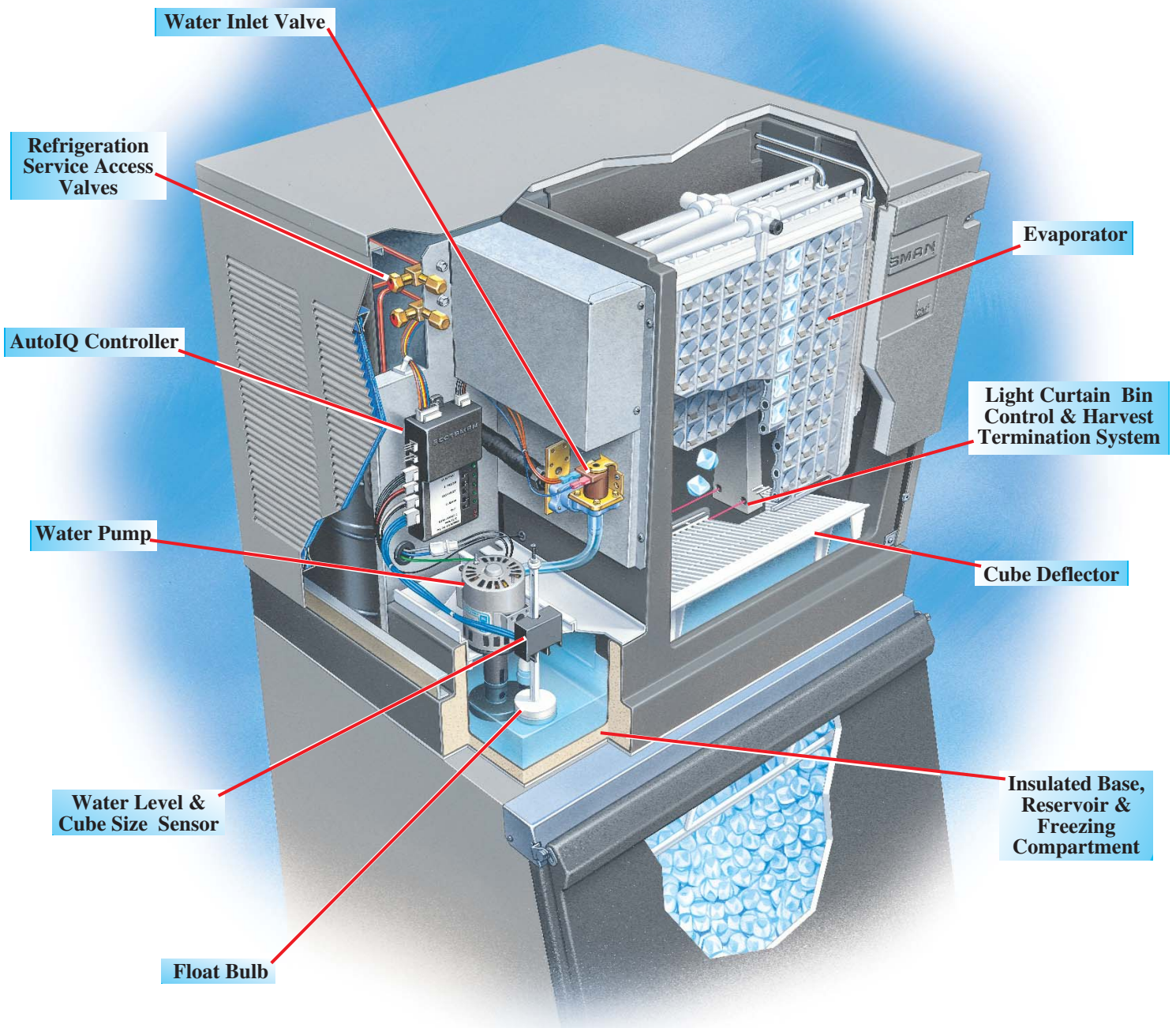
