Safety:

- Do not operate equipment that has been damaged.
- Refer all maintenance to qualified personnel.
- Never operate the ice maker with any covers, panels or other parts removed or not properly secured.
- Instruct all personnel in the proper use of the equipment.
- Clean up any spillage immediately.

Caution

Failure to comply with all installation guidelines may cause personal injury, equipment or property damage and may void the product warranty.

Note: Important Installation Advice

- Always install the ice maker on a stable and level surface.
- Always secure the ice maker to the ice storage means.
- Do not install the equipment in wet areas.
- Do not locate the equipment near any heat source, in direct sunlight, in hot ambient areas, or without proper clearance for ventilation. Placing equipment in these locations will result in reduced capacities, high system pressures and may cause equipment failure.

Remove the ice machine front-cover panel, top-cover panel and side-cover panels from the ice machine frame.

The ice storage bin surface must be level. Use minimum 150 mm (6") ice storage bin leg adjusters, or seal the bin directly to the floor using shims as required. Use an NSF certified sealant to seal the bin to the floor. If there are gaps larger than 3 mm (1/8") install a cove molding around the bottom of the bin.



CAUTION

Note: The ice drop opening and the probe opening must NOT be blocked by the storage bin walls.

Carefully lift the ice machine and position it on the ice storage bin.

The ice machine is heavy! Use of a mechanical lift may be required.

Attach the ice machine to the ice storage bin. The ice machine is supplied with an attachment bracket to fit Scotsman B330 and B530 ice storage bins.

Drains

Separate drains must be provided for the ice maker and ice bin. The size of the drain tubing must never be reduced along its length.

Make sure that the building drain system can accommodate all the drain water from the ice machine operation.

Individual drains must never be directly connected to a common manifold, drain or standpipe. If individual drains are to be discharged into a common manifold, drain or standpipe, a minimum 38mm (1.5") air gap must be provided at each connection. This is to prevent any backflow or back-siphonage of drain water into the ice maker or ice bin.

Drain lines must be installed with a minimum drop of 2.5 cm per meter run (.3 inch drop per foot run).

Ice machine and bin drains may be insulated to prevent condensation.

Follow all local and national codes.

Connect Drain

Adapt as needed and connect to the 3/4" ID flex drain out the back of the unit. Do not use flexible tubing beyond this connection, use only rigid tubing.

Potable Water Supply

There are no specific requirements for water treatment provided that the water is potable, not laden with sediment and does not exhibit residual chlorine level greater than 0.2 ppm. The use of water treatment, however, may increase the intervals between cleaning operations.

Do not connect the ice machine to a hot water supply line. Insulate the water line from sources of heat or to prevent condensation.

Note: Water temperatures higher than the recommended maximum will cause reduced capacity.

High residual chlorine (more than 0.2 Ppm) can cause corrosion of ice maker components. High chlorine levels must be reduced, in the ice maker water supply, to protect the equipment and preserve the product warranty. Please contact your local water conditioning expert for recommendations, about your specific water supply, or consult the factory.

A minimum 0.2 MPa (30 psig) dynamic water supply pressure is required for proper operation of the ice maker water valve. Minimum water pressure 0.2 MPa (30 psig) Maximum water pressure 0.6 MPa (100 psig). If a water pressure regulator is used, the recommended setting is 0.2 MPa to 0.3 MPa (30 to 50 psig) dynamic.

Connect Water Supply

NOTE - Purge all water supply lines before connecting them to the ice machine.

Adapt as needed using field supplied fittings and connect to the 3/4" FPT fitting on the back of the unit. Minimum tubing size to use is 3/8" OD.

All units are intended to be installed with a permanent connection to the field electrical supply. Drop cord connections should never be used with this equipment.

Always be sure the power supply is the same as the ice machine specification. See the ice machine electrical plate.

Branch circuit protection

Proper protection must be provided by the use of fuses or hacr type circuit breakers. Each ice maker must be connected to a separate protected circuit with no other loads. A fused disconnect provided by the installer and installed adjacent to each ice maker is recommended and may be required by local codes.

Minimum ampacity does not indicate typical running current value. Refer to the equipment electrical plate. Use the minimum ampacity value for sizing branch circuit conductors up to 8 meters (26 feet) in length. For conductor length over 8 meters, increase the wire gauge as required.

Normal protector size is based on rated voltage and operation at lower than extreme temperature limits.

Branch circuit conductors may be sized to allow increasing the protector value up to the specified maximum. This may avoid nuisance protector opening under harsh operating conditions.

Follow all local and national codes.

Connect Electrical Supply Wires

The unit has lead wires that are available at the back of the cabinet.

Connect the correct size wires for the load to those wires.

- ◇ Is the ice maker and bin assembly level?
- ◇ Is there proper clearance around the machine for air circulation?
- ◇ Have all electrical, water and sewer connections been made?
- ◇ Has the supply voltage been tested with the ice maker on a dedicated, protected circuit?
- ◇ Is the machine installed where ambient air temperatures will range from 45 to 90F (7 to 32C)?
- ◇ Is the machine installed where incoming water temperatures will range from 45 to 90F (7 to 32C)?
- ◇ Does the water supply provide a minimum 20 psig dynamic to maximum 100 psig static pressure?
- ◇ Are there separate drain lines for the ice maker and bin?
- ◇ Are the ice makers and bin drains vented?
- ◇ Is the bin thermo probe run correctly, secured, tested and positioned in the bin at the right level?
- ◇ Are the electrical lines free from contact with refrigerant lines and moving parts?
- ◇ Are the drain pan and ice chute positioned properly and is the packing tape removed?
- ◇ Have you cleaned and sanitized the ice maker and bin?
- ◇ Is the mode selector switch set to the ice position?
- ◇ Are the cabinet panels secured?
- ◇ Has the owner been instructed regarding cleaning, maintenance and the high pressure reset button?
- ◇ Has the owner completed the registration card?
- ◇ Have you left the installation and operation manual?

Make all plumbing and electrical connections to the ice machine and ice storage bin. See the next page.

Remove front and right side panels.

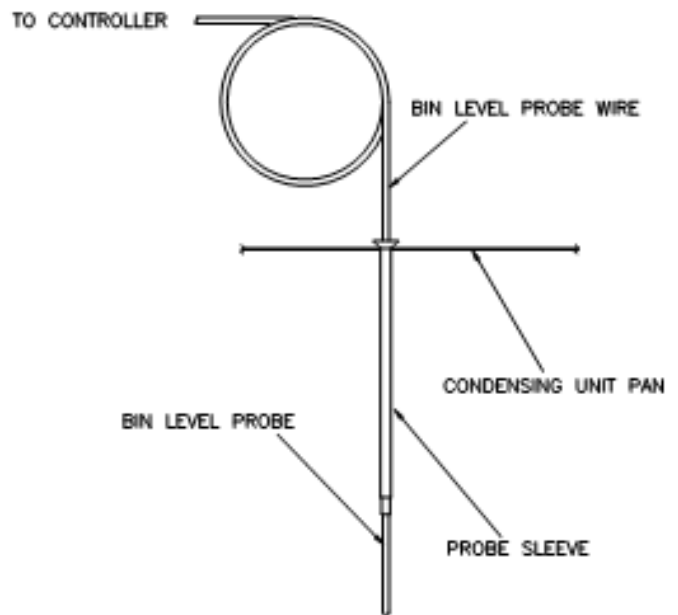
Remove all shipping materials from the ice machine including the water plate shipping strap. See the photo.



Install the bin level probe into the ice storage bin. See the illustration.

Be sure that the on-off switch is in the "OFF" position and the make ice-clean selector switch is in the "CLEAN" position.

1. Turn on the water supply and the electrical power and check all supply lines for leaks.
2. Make sure all pump and water tank hoses are connected, then pour .5 liter of clean potable water into the circulation system(s) to lubricate the pump seal.
3. Move the on-off switch to the "ON" position and observe the water flowing from the distributor tube, filling the water tank. Also observe that the water pump is circulating water through the system. The water fill is complete when the water level in the probe tube reaches the high-level probe. Observe that the water valve is de-energized at this time and there are no water leaks from the hoses or water tank into the drain pan.
4. Pull down on the right side of the water plate, stretching the springs until the actuator motor rotates the cam arms counter-clockwise. Observe that the cam arms continue to turn, opening the water plate fully, dumping the water in the tank. At


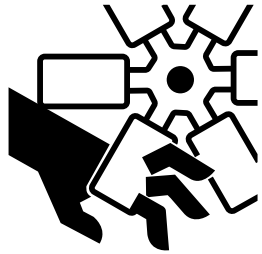


this point, the cam arm rotation will reverse and close the water plate. The cam arm rotation will stop when the water plate is fully closed and the water fill process will repeat.

5. Move the ice-clean switch to the "ICE" position and observe that the compressor and the fan motor (air cooled only) begin to run. The refrigeration system operation should be checked and adjusted during the first few cycles.
6. Test the bin level control operation by holding ice against the probe. The ice maker should shut off the within 30 seconds of contact between the ice and the probe tube.
7. **All adjustments and Service should be referred to a qualified technician who has the proper Service Manual.**
8. Make sure that the drain pan, ice deflectors and stacking chute (stacked ice machines only) are properly installed. Replace and secure all the cabinet panels.
9. Discard all the ice from the start-up cycles, then clean and sanitize the ice storage bin according to the instructions provided with the bin.

Condenser Cleaning


The air cooled condenser will need regular maintenance. All air used to cool the ice machine flows through it, and eventually it will become

	CAUTION
	
Rotating fan blade can cause personal injury.	
Unplug unit from power supply before beginning to clean condenser	

restricted. That restriction to air flow reduces ice making capacity.

1. Remove front panel and switch the machine off.
2. Obtain access to the back of the machine. This might require the unit to be pulled out slightly.
3. Brush the surface dirt off the condenser. Do NOT use a tool that could damage the fins of the condenser.
4. Vacuum the back of the condenser and / or blow from the inside to release any dirt. Imbedded grease will require the use of coil cleaner.
5. If the fan blade is also grease covered, it must be cleaned too.
6. Restart the unit and return the panels to their normal positions.

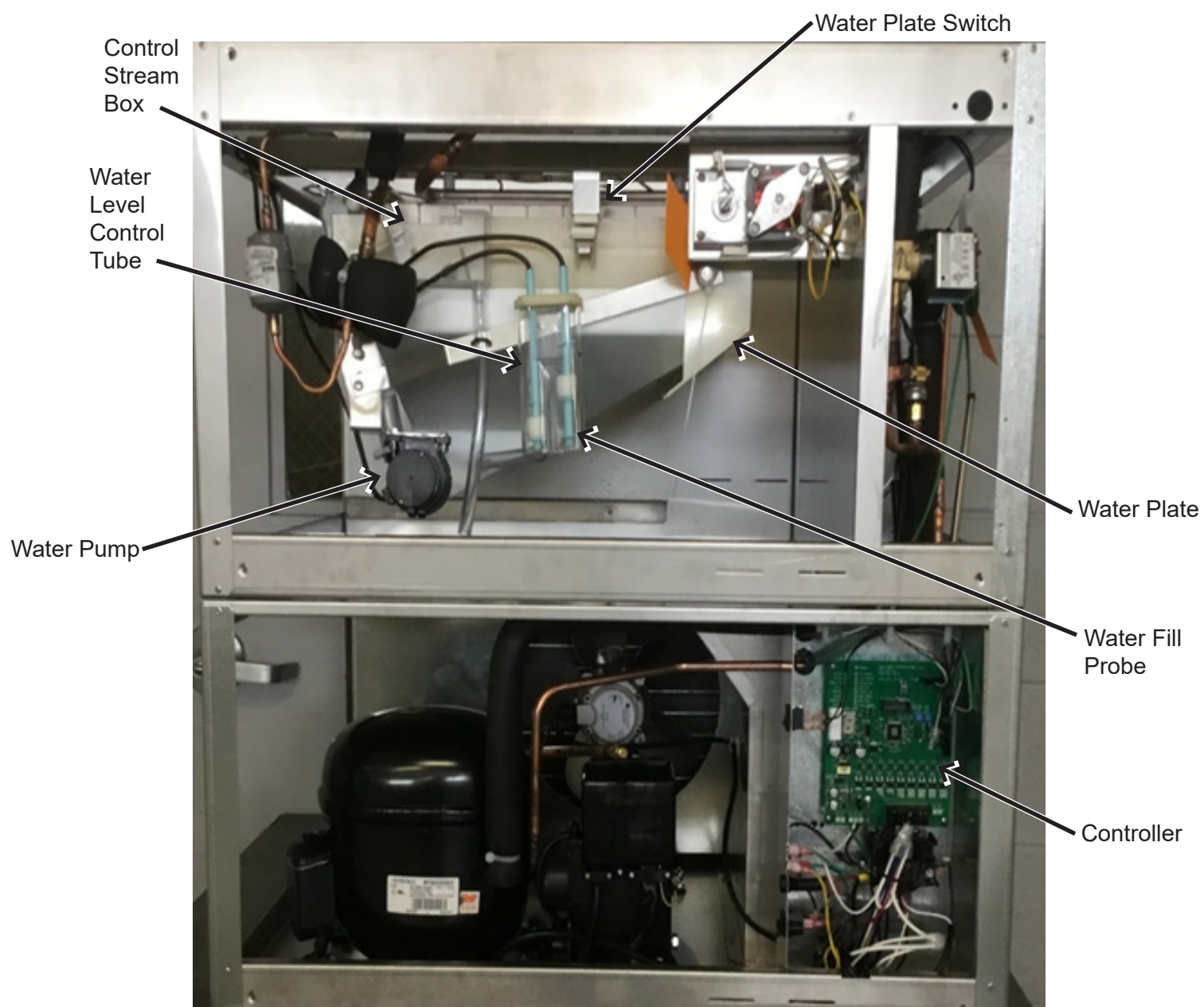
Note: Use a clean plastic bottle fitted with a stopper or cap that has a pouring tube and a vent to facilitate mixing and pouring of the specified solutions.

⚠ CAUTION	Ice machine scale remover contains acids. Acids can cause burns.
	If concentrated cleaner comes in contact with skin, flush with water. If swallowed, do NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately. Keep out of the reach of children.

1. Mix 3 oz. of Scotsman Clear 1 Scale Remover in a gallon of warm water.
2. If the ice machine is operating, wait until the ice falls out of the evaporator, then move the Ice-Clean Switch to the "Clean" position.
3. Empty the storage bin and turn off any other ice machines on the same bin.
4. After the water fill is complete, turn off the ice machine.
5. Separate the probe cap from the water level control tube.
6. Hold the water level control tube upright, so that it does not overflow.
7. Pour about half of the cleaning solution into the top of the water level control tube.
8. Return the probes and cap to the water level control tube.
9. Pour the remaining cleaning solution into the control stream box.
10. Turn on the ice machine and allow the solution to circulate for 15 minutes then pull down on the right side of the water plate. This will cause it to open and dump the cleaning solution and then refill with water. Repeat the dump process three times to be sure all the cleaning solution is rinsed out of the machine.
11. Mix a sanitizing solution containing 0.5 ounce (15 ML) 5-1/4% sodium hypochlorite (household bleach or equivalent) and 1 quart (3.8 Liter) clean water.
12. Using the same process as in steps #5-8, pour half of the sanitizing solution into water level probe tube and the other half into the control stream box.
13. Allow the solution to circulate for 15 minutes. Pull down on the right side of the water plate, to cause it to open and dump the sanitizing solution and then refill with water. Repeat this process two times to be sure all the cleaning solution is rinsed out of the machine. If necessary, adjust the water level probes to the proper levels.
14. While the cleaning and sanitizing solutions are circulating, clean and rinse all accessible parts and surfaces of the ice machine with clean towels and . Mix a cleaning solution containing 8 tablespoons (1/2 cup) (96g) baking soda and 1 Gal. (3.8 Liter) of warm water and a sanitizing solution containing 1 teaspoon (5 ML) 5-1/4% sodium hypochlorite and two quarts (1.9 Liter) of clean water.
15. After cleaning has been completed, move the Ice-Clean Switch to the "Ice" position. Check the operation of the machine, particularly the water level and subsequent ice cube formation. Adjust the water level probes if needed.

BC0530 Service Manual

Component Location



Water Fill Levels, Cycle Times and Harvest Weights

Water Fill Level inches (mm) *	2.75 (70)
Approximate Cycle Time (Minutes)	31
Approximate Harvest Weight-lbs. (kg)	7.70 (3.49)

Note: Rough measurement from top edge of water tank to water level in control tube after water fill is complete. Additional fine adjustments may be required.

Cube Information

Cube Type	Cube Dimensions in. (mm)	Cube Weight oz. (g)	Cubes per Cycle
(Full Cube)	1.25 x 1.25 x 1.25 (31 x 31 x 31)	1.15 (32.6)	108

Typical Refrigerant Operating Pressures

Measurement Point	Approximate Low Side (Suction Pressure)	High Side (Discharge Pressure) (R-404a)
Beginning of Freeze Cycle	50 PSI (345 KPA)	Likely to be higher than 250 PSI (1720 KPA)
Just Before Defrost Cycle Begins	12 to 20 PSI (80 to 140 KPA)	Likely to be lower than 250 PSI (1720 KPA).
During Defrost Cycle	70 to 150 PSI (480 to 1030 KPA)	150 PSI (1030 KPA)

Refrigerant Compressor: Provided to pump refrigerant through the refrigeration system. See the serial number plate for refrigerant specification and electrical characteristics.

Condenser: All air-cooled models are provided with a self-contained refrigerant condenser to remove heat from the refrigeration system.

Condenser Fan and Motor: Provided with all air-cooled models to draw air through the condenser.

Heat Exchanger: Provided to sub-cool the refrigerant, ensuring that the refrigerant is liquid at the inlet of the expansion valve.

Filter Drier: Provided as insurance that all moisture and impurities are removed from the refrigeration system.

Thermostatic Expansion Valve: Maintains the proper flow of refrigerant, through the system, as the load changes during the ice making cycle.

Evaporator: A plated copper evaporator is found in all models. The evaporator provides the five freezing surfaces for ice cube formation.

Defrost Valve: Directs compressor discharge gas to the evaporator, warming it to release the ice cubes during the harvest cycle.

Water Tank: Provided as a sump to hold the water required to make one batch of ice cubes.

Water Solenoid Valve: Opens to allow potable water to enter the ice machine and closes when the water tank is filled to the correct level.

Note: There is a strainer in the water valve inlet, which protects the water valve from particles in the water supply. If the need for cleaning this strainer is frequent, an external water filter should be provided.

Water Plate: Functions as a water manifold with a flat surface and to regulate the web thickness between the cubes. This surface is positioned close to the evaporator and acts to form the sixth side of the ice cubes. The water plate surface has one spray hole for each cell in the evaporator, to provide water to the freezing surfaces. The water plate surface also has two drain holes under each cell, to allow unfrozen water to return to the water tank to be re-circulated. The water plate swings down during the harvest cycle to allow the ice cubes to fall out of the evaporator.

Note: If at any time during the Fill, Freeze, or Circulate cycle the water plate is manually opened the controller will switch to the step 3 of the ice making sequence.

Water Pump: Continuously circulates the water from the water tank, through the water plate during the ice making cycle. The water pump also operates during the wash cycle to circulate cleaning and sanitizing solution.

Actuator Motor: Rotates the cam arms counterclockwise, at the beginning of the ice harvest cycle, to lower the water plate, so the ice can fall out of the evaporator. It then rotates clockwise, at the end of the harvest cycle, to close the water plate for the next ice making cycle.

Actuator Motor Capacitor: Installed between the two actuator motor windings, the function of this capacitor is to determine the direction of the rotation of the actuator motor.

Cam Arms: These are attached to the actuator motor output shaft and function initially to separate the water plate from the evaporator and then to support the water plate as it opens fully.

BC0530 Service Manual

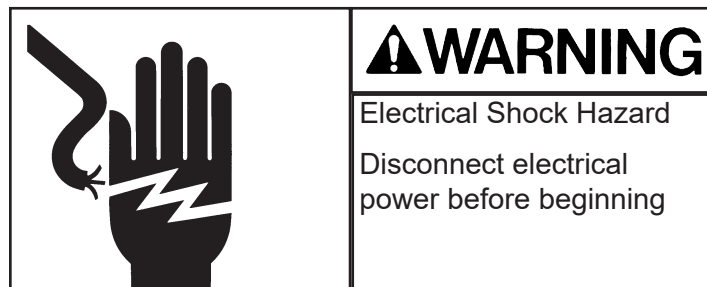
Water Plate Springs: Function as the connection between the cam arms and the water plate. They also act as a safety mechanism, stretching if any ice remains on the water plate surface as it is closing against the evaporator.

Drain Pan: Provided to catch the dreg water at the end of the ice making / cleaning and sanitizing cycles and directs it to the drain.

Ice Deflectors-Front and Rear: Provided to direct the falling ice to the storage bin.

Controller: Controls the ice machine utilizing multiple sensors, provides power directly to many of the ice machine components. Through solid-state relays, outputs and indirectly to the compressor and condenser fan motor, if so equipped by operation of the Contactor. The controller also provides status indication of the ice machine and components as well as diagnostics for service personnel.