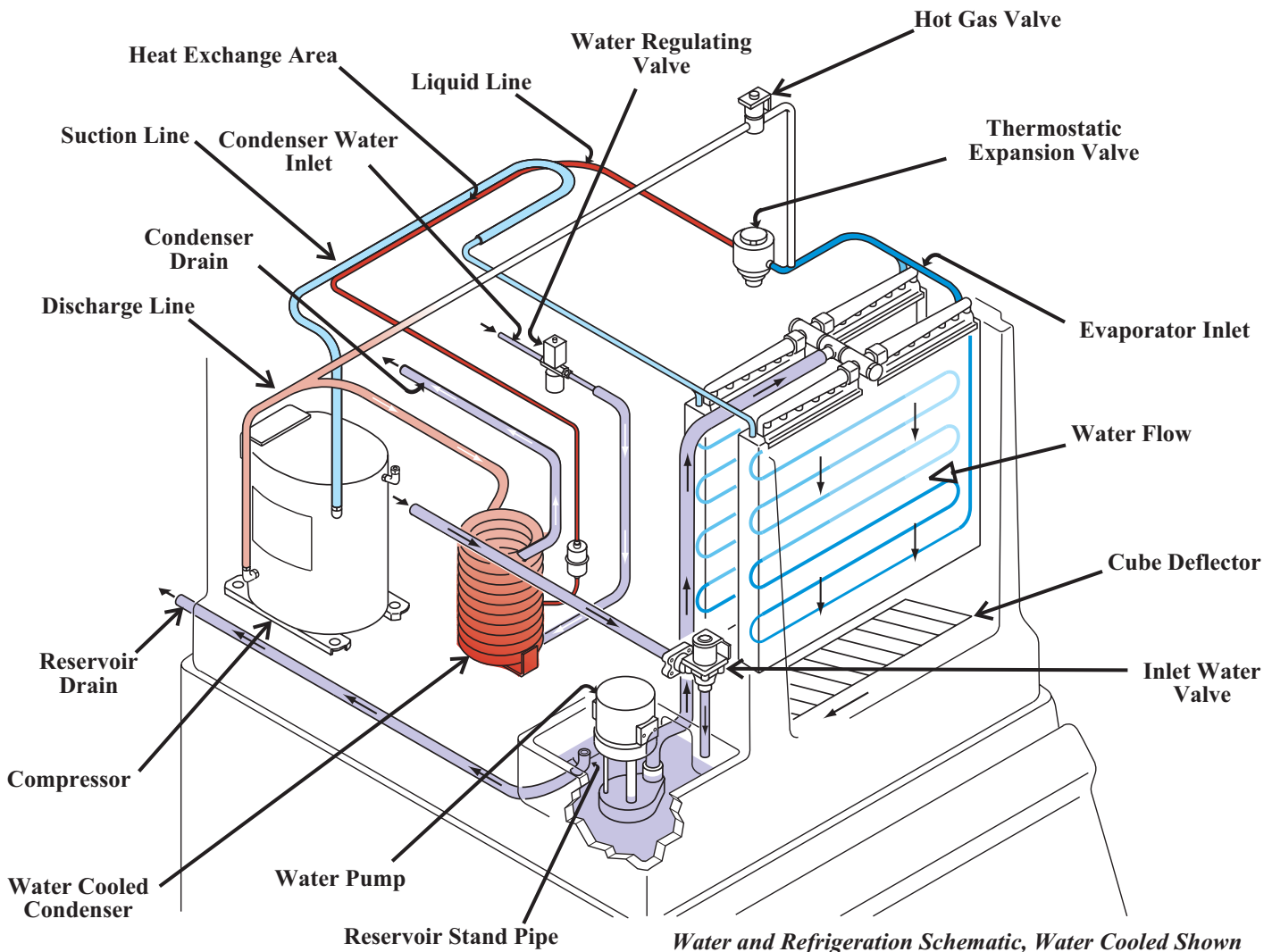