On-Off Switch: The “On” position provides power to the controller to operate the ice machine. The “Off” position interrupts power to the controller to shut down the ice machine.



Warning: Switching the machine “off” does not de-energize circuits, disconnect power before servicing.

Ice-Clean Switch: The “Ice” position signals the controller to provide full operation of the ice machine.

The “Clean” position signals the controller to exclude operation of the contactor and thereby the compressor and condenser fan motor if so equipped

This position is useful for cleaning the ice machine and for test procedures where operation of the compressor is not required or desired.

Ice Level Probe: Senses when the ice bin is full- Contact between this probe and the ice in the storage bin will signal the controller to shut off the ice machine. When ice is removed from the probe, the ice machine will restart.

Adjustment: While holding ice against the probe tube, turn the adjustment knob on the controller to shut off the ice machine within one minute. A warmer (CCW right side blue knob) adjustment will shut off the ice machine sooner. A colder (CW) adjustment will delay shut off.

Evaporator Temperature Probe: Senses the temperature of the evaporator. During the defrost cycle, the evaporator must warm sufficiently to release the ice. This probe signals the controller to terminate the defrost cycle, after the ice has fallen out of the evaporator, and start the next ice making cycle.

Note: A secondary function of this probe is to signal the controller to shut off the ice machine if the evaporator should overheat.

Adjustment: Turn the adjustment knob on the controller warmer (CCW left side blue Knob), only if the defrost time is insufficient to drop all the ice from the evaporator, before the water plate begins to close. The defrost time should be increased no more than is required to ensure all the ice has fallen from the evaporator.

BC0530 Service Manual

Control Stream: This is a small clear box, divided into two sections and located on the front face of the water plate. It is a “safety valve” that ensures evacuation of the water reservoir so that harvest cycles will begin without undue delay. Water flowing into the left section of the box is returned to the water tank and re-circulated through the system. Water flowing into the right section of the box is drained out of the system. The velocity of the stream flowing in the box, during the ice making cycle, is an indicator of the water pressure inside the water plate. This pressure will increase as the ice cubes fill out in the evaporator, covering the drain holes provided for each cell. This pressure increase will cause the stream, normally flowing into the left section of the box, to flow over the partition and into the right section, draining the system of excess water.

Adjustment: Turn the Philips head screw located behind the expansion valve such that the stream of water falls to the center of the hole in the water plate control stream box, during the early portion of the ice making cycle, before the cubes are full.

Water Level Probe Assembly: This assembly consists of a dual float switch which is positioned in a clear water level tube. The water level tube is mounted to the stainless steel bar on the front of the water plate and is connected to it by a hose. The water level in the tank is visible in the tube. The water level float is positioned in the water level tube. The probe on the left is the harvest or LOW PROBE. When the water level is low enough to drop that float, the controller is signaled to start the harvest cycle. The right side probe is the “HIGH PROBE.” When the water level raises this float the pump will activate, the water level will lower and then refill back to a second high water light on the board, this is the secondary fill. The controller will then de-energize the water inlet valve and commence ice making mode.

Adjustment: The “Low Float” should be adjusted so there is 1 1/8 inch of blue stick sticking up out of the cap. Once set no further adjustment should be needed. The “High Float” determines how much water is taken into the system at the beginning of a cycle. This side should have 1 in of blue stick sticking out of the top of the cap. Pull up on right side to add water, push down to decrease water. It is adjusted as required and the desired fullness (dimple size) of each

cube. Typically all cubes should have a small dimple at the end of the freeze cycle. Lack of a dimple in the cubes is an indicator that the water tank level is too high at the start of the cycle.

Note: Making cubes without a 1/8 dimple will reduce ice machine capacity and may damage the water plate surface in extreme cases. If the control stream is draining water for more than 15 seconds, at the end of the ice making cycle, the water level in the tank is Too high. Lower the high probe until proper operation is evident.

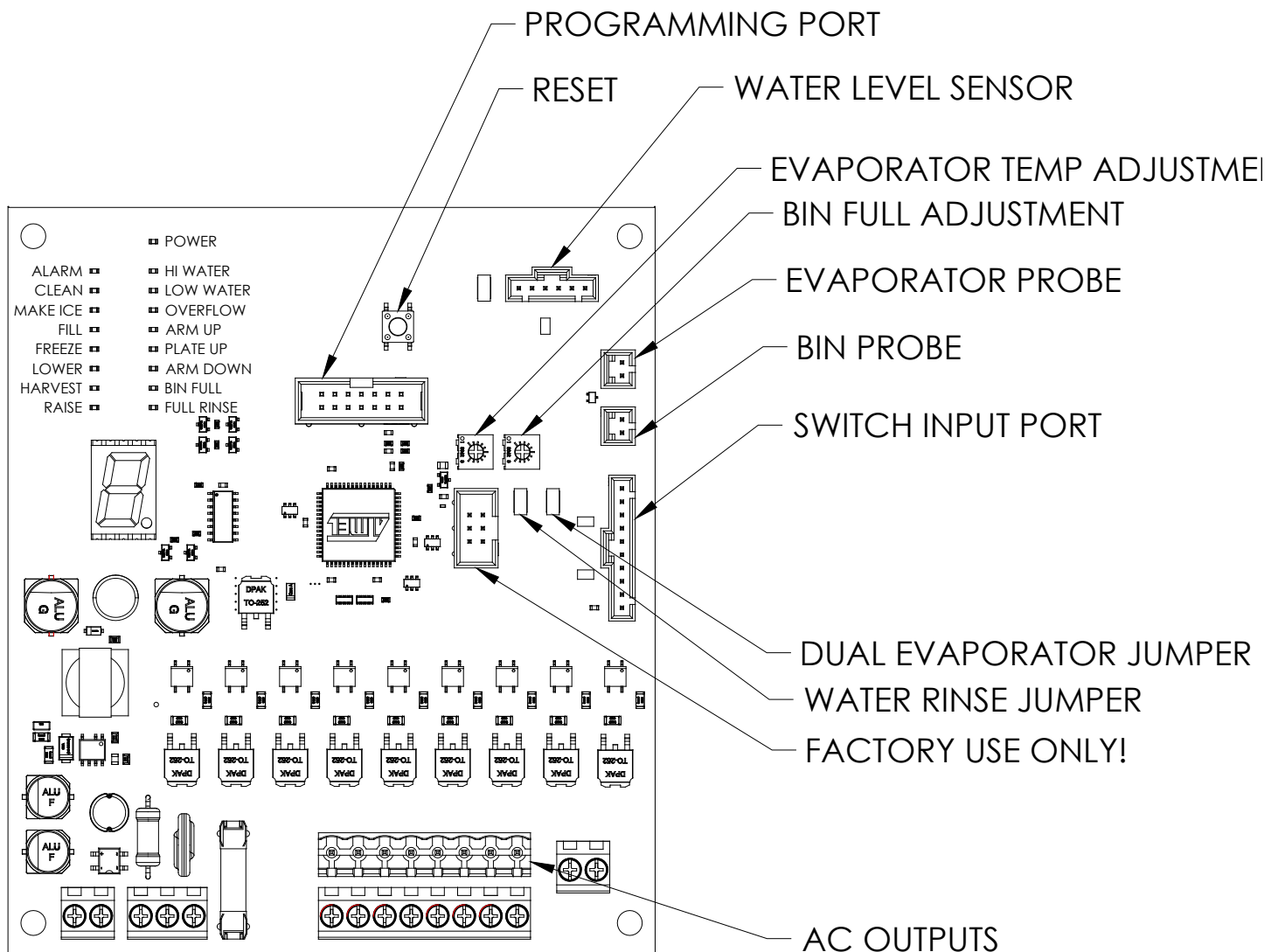
Magnetic Plate Up Switch: This switch is actuated by the water plate and informs the controller about the position of the plate—fully up or not fully up. If this magnetic switch is not actuated when the water plate closes, because ice is remaining on the water plate surface, the actuator motor will reverse and reopen the water plate. This will continue until the surface is clear.

Magnetic Cam Switch: This switch acts to limit the clockwise and counterclockwise rotation of the actuator motor. It informs the controller when the cam arms are in the “12 o'clock” position (water plate up), also informs the controller when the cam arms are in the “7 o'clock” position (water plate down), so the actuator motor can be de-energized.

Note: The front water plate spring must be on the left side of the cam hub when the water plate is fully closed (cam arm in the 12 o'clock position).

Contactor: Provided with all models to carry the compressor load. The condenser fan motor is also connected to the contactor. The contactor coil is rated for line voltage and the contacts are rated for definite purpose applications (FLA and LRA).

High Pressure Cutoff: A auto reset pressure switch is provided, which will open the circuit to the contactor coil if the discharge pressure should reach 425 psig and reset at 300 psig.



Machine Status: Displays the position of the Ice/Clean switch or an Alarm.

Sequence: Displays the current stage of the ice making process.

Input Status: Displays the status of the individual sensors for the ice making process.

Fault Codes: The electronic control will monitor for the following conditions and shut down the ice machine as required to prevent damage to the equipment.

>2 If the water tray automatically cycles 3 times in a row due to a water plate obstruction the controller will shut down the ice maker and provide LED fault indicators.

After 3 consecutive failed attempts at raising the water plate, the machine will defrost in 5 minutes then try again. A 2 will flash during the 5 minute defrost. Machine will shut down if it fails after this defrost period.

>3 Flashes after 3 consecutive cycles over 35 minutes, But will not shut down the machine. Stops flashing once a cycle is under 35 min.

BC0530 Service Manual

>4 After 3 consecutive occurrences of fault 4 the machine will attempt to remove any blockages by defrosting and cycling water – LED40 will be flashing (5Hz) during this defrost and water cycle-defrost will last for 5 minutes –Water will cycle for 10 minutes –if the machine has 3 more consecutive short freeze cycles, LED 40 will be solid and the machine will shut down.

>6 Water fill exceeds 3 minutes then the Valve closes & waits 10 minutes, as LED 60 Flashes. Valve then opens & tries again. This routine repeats 3X and results in a solid Code 6, if the fill is not completed on the third try.

>7 Both Arm-Up/Arm Down (Cam) Switches Closed (un-actuated) at the same time (not allowed).

>8 Indicates that the machine is in full rinse mode (left jumper pulled)

>9 Indicates bin full, Ice machine will be shut down after current batch is complete.

Note: The controller will need to be reset to clear these error codes. Board Revision numbers are found on the sticker placed on a processor chip in the middle of the control board. Example: 2.0

Stacked Jumpers:

- Under normal operation all machines will have a jumper on the pins marked full rinse. If this jumper is removed the water valve will stay energized to thoroughly rinse the water plate during the water plate lowering, harvest and water plate rising cycles.

Note: The machine will need reset for the controller to acknowledge this change.

- The right jumper is used to tell the controller when it is being used on a dual evaporator machine. BCO530 should not have jumper on.

Note: if you are replacing control board the new board will come with jumper on. (MUST BE REMOVED OR PLATE WILL NOT RISE).

Programming Port: Used by service technicians to alter or update the controller software.

Water Level Sensor: Port for water level FLOATS.

Evaporator Temperature Adjustment: To increase the temperature of the evaporator at which the water plate closes, turn this dial counterclockwise. To decrease, turn the dial clockwise. The operator can adjust the harvest termination temperature between 35 and 60F.

Note: After adjustment the controller must be reset.

Reset Button: Reboots the controller.

Temperature Sensor Port: For evaporator and bin temperature sensor probes.

Bin Full Adjustment: To increase the temperature at which the ice level probe reacts to contact with ice in the bin turn the dial clockwise. To decrease, turn the dial counterclockwise. The temperature range for this adjustment is between 33 and 45F.

Note: After adjustment the controller must be reset.

Switch Input Port: For the on/off, ice/clean and limit switches

Factory Use Only: Used to display diagnostic codes to an LCD monitor used only by service the factory.

Output: AC output for powering the fan(s), compressor, water pump(s), actuator motor(s), contactor(s), and valves.

BC0530 Service Manual

Error-Code Troubleshooting

CODE:	FAULT CODE INDICATES:	POSSIBLE CAUSE:	SOLUTION:
1	(Rev. 1.1/1.2/1.3)	<ol style="list-style-type: none"> 1. Bad Evaporator Probe (shorted) or wiring. 2. Hot Gas Valve stuck open 3. Bad Control Board. 4. Actuator Motor won't raise the Water Plate. 	<ol style="list-style-type: none"> 1. Repair/replace wiring or replace Probe. 2. Pull down the Water Plate and verify the Hot Gas Valve closes after the Water Plate closes. Repeat, with power to the Hot Gas Valve coil disconnected. If Hot Gas Valve does not close, replace it. 3. Replace Control Board. 4. Replace Actuator Motor. (Motor never raises Plate to actuate Plate Switch, so HGV stays open & Evap temp rises > 120F.
	Evaporator temp over 120F.		
2	(Rev. 1.1)	<ol style="list-style-type: none"> 1. Cam Arm or Cam Pin is broken. 2. Cam Spring disengaged or broken. 3. Plate-Up Switch stuck open or not actuating. 4. Over-freeze causing ice to stick to water plate. 5. Silicone coating on Water Plate worn away. 6. During harvest, the Evaporator Probe is out of adjustment (reads too warm) or is defective. 7. Arms-Up Switch stuck closed- Plate stays down. 8. Bin Probe is out of position 	<ol style="list-style-type: none"> 1. Replace Cam Arm or Cam Pin. 2. Reinstall springs or replace as needed. 3. Adjust switch actuator or replace as needed. Check to ensure that the Plate-Up switch actuates before the Arms-Up switch actuates. 4. Lower the short water level probe, in 1/16" increments, until cubes have a pea-sized dimple in the center. 5. Replace the Water Plate if the factory coating is severely worn and is causing ice to stick to it. Use a Food-Grade Silicone spray to provide a temporary improved surface, until the water plate can be replaced. 6. Adjust Evaporator Probe colder (turn CW), or replace if adjustment does not help. 7. Free up, adjust or replace stuck/shorted Arms-Up Switch, or repair wiring. 8. Re-position or replace Bin Probe.
	Water Plate failed to close after three consecutive attempts.		
	(Rev. 1.2/1.3)		
	<p>After 3 attempts to close, machine goes into a 30-minute shutdown, with the Plate open. <u>It will repeat this routine</u> (w/ the Plate closing 3 times & then a 30-minute wait) <u>four times</u>, before going out on Code 20.</p> <p>The Code 20 LED will <u>flash</u> as this routine is in process, and then light <u>solid</u> after the routine tries 4 times and ends Code 20.</p>		

BC0530 Service Manual

CODE:	FAULT CODE INDICATES:	POSSIBLE CAUSE:	SOLUTION:
3	<p>(Rev 1.1/1.2)</p> <p>Freeze time exceeds <u>60 min.</u></p> <p>(Rev 1.3)</p> <p>Freeze time exceeds <u>45 min.</u> three times consecutively.</p>	<ol style="list-style-type: none"> 1. Not enough air or liquid flow through condenser. 2. Low-level (harvest) probe shorted or touching side of glass tube. 3. Inoperative water pump. 4. Refrigeration problem. 5. Bad Contactor (Compressor would be off!) 6. Inlet Water Valve stuck open. Water Tank will be overflowing. 7. Controller not shutting off Water Valve. 8. Hot Gas Valve (HGV) stuck <u>partially</u> open, or with a liquid-cooled compressor, HGV stuck <u>fully</u> open, but Evaporator never gets hot enough (>120F) to give an Error Code 10. 	<ol style="list-style-type: none"> 1. Reset high-pressure safety, if tripped. Clean the condenser, on air-cooled units. Check water/coolant supply, on liquid-cooled units. 2. Check/repair shorted wiring to this probe, or gently move probe away from glass surface. Make sure probe is not pushed up/down out of vertical adjustment when moving it away from glass. 3. Unplug the pump and confirm the impeller is not jammed with foreign material. Put machine in Wash Mode & check voltage at pump-cable connector. On the Controller Board's AC output bus, check wires P5-2 and P5-6, during Wash Mode, for line voltage. If rated line voltage is present, and the pump's impeller is not obstructed, replace faulty Water Pump. 4. Check for low refrigerant charge. 5. Replace Contactor. 6. Replace Water Valve. 7. Replace Controller. 8. Replace Hot Gas Valve.

BC0530 Service Manual

4	(Rev 1.1/1.2/1.3) Freeze time less than 5 min., for 3 consecutive times. (Water level in the glass Probe Tube is prematurely falling below the low-level probe, during the first 5 minutes of the freeze cycle, or, the Low-level probe circuit is open.)	<ol style="list-style-type: none"> 1. Slushing, in Pump, water lines or Water Tank, due to Expansion Valve mis-adjustment or <u>not</u> being wrapped in insulating foam, or failure. 2. Low-level Probe circuit is open, or the Water-level Probe Assembly is bad. 3. Water is being lost somewhere (leaking), causing premature harvest to occur. 4. During harvest, Evaporator Probe out of adjustment (too Warm). 5. High-level Probe possibly short circuiting during fill, causing short fill and hollow cubes. 	<ol style="list-style-type: none"> 1. Ensure Expansion Valve (TXV) is covered with insulating foam, Adjust TXV as needed. As a starting point, <u>gently</u> turn the TXV in CW direction until it stops, then turn it CCW 5-1/2 turns. Adjust in ¼ turn increments as needed. 2. Repair wiring to Low-level Probe or replace Probe assembly. 3. Inspect hoses, water tank, water pumps, water plate and water level probe assembly to locate leak, repair or replace bad part as needed. 4. Adjust colder (CW). 5. Locate & repair short circuit.
CODE:	FAULT CODE INDICATES:	POSSIBLE CAUSE:	SOLUTION:
6	(Rev 1.1/1.2)	<ol style="list-style-type: none"> 1. Water supply off or major leak in the water tank, or water lines. 2. External water filter plugged. 3. Water solenoid valve inoperative. 4. Upper (short) Probe, in the Water-Level Probe Assy, may have a loose wire connection (open). 5. Common (longest) Probe, in the Water-Level Probe Assy, may have a loose connection (open) 6. Controller is bad. 	<ol style="list-style-type: none"> 1. Turn on water supply or check for leaks. 2. Replace, bypass or eliminate external water filter. 3. Place in Wash Mode and pull down on water plate, to lower it. On the return up, water valve will energize to fill, until the short probe is reached. If water solenoid valve has power & water, but does not open, replace the valve. 4. Verify wire connection is securely crimped on top of probe & back to Controller. 5. Verify wire connection is securely crimped on top of probe & back to Controller. 6. Replace Controller.
	Water fill exceeds 5 min.		
	(Rev1.3)		
	Water fill exceeds 3 min, then the Valve closes & waits 10 min, as Code 60 LED flashes. Valve then opens & tries again. This routine repeats 3X & results in a solid Code 60, if the fill is not completed on the third try.		

BC0530 Service Manual

7	(Rev 1.1/1.2)	(Rev 1.1/1.2)	1. No action required. (Increase incoming water temp to >45F for best results)
	Evaporator Temperature <31F, during water fill only. (System opens Hot Gas Valve to compensate, until an Evaporator temp of about 38F is reached. This temp range is adjustable from about 35-46F).	1. This is not necessarily a fault condition, but could indicate that the incoming water temp is very cold, which <u>can slow down ice production</u> , as the Hot Gas Valve continuously reopens to warm the Evaporator to >38F.	
	(Rev 1.3)	(Rev 1.3)	1. Tighten switches. 2. Wiring should be to the Common & Normally Closed (NC) positions, with black wire to the bottom- <u>front</u> NC terminal and red wire to the bottom- <u>rear</u> NC terminal. White wires should go to the Common terminals on top. 3. Straighten bracket. 4. Cam flats should be almost opposite each other. See Water Plate Up/Down adjustment, page 41 of Service Manual. 5. Replace stuck/shorted Arms-Up Switch or check solutions 2-5 above. 6. Replace stuck/shorted Arms-Down Switch or check solutions 2-5 above.
	Both Arm-Up/Arm-Down (Cam) Switches Closed, (un-actuated) at the same time (Not allowed).	1. Switches are loose. 2. Switches are mis-wired. 3. Switch Bracket bent & switches not in position. 4. Switch <u>Cams</u> loose and/or in the wrong position. 5. Arms-Up Switch stuck closed – Plate stays down. 6. Arms-Down Switch stuck closed – Plate stays up.	
8	(Rev 1.3 only)	1. This is an optional mode, which is not as energy efficient.	1. Replace jumper to restore normal energy efficient minimum-rinse mode.
	Machine is in Full-Rinse Mode. (Left Jumper is pulled, on Controller)		
CODE:	FAULT CODE INDICATES:	POSSIBLE CAUSE:	SOLUTION:
9	(Rev 1.3 only)	1. This is a normal condition, indicating that the Bin is full. (Bin Probe is cold!) 2. If Code 90 is indicated, but Bin is <u>not</u> full, check for faulty Bin Probe, bad wiring to Bin Probe or faulty Controller Board.	1. No action required. 2. Repair wiring, replace bin Probe, or replace Controller.
	Ice Bin Full (A cold Bin Probe will shut down the icemaker right after the next harvest is complete)		

The following tables describe the general states and sequence of operation for the ice machine models in ice-making mode with an additional table depicting the status when the ice bin is full and the cleaning mode. The charts provide information about the inputs to the controller and the corresponding AC outputs associated with each part of the ice making cycle.