Scotsman®

Technical Review: The CM Cubed Ice System



Water & Refrigeration System

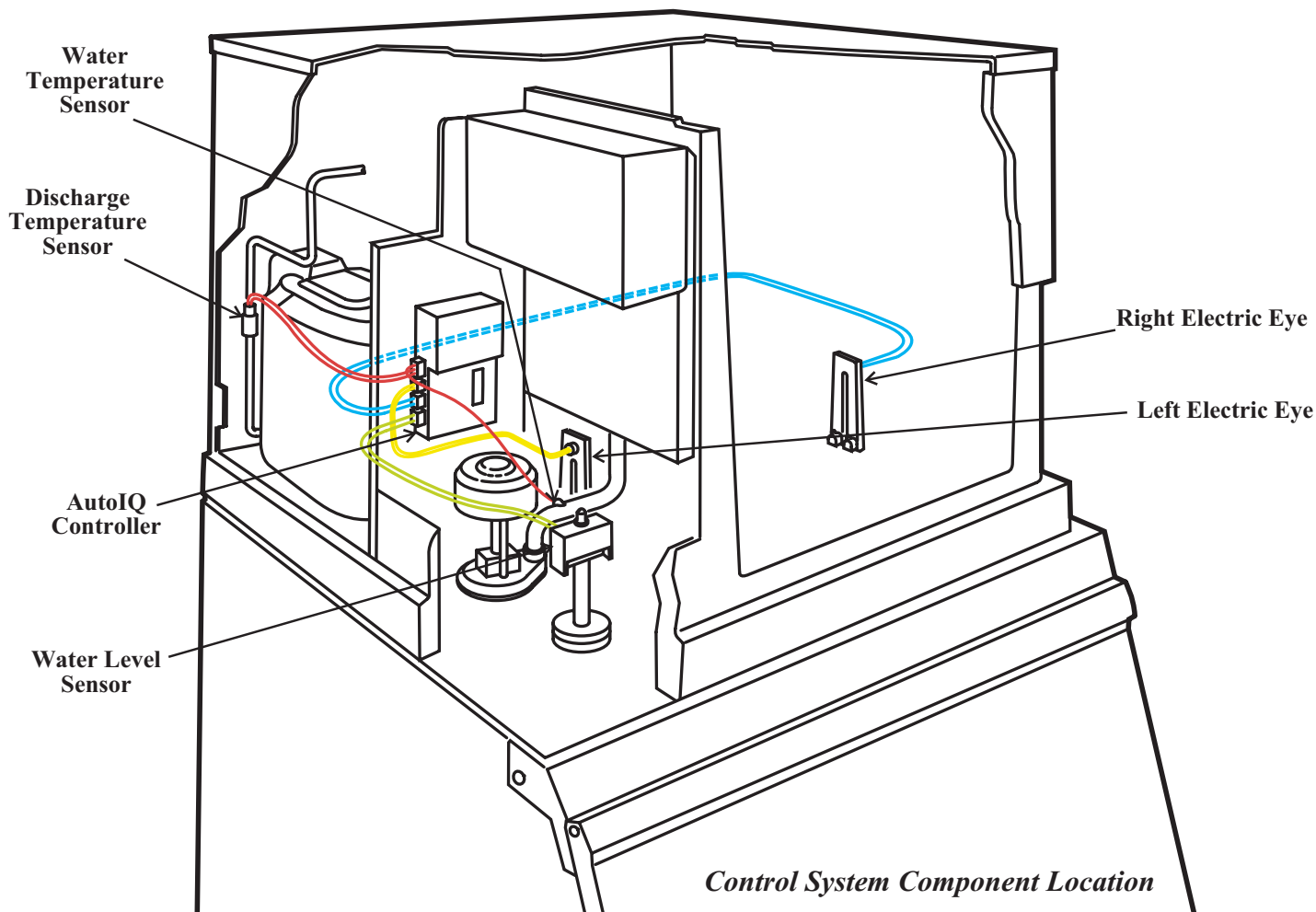


The CM³ water system takes in water in batches. In models CME256 through CME806 make up water flows through the inlet water valve into the reservoir during the first part of the harvest cycle. The reservoir fills up to the top of the stand pipe at the back, but water continues to flow in; excess water is rinsed out through the stand-pipe drain system.

Water fill is strictly controlled by the AutoIQ Controller to maintain a consistent amount of water flow in and out of the reservoir. The amount of time it takes to fill the reservoir is measured every cycle to determine the fill time needed to maintain the correct amount of water rinse.