Note: Abnormal operation of the ice machine is covered in the Fault Condition section of the manual.

Ice Making Sequence

	Step 1 Fill	Step 2 Freeze	Step 3 Lower	Step 4 Harvest	Step 5 Raise
Control	Status	Status	Status	Status	Status
Bin Level Probe	Warm/Not Full	Warm/Not Full	Warm/Not Full	Warm/Not Full	Warm/Not Full
Ice-Clean Switch	Ice	Ice	Ice	Ice	Ice
Contactor	Closed	Closed	Closed	Closed	Closed
Water Plate Switch	Up	Up	Down	Down	Down
Evaporator Temperature Probe	N/A	Cold	Cold	Warming	Warm
Water Level Control	Low Level/ Rising	High/Level Falling	Low	Low	Low
Arms-Up/Down Switches	Arms Up	Arms Up	Arms Lowering	Arms Down	Arms Rising
Ice	None	Forming	Fully Formed	Fully Formed	None
Compressor (Condenser Fan)	On	On	On	On	On
Water Plate	Closed	Closed	Opening	Open	Closing
Water Pump	On	On	Off	Off	Off
Defrost Valve	Closed/ De-energized	Closed/ De-energized	Open/ Energized	Open/ Energized	Closed/ De-energized
Water Valve	Open/ Energized	Closed/ De-energized	Open/ Energized	Closed/ De-energized	Open/ Energized
Actuator Motor	Off	Off	On/CCW Rotation	Off	On/CW Rotation
Control Stream	Low	Low to High	Off	Off	Off

	Ice Bin Full	Cleaning Mode
Control	Status	Status
Bin Level Probe	Cold/Bin Full	Warm or cold
Ice-Clean Switch	Ice	Clean
Contactor	Open	Open
Water Plate Switch	Up or Down	Up
Evaporator Temperature Probe	Warm or Cold	Warm
Water Level Control	Low or High	High*
Arms-Up/Down Switches	Water Plate Up or Down	Water Plate Up
Ice	None or Fully Formed	None
Compressor (Condenser Fan)	Off	Off
Water Plate	Open or Closed	Closed
Water Pump	Off	On
Defrost Valve	Closed	Closed
Water Valve	Closed	Closed*
Actuator Motor	Off	Off
Control Stream	Off	Low

BC0530 Service Manual

Description of Each Process

The following sequence begins with the cuber as shipped from the factory with the water plate(s) closed and ready to begin a normal ice making cycle.

Fill: The water solenoid valve will be energized only until the water level reaches the highwater FLOAT, and the water pump will run when the water plate is closed.

Freeze: Once the water fill cycle has been completed, the water solenoid valve will remain de-energized until the following harvest cycle. The water level in the liquid level probe tube lowers as the water is frozen, but no additional water will be introduced during the freeze cycle. The control stream runs continuously during the freeze cycle with the water returning to the water tank through the hole which can be seen through the control stream box to the left of the dam in the box. The control stream is a "safety valve" to ensure the ability to initiate harvest rather than an ice quality control, and it should never need to go over the dam for more than 15 seconds before harvest begins.

Note: No water, other than condensation, should drip or run to the drain pan from the control stream or from the water tank during the freeze cycle. The water level in the liquid level probe tube must get below the level of the low float to initiate the harvest cycle. If there is an excess of water in the water tank, the water pump outlet pressure increases when the evaporator cells are full, and the control stream rises and flows over the dam to the drain pan to evacuate the liquid level control tube.

Lower: When the water level in the liquid level probe tube is below the low water level probe the controller senses the absence of continuity between the probes. Power is applied to the defrost valve coil allowing hot gas to circulate through the evaporator. The evaporator begins to defrost, and the water plate begins to open immediately. When the cam arm down switch is activated the water plate will stop.

Harvest: As long as the evaporator remains cold, the water plate(s) remain in the open position with the water solenoid valve de-energized. The defrost valve remains energized, and the evaporator become warm enough to release the ice which drops by gravity into the ice storage area.

Raise: After the ice is out and the evaporator warms to the reset temperature required by the controller the actuator motor will be energized to close the water

plate. The water solenoid valve will be energized to begin the water fill for the next ice-making cycle, the defrost valve will be de-energized, and the evaporator will begin to cool.

Ice Bin Full: When the level of ice reaches the bin probe, the ice maker stops automatically, and it remains off until the bin probe warms up when the ice level is lowered.

Cleaning Mode: All of the cuber operational components except refrigeration are able to function with the make ice/clean switch in the clean position. Simply placing this switch in the cleaning position does not complete the cleaning and sanitizing of the cuber. Instructions pertaining to the cleaning of a machine can be found in this manual.

Note: The frequency of the need for cleaning is determined by the supply water characteristics. The cuber should be cleaned no less frequently than once each 6 months, and it may require more frequent cleaning. The requirement for sanitizing frequency may be contained in local health code regulations.

Water Plate Closure Problems: If the plate up switch is not properly actuated, due to mis-adjustment, weak springs, or an obstruction to the water plate travel, such as ice which did not slide off of the plate, the actuator motor will immediately reverse and re-open the water plate.

Shutdown-High Pressure: All models are provided with a high pressure cutoff which interrupts power only to the compressor, and to the condenser fan motor, when the high-side pressure rises to the cutoff setting 425psig (AUTO RESET AT 300PSIG). When this happens be sure there is sufficient airflow, a clean condenser, and a properly functioning fan motor.

Ice Making Mode Start Up

At power up in the ice making mode the electronic control will monitor the following criteria:

If the evaporator temperature is colder than the Harvest Termination temperature at start up the controller will switch to the Lower state.

If there is an obstruction preventing the water plate from closing the Plate Up switch at startup, the controller will switch to the Lower state.

If the water plate is not in the up position at start up and the evaporator temperature is warmer than the Harvest Termination temperature, the controller will switch to the Raise state.

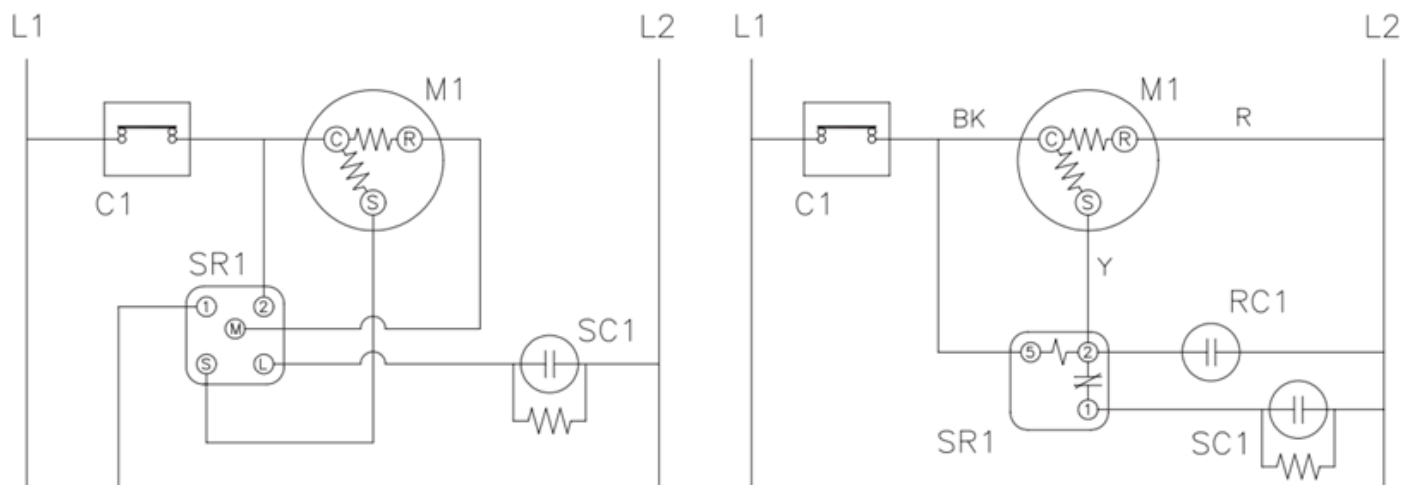
Cleaning Mode Start Up

At power up in the wash mode the electronic control will monitor the following criteria:

If there is an obstruction preventing the water plate from closing the Plate Up switch at startup, the controller will switch to the “Lower” state.

If the water plate is not in the up position at start up, the controller will switch to the “Raise” state.

Compressor Wiring



BC0530 Service Manual

Compressor Test Procedure

Safety:

- Refer all service work to qualified technicians.
- Knowledge of proper installation and service procedures is essential to the safe maintenance of equipment.
- Do not operate equipment that has been damaged.
- Always disconnect the power supply before servicing the equipment. Some circuits remain energized when the ice machine is switched off.
- Never operate the ice maker with any covers, panels or other parts removed or not properly secured.
- Never modify the circuitry of equipment from the original specifications.
- Use only genuine replacement parts.
- Use of non-approved parts when servicing equipment may create a safety hazard or cause equipment and property damage.
- Use of non-approved parts, when servicing equipment, will void the equipment warranty.
- Disconnect all electrical power before removing the protective terminal cover.
- Never energize the system unless the protective terminal cover is securely fastened.
- Never energize the system unless the compressor is properly connected to ground.
- Never reset a circuit breaker or replace a fuse without checking for a short circuit to ground. An open fuse or tripped circuit breaker is an indication of a ground fault. Energizing a compressor with a ground fault may cause terminal pin ejection, which will allow oil and refrigerant to spray out of the system. This oil spray, combined with an electrical spark, can ignite causing harm to personnel and property.
- Discharge all capacitors with a 20,000 ohm resistor before working with them or removing them from the ice machine. This must be done to avoid damage to measuring devices and the risk of electrical shock.



CAUTION

Caution: Failure to comply with all service guidelines may cause personal injury, equipment or property damage and voiding of the product warranty.

Note: • When servicing ice machine refrigeration systems, all work performed must be consistent with the best refrigeration service practices. These systems must remain clean, dry and properly charged with refrigerant, in order for the ice machine to operate as designed.

- All ice machine models utilize CSR (capacitor start/capacitor run) compressors. Each model includes a potential start relay, a start capacitor and a run capacitor, in the compressor circuitry, to start and operate these compressors properly and with maximum efficiency. This procedure will help diagnose problems with these compressors and all related components.

Test Procedure for a Short Circuit to Ground (Ground Fault)

1. Disconnect all electrical power to the system, making sure all power legs are open.
2. Remove the protective terminal cover. Inspect for evidence of overheating at any connection. Overheating is an indication that a compressor motor problem exists. Disconnect all leads from the terminal pins.
3. Check the compressor for a ground fault using an ohm meter or a high potential ground tester. Connect one lead to the copper suction line and connect the other lead to one of the terminal pins. Repeat this procedure for the two remaining terminal pins. If the instrument indicates any resistance less than 2 mega ohms between any pin and the suction line (compressor housing), a ground fault exists.
4. If a ground fault exists, replace the compressor. Do not reconnect the compressor or re-use any leads or terminal connectors that exhibit signs of overheating.

BC0530 Service Manual

Test Procedure for Continuity and Proper Resistance

1. If no ground fault has been found, determine if there is an open or short circuited motor winding or if the thermal protector is open.
2. Allow time for the thermal protector to reset. This may take as long as an hour for internal type thermal protectors.
3. For single phase compressors, test the continuity of the start winding by measuring between terminal pins C and S. Test the continuity of the main winding by measuring between terminal pins C and R. If there is no continuity in either winding, replace the compressor.
4. If continuity is found in all motor windings, measure the resistance (ohms) of the windings.
5. For single phase compressors, measure between each pair of terminal pins: C-S, C-R and S-R. The sum of the resistance measured between C-S and C-R should equal the resistance measured between S-R, plus or minus a small deviation. Proper resistance may be confirmed by comparing the measured resistance to the resistance specifications for specific compressor models. If the resistance is not correct, replace the compressor. If the specifications are not found on the ice machine, please contact the factory.

Test Procedure for Compressor Electrical Components

Testing The Potential Relay:

1. Before testing the relay, be sure it is the one specified for use with the ice machine compressor and the mounting position of the relay is correct.
2. Measure for continuity between terminals 5 and 2—if there is no continuity, replace the relay.
3. Measure for continuity between terminals 2 and 1—if there is no continuity, the contacts are open and the relay must be replaced.
4. The relay may also malfunction if the supply voltage is 10% higher or lower than the rated voltage or if the relay is loosely mounted, allowing it to vibrate or if it is used in conjunction with an incorrect start capacitor.

Testing the Run Capacitor:

1. Before testing the run capacitor, be sure it is the one specified for use with the ice machine compressor.
2. After making sure the capacitor is discharged, disconnect it and test the value with a capacitance meter. If the measured value is more than 10% higher or lower than the rated value, replace the run capacitor.
3. The capacitor may also malfunction if the supply voltage is more than 10% higher than the rated voltage.

Testing the Start Capacitor:

Before testing the start capacitor, be sure it is the one specified for use with the ice machine compressor.

1. After making sure the capacitor is discharged, disconnect it and test the value with a capacitance meter. If the measured value less than the rated value or more than 20% higher than the rated value, replace the start capacitor.
2. As an alternative, test the run capacitor by determining if there is continuity across the terminals. Use a meter set to the R x 1 scale. If there is continuity the capacitor is shorted and must be replaced.
3. Another alternative is to set the meter to the R x 100,000 scale. If there is no needle deflection on an analog meter when placing the probes across the capacitor terminals or if infinite resistance is indicated on a digital meter, the capacitor is open and needs to be replaced.
4. The capacitor may also malfunction if the relay contacts are not working properly, or if the capacitor is subjected to prolonged operation of the start cycle, because the start relay is incorrect, the starting load is too high, or the supply voltage is more than 10% lower than the rated voltage.

BC0530 Service Manual

Additional Service Information

Testing the External Thermal Protector:

1. After allowing sufficient time for the thermal protector to reset, disconnect it and test for continuity across the terminals. If there is no continuity, replace the thermal protector.
 2. Disconnect and test the compressor wiring by confirming that there is continuity between relay terminal 5 and compressor terminal C and also between terminals 2 and S as well as 4 and R.
 3. Replace the potential relay if all other tests do not reveal the problem. A new relay will eliminate any electrical problems that cannot be determined with the previous testing. If a new relay does not correct the operation, the compressor may have a mechanical problem.
-

Note: Excessive short cycling may be caused by a faulty thermal protector, but it also may be caused by other malfunctioning system components such as the bin thermostat, Ice-Off-Wash switch, and contactor or high pressure cut-out.

BC0530 Service Manual

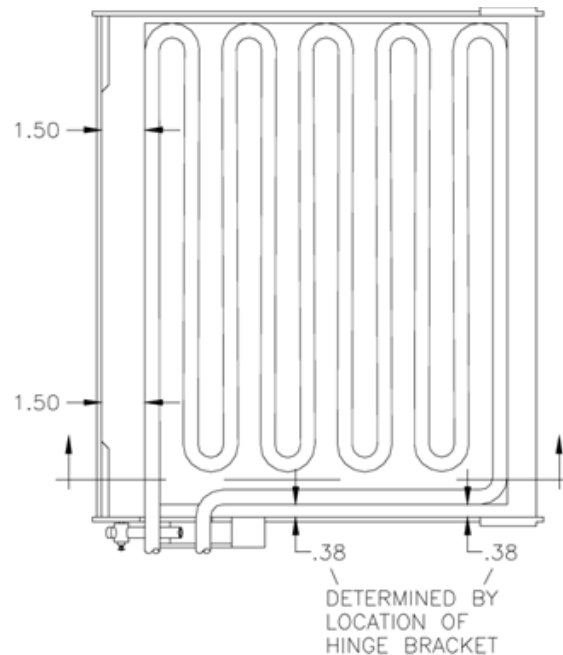
WATER PLATE REPLACEMENT

1. Turn off water and open plate until cams are in the 9:00 position then turn off the power.
2. Remove the control stream drain hose.
3. Remove water level probe assembly by sliding it to the right beyond the control stream box and lift. Disconnect tube assembly from main tank.
4. Remove the pump mounting screw holding the water plate brace, the inlet, and outlet hoses from the pump.
5. Pry plastic hinge brackets away from the plate.
6. Unhook the main springs from the water plate.
7. Remove the screws that mount the control module box. Pull the module forward to disconnect front cam.
8. Slide the water plate and tank to the right without turning and slide it forward out of the machine.
9. Remove the spring bosses, water plate brace, water deflector, pressure pads and the four screws holding the tank to the water plate. Remove plastic bolt from shoulder on water plate and place in new plate.
10. 1Attach the tank to new water plate with two #6 mach. screws on the left side and two #10 sheet metal screws on the front and back.

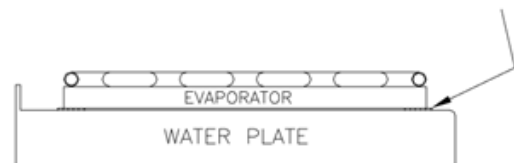
Note: The speed nuts on the front and back holes are no longer required.

11. 1With the open end of the water plate to the right, slide it back into the machine and to the left of its normal position.
12. Hook up the main springs to the water plate, rear spring first.
13. Hook on and snap into place the plastic hinge brackets

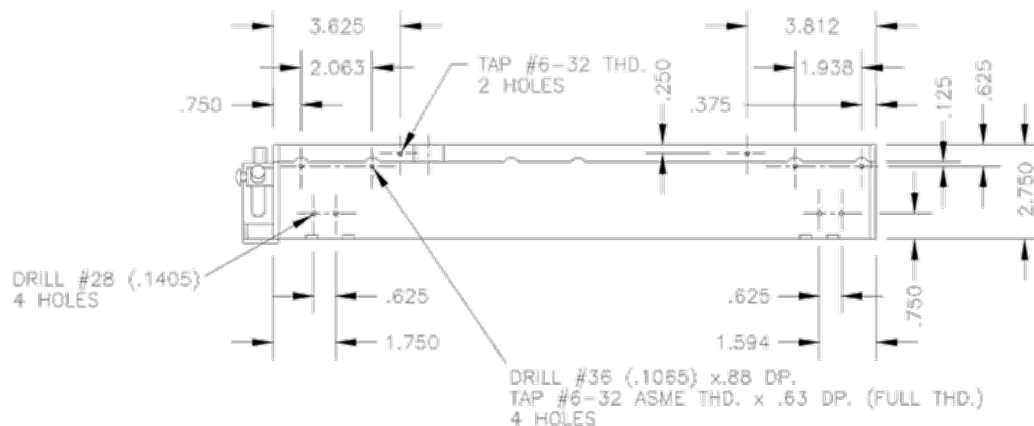
14. Secure the pump mounting screw holding the water plate brace.



CLEARANCE SPECIFICATION:
.075" FULL CUBE "C" & HALF CUBE "HK"
CHECK CLEARANCE ALL CORNERS



15. 15. Remove the water level probe assembly and reposition the control stream drain tube. Position and secure the control module box to mounting bracket. Check adjustment of plastic lift bolt. Reconnect harvest switch, if present.
16. Water plate must be aligned with the evaporator per drawing illustration.



BC0530 Service Manual

WATER PLATE ALIGNMENT

If the water plate is not aligned with the evaporator, the cubes may appear cloudy or misshapen.

Dimension "A" is not adjustable. If this dimension is out of tolerance, the evaporator or water plate mounting components may be damaged.

Adjustments to dimension "B" can be made by sliding the front and rear hinges along the left edge of the water plate. Lightly tap the hinges as required to align the water plate with the evaporator. Alignment is correct when the space between the evaporator and the water plate is equal in front and in back.

"A" = $1.5" \pm 3/32"$ (38 mm \pm 2.5 mm) "B" = $5/16" \pm 1/16"$ (8 mm \pm 1.5 mm)

WEB THICKNESS ADJUSTMENT

The web thickness between cubes (the gap between the bottom of the evaporator and the water plate surface) can be adjusted by inserting or removing shims between the support channels and the evaporator support posts or the cam shaft bearing brackets. Loosen the actuator motor mounting screws before inserting or removing shims between the channels and cam shaft bearing brackets. The web thickness specification for both C and HK models is $1/16"$ (2mm)

WATER PLATE UP/DOWN POSITION AND ADJUSTMENT

When the water plate is up (closed), the spring end of the cam arm must be in the 12 o'clock position, with the spring on the left side of the cam arm hub. The arms up switch lever (front) will be down and the arms down switch lever (back) will be up. When the water plate opens, the cam arm turns counterclockwise until the arms down switch operator allows the arms down switch lever to drop. When the water plate is fully down (open), the cam arm should be in the seven o'clock position; the spring should be aligned with the cam arm. When closing again, the cam arm will turn clockwise, until the arms up switch operator allows the arms up switch lever to drop.