As the R-404A refrigeration system removes the heat from the vertical evaporator, ice builds up causing the water level in the insulated reservoir to fall. A Thermostatic Expansion Valve is used to meter liquid refrigerant into the Evaporators. A Hot Gas Valve is used to by-pass the Condenser when the unit is in the harvest cycle. Water cooled models use a counter-flow system, in that type of system water enters the Condenser at the bottom, where the refrigerant is flowing out to the Thermostatic Expansion Valve.

Control System



The control system constantly monitors the ice machine's operation and environment. Using that information, changes are made to the system to compensate for changing operational conditions. One of those changes is the length of the harvest cycle.

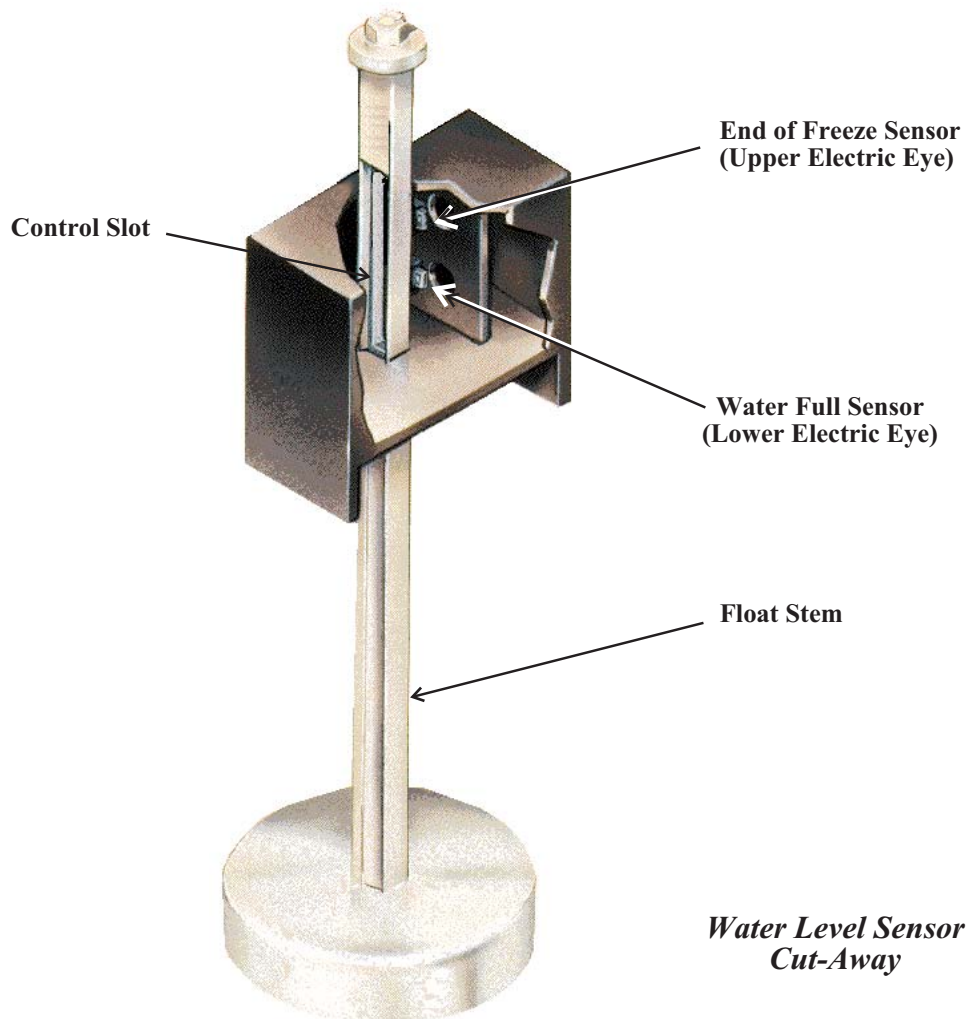
The ice machine's sensors measure compressor discharge temperature, reservoir water temperature, reservoir water level, and check for bin full or ice harvest.

The AutoIQ Controller uses the data from the sensors to determine and control: Reservoir fill time; how long to keep the fan off (in order to build up discharge pressure during harvest); when to start the harvest cycle, when to switch the machine On and Off