The positions of the cam arms, when the water plate is open and closed, may be adjusted by loosening the set screws and rotating the switch operators as required. Baseline positions of the switch operators for the front and back are 11 and 4 o'clock when the water plate is up. When the water plate is down, positions for the front and back switch operators are 6 o'clock and 11 o'clock

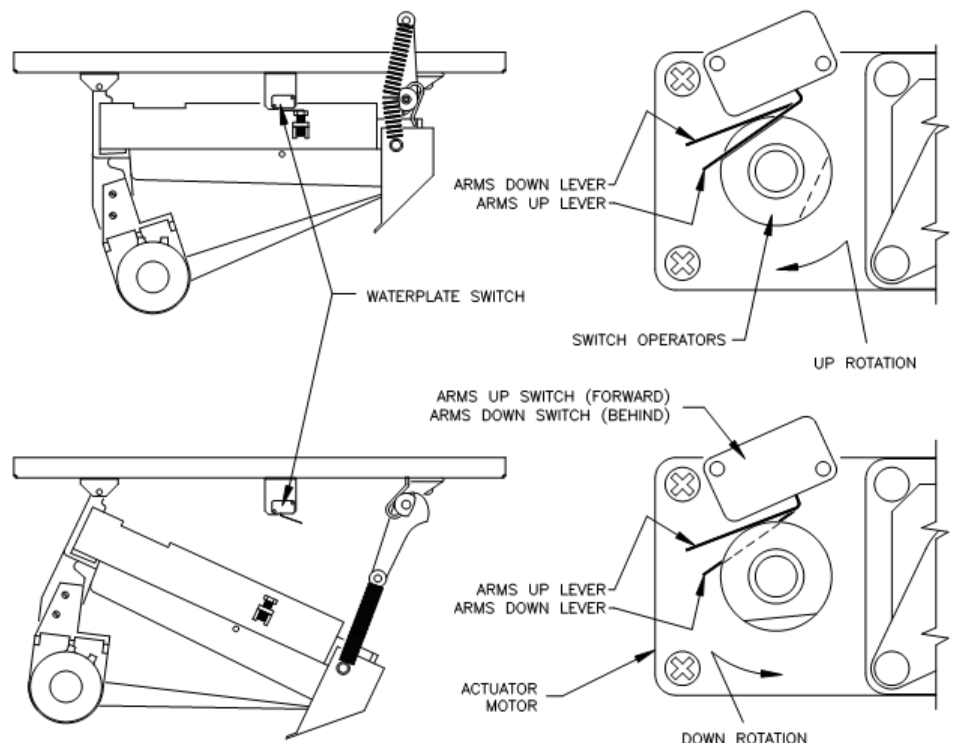
Note: The front operator is for adjusting the arms up switch and the back operator is for adjusting the arms down switch.

Up Position

- If the cam arm in the up position is too far clockwise from 12 o'clock rotate the front switch operator clockwise to stop the arm's rotation earlier
- If the cam arm in the up position is too far counterclockwise from 12 o'clock rotate the front switch operator counterclockwise to stop the arm's rotation later

Down Position

- If the cam arm in the down position is too far clockwise from 7 o'clock rotate the back switch operator clockwise to stop the arm's rotation later
- If the cam arm in the down position is too far counterclockwise from 7 o'clock rotate the back operator counterclockwise to stop the arm's rotation earlier



BC0530 Service Manual

Note: Component relationships and/or operation, other than described, indicate component failure, maladjustment or improper reassembly when servicing the ice machine.

ACTUATOR MOTOR ELECTRICAL TESTS

The following tests are for troubleshooting the actuator motor and related circuits:

Use an AC voltmeter set for the proper range. Voltages in the tables are measure across the motor reversing capacitor (between the colored motor lead wires.

If there is no ice in the evaporator(s) and the water plate(s) is(are) not fully closed (with the water plate switch(es) pushed up and the "ARMS UP" LED on), the actuator motor(s) and pump(s) should be running. If not, be sure there is power to the motor(s) and also that the motor(s) is(are) not overheated and off due high temperature. Allow the motor to cool down before starting the test procedure.

Always refer to the proper wiring diagram when troubleshooting.

Motor winding resistances at 75° F (24° C) out of the circuit are as follows:

REX 115volt motors, white to black or yellow, approximately 95 ohms

PROBE TEST PROCEDURE

Water Level Probes:

Water Float Probes can be tested at any temperature and are good if they exhibit continuity.

Evaporator Temperature and Ice Level Probes:

The evaporator temperature probe and the ice level probe are designed to have a nominal resistance of 32,650 k ohms at 32° F (0°C). To test these probes they must be placed in ice water 32°F (0°C) for a minute and then checked for resistance while the tube is still in the ice water. A probe is considered good if it exhibits a resistance value of 32,650 k ohms at 32° F (0°C). Probes with values outside this range should be replaced.

Actuator Motor Test Parameters			
Voltage Reading	Capacitor	Motor	Remedy
115 volt motors, reads 180-240	Good	Good	Tap gear case to align bearings
Line voltage for any voltage motor	Open	Good	Replace capacitor
Line voltage for any voltage motor in one actuator switch position and 0 volts in the other position	Open and →	One motor winding open	Replace capacitor and
115 volt motors, reads 180-240 in one actuator switch position and 0 volts in the other position	Good	One motor winding open	Replace motor
0 volts in both actuator switch positions. Be sure there is power to the motor (line voltage) by leaving one probe on either capacitor lead and placing the other probe on the white motor lead.	Shorted or →	Both motor windings open	Disconnect the actuator motor from the circuit and test the winding resistance. If approximately 500 ohms from white to red or yellow, replace the capacitor. If the resistance is erratic, replace the motor.

TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Ice machine is not operating.	On-Off switch in "Off" position	Move switch to "On" position.
	No power at ice machine. Circuit protector open.	Replace fuse or reset breaker. Check circuit for overload condition.
	Ice machine off because bin is full of ice.	Use ice or move ice away from bin level probe.
	Ice machine off because bin level probe is defective.	Replace bin level probe.
	Ice machine off as if bin is full. Ambient temp below 50°F (10°C).	Ambient temperature must be 60°F (15°C) minimum.
Compressor is not operating. Water pump and other components are operating normally. See compressor test procedure for more information.	Ice-Clean switch in "Clean" position.	Move switch to "Ice" position.
	High pressure cut-out open on air cooled models. Condenser dirty.	Clean condenser and reset high pressure cut-out. Confirm proper operating pressures.
	High pressure cut-out open on air cooled models. Air circulation through condenser is insufficient or hot air is recirculating through the condenser.	Provide adequate spacing between the ice machine and walls, ceilings or other equipment. See installation instructions for spacing requirements. Confirm proper pressures.
	High pressure cut-out open on liquid cooled models. Coolant liquid interrupted or insufficient	Restore adequate coolant liquid supply and reset high pressure cut out. Confirm proper operating pressures.
	High pressure cut-out open on liquid cooled models. Interior of condenser has a mineral build-up.	Clean or replace condenser.
	High pressure cut-out open. Refrigeration system is overcharged.	Remove refrigerant and recharge the system to specifications.
	Compressor thermal protector open because of low voltage condition.	Allow thermal protector to reset. Measure voltage at contactor while compressor is running. Correct power supply problem if voltage is lower than specified on the ice machine electrical plate. See compressor test procedure for more information.
	Compressor thermal protector open because of defective run capacitor.	Replace run capacitor. See compressor test procedure for more information.
	Contactor is defective.	Check for voltage at coil terminals. Replace contactor if it does not close when the coil is energized.
	Compressor start capacitor or relay defective	Test and replace these parts if defective. See compressor test procedure for more information.
	Compressor is defective.	Replace compressor. See compressor test procedure for more information.

TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Condenser fan motor is not operating on air-cooled models. Compressor is operating	Fan motor protector open.	Replace motor if it does not run when cool or at normal operating conditions.
	Fan motor defective	Replace motor.
Defrost performance slow	Condenser sub-cooling >11°C at the middle point of the freeze cycle on liquid-cooled models.	System is overcharged with refrigerant. Remove refrigerant and recharge the system to specifications.
	Condenser liquid regulating valve not closing fully during defrost on liquid-cooled models.	Adjust, repair or replace liquid regulating valve.
	Air cooled ice machine installed in a low ambient temperature location.	Ambient temperature must be 60°F (15°C) minimum.
	Ice frozen into the water plate surface. Thick web between ice cubes.	Adjust web thickness to specifications.
	Ice frozen into the water plate surface. Cubes are fully formed without small dimples.	Reduce the water fill level until ice cubes are produced with small dimples.
	Ice cubes have large dimples or are hollow at the end of the freeze cycle. Batch weight is too light.	Increase the water level until ice cubes are produced with small dimples.
	Evaporator grids are distorted.	Carefully straighten grids or replace evaporator if the damage is severe.
Water plate re-opens immediately after closing	“Water plate up” switch lever is not being pushed up completely.	Adjust “water plate up” switch actuator on water plate until it pushes up the switch lever completely.
	Water plate is prevented from closing by some obstruction such as ice remaining on the water plate surface.	Eliminate obstruction. Adjust the evaporator temperature probe so all ice is out of the evaporator before the water plate begins to close.
Water plate closes but re-opens before water fill is completed.	Water plate springs are stretched or weak and allow the water plate to drop slightly as the water fills the tank. The “water plate up” switch lever is allowed to drop and re-open the water plate.	Replace defective springs.
	A water plate spring is broken or disconnected from the cam arm or the water plate.	Replace broken spring or reattach disconnected spring.

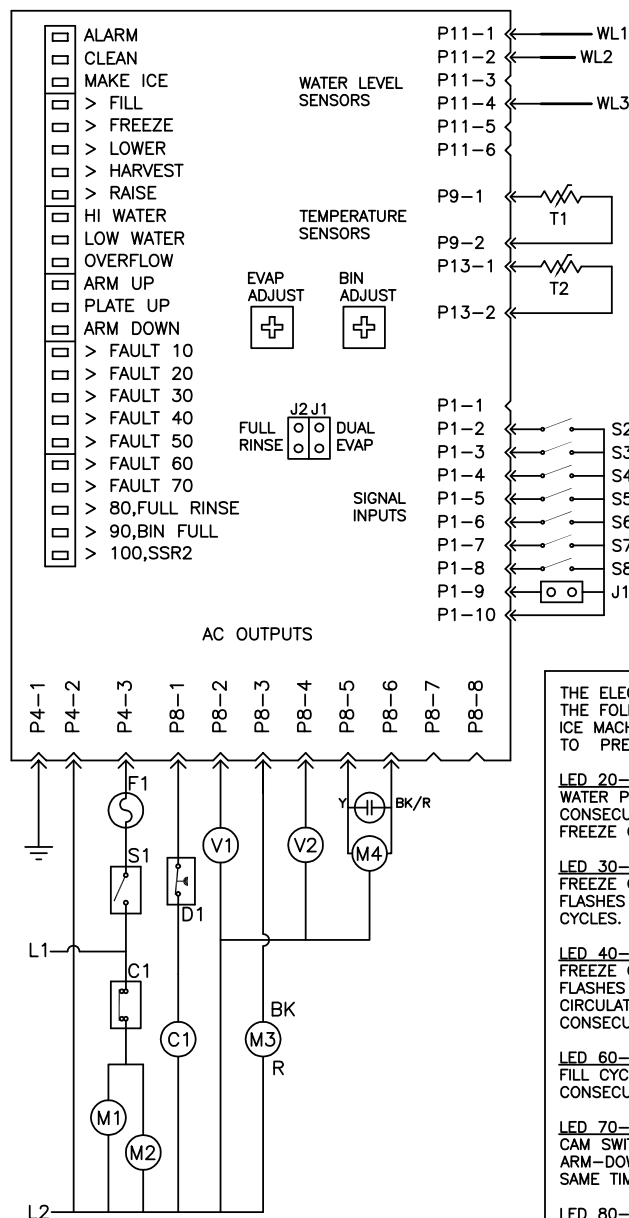
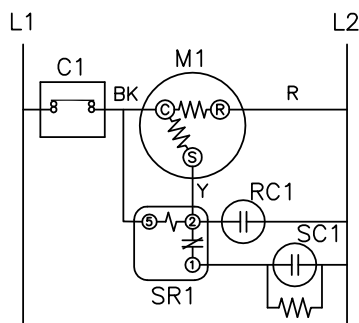
TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Water plate will not close after defrost.	Evaporator temperature probe is defective and not sensing warm evaporator temperature.	Test probe and replace if defective.
	Actuator motor output shaft is turning but front cam is not turning.	Cam pin is broken or missing.
	Actuator motor will not run. No voltage measured at actuator motor.	Inspect operation of arms up and arms down switches. Adjust or replace if defective.
	Actuator motor will not run. No voltage measured at actuator motor and controller output terminal.	Test controller and replace if defective.
	Actuator motor will not run. Voltage measured at actuator motor. Actuator motor or capacitor defective.	Replace defective actuator motor or capacitor. See actuator motor test procedure for additional information.
	Actuator motor overheated. Open thermal overload.	Let motor cool and determine why motor is running continuously.
Defrost does not initiate when water level drops below low water level probe.	Water level probe does not sense that the water level is low.	Be sure there is no continuity path between the probes through water or mineral deposits on the probe cap. Make sure the cap is clean and dry especially after cleaning the ice machine.
	Water level probes are OK but no voltage measured at the controller output terminals to the actuator motor, water valve or defrost valve.	Test controller and replace if defective.
Defrost cycle ends and water plate closes before all ice is out of the evaporator.	Evaporator temperature adjustment is set too cold and terminates defrost too early.	Adjust evaporator temperature adjustment counterclockwise (warmer) to extend defrost time.
	The evaporator temperature probe has poor contact with the evaporator and terminates defrost too early.	Be sure the evaporator temperature probe is fully inserted into the evaporator probe holder.
	Evaporator grids are distorted, slowing the fall of the ice from the evaporator.	Carefully straighten grids or replace evaporator if the damage is severe.

TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Defrost valve opens during water fill.	Slow water fill.	The water supply pressure must be a minimum of 5 PSI (34 KPA) dynamic at the water valve. Be sure that the supply line is of adequate size. This is especially important for liquid cooled models where the potable water and condenser coolant water are supplied by the same water line. Check for restrictions in the water supply line including clogged filters. Check the water line strainer and clean it if needed.
	Cold potable water supply.	This is normal operation of the unit, if the water supply is too cold. Very cold water will not rinse the ice residue from the water plate, causing it to build up and affect normal operation.
Ice remains attached to the water plate surface at the end of defrost.	Ice frozen into the water plate surface. Thick web between ice cubes.	Adjust web thickness to specifications.
	Ice frozen into the water plate surface. Cubes are fully formed without small dimples.	Reduce the water level until ice cubes are produced with small dimples.
	Over-freezing	Be sure that the control stream does not go over the dam for longer than 15 seconds.
	Cold potable water supply.	Very cold water will not rinse the ice residue from the water plate thoroughly.

TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Water valve will not close. Potable water level continues to rise after contacting the tip of the highwater level probe, during the fill cycle.	No voltage measured at water valve coil. Water valve remains open because of water supply problem.	The water supply pressure must be a minimum of 5 PSI (34 KPA) dynamic at the water valve. Be sure that the supply line is of adequate size. This is especially important for liquid cooled models where the potable water and condenser coolant water are supplied by the same water line. Check for restrictions in the water supply line including clogged filters. Check the water line strainer and clean it if needed.
	No voltage measured at water valve coil. Water valve remains open because of dirty or defective water valve.	Disassemble and clean water valve if needed. Make sure the bleed holes in the valve diaphragm are open. Replace water valve if defective.
	Line voltage measured at water valve coil.	Test for continuity through the high level probe and the reference probe. Replace the probe if the continuity is broken.
	Water level probes test OK, but line voltage measured at water valve coil.	Test controller and replace if defective.
Water valve will not open. Potable water level never reaches the highwater level reaches the highwater level probe, during the fill cycle.	No voltage measured at water valve coil because of an abnormal probe continuity path.	Be sure there is no continuity path between the probes through water or mineral deposits on probes through water or mineral deposits on the probe cap. Make sure the cap is clean and dry especially after cleaning the ice machine.
	Test controller and replace if defective. No voltage measured at water valve coil and controller output terminal because of defective controller.	Test controller and replace if defective.
	Water valve closes when water contacts the tip of the low water level probe, because the low and highwater level probes are reversed in the water level probe terminal plug.	Relocate and reinstall the probe wires, in the probe terminal plug or replace the water level probe set.

TROUBLE SHOOTING		
Problem	Possible Cause	Solution
Poorly formed or cloudy ice cubes.	Water plate pressure is low. Pump operating improperly because of low supply voltage.	Measure the supply voltage with the ice machine running. Be sure voltage is within the specified tolerances.
	Water plate pressure is low. Improper pump installed in ice machine.	Be sure the pump being used is proper for the ice machine model.
	Water plate pressure is low. Water plate is cracked or leaking	Repair or replace water plate.
	Ice cubes have large dimples or are hollow at the end of the freeze cycle.	Increase the water level until ice cubes are produced with small dimples.
	Water plate is out of alignment with evaporator.	Re-align water plate. See the water plate alignment illustration for more information
	Ice cubes do not break apart after defrost because of thick web between cubes.	Adjust spacing between evaporator and water plate. See the web thickness adjustment illustration for more information.
	Ice cubes have uneven dimples. Dimples are larger on right side of evaporator because of low refrigerant charge.	Remove refrigerant and recharge the system to specifications.
	Ice cubes have uneven dimples. Dimples are larger on right side of evaporator because of high evaporator superheat.	Adjust the expansion valve to decrease the evaporator superheat.
Actuator motor turns clockwise at start of defrost.	Ice cubes have uneven dimples. Dimples are larger on left side of evaporator and ice may freeze into the right side surface of the water plate because of low evaporator superheat.	Adjust the expansion valve to increase the evaporator superheat.
	Arms up and arms down switches are defective, or the relationship between the switches and switch operators is improper.	Confirm proper operation of the arms up and arms down switches and replace if needed. Confirm proper settings of the switch operators and adjust as required.
Cam arms are improperly positioned when the water plate is fully opened and/or closed.	Arms up and arms down switch wiring is incorrect.	Correct switch wiring.
	The relationship between the switches and switch operators is improper.	Adjust switch operators so the cam arms are at the 12 o'clock position when the water plate is fully closed and at the 7 o'clock position when the water plate is fully open. See the cam arm, switch and switch operator relationship illustration for more information.

ITEM	DESCRIPTION
C1	CONTACTOR
D1	HIGH PRESSURE CUT-OFF
F1	4A FASTBLOW FUSE
M1	COMPRESSOR
M2	CONDENSER FAN MOTOR (AIR COOLED)
M3	WATER PUMP
M4	ACTUATOR MOTOR
PS1	POWER SUPPLY
RC1	RUN CAPACITOR
S1	ON-OFF SWITCH
S2	ARMS UP SWITCH
S3	PLATE UP SWITCH
S4	ARMS DOWN SWITCH
S5	ICE-CLEAN SWITCH
SC1	START CAPACITOR
SR1	START RELAY
T1	EVAPORATOR THERMISTOR
T2	BIN THERMISTOR
V1	WATER VALVE
V2	DEFROST VALVE
V3	LIQUID LINE VALVE
WL1	WATER LEVEL PROBE-REFERENCE
WL2	WATER LEVEL SENSOR-HIGH
WL3	WATER LEVEL SENSOR-LOW



THE ELECTRONIC CONTROL WILL MONITOR FOR THE FOLLOWING CONDITIONS AND PREVENT THE ICE MACHINE FROM OPERATING AS REQUIRED TO PREVENT DAMAGE.

LED 20-
WATER PLATE HAS RE-OPENED 13 CONSECUTIVE TIMES WITHOUT STARTING A FREEZE CYCLE.

LED 30-
FREEZE CYCLE EXCEEDS 35 MINUTES. FLASHES AFTER 3 CONSECUTIVE 35-MINUTE CYCLES.

LED 40-
FREEZE CYCLE SHORTER THAN 5 MINUTES. FLASHES AFTER 3 CONSECUTIVE ATTEMPTS AND CIRCULATES WATER. SOLID AFTER 6 CONSECUTIVE ATTEMPTS.

LED 60-
FILL CYCLE EXCEEDS 3 MINUTES 3 CONSECUTIVE TIMES.

LED 70-
CAM SWITCH FAULT-BOTH ARM-UP AND ARM-DOWN SWITCHES ARE ENGAGED AT THE SAME TIME.

LED 80-
FULL RINSE ENABLED (NO JUMPER ON J2)

LED 90-
BIN FULL-BIN PROBE'S TEMPERATURE IS LESS THAN THE BIN ADJUST'S SETPOINT

Note: Code display will show one number, the zero part of the code will not show. Example: Code 20 will display as 2.

SCOTSMAN ICE SYSTEMS

101 Corporate Woods Parkway

Vernon Hills, IL 60061

800-726-8762

www.scotsman-ice.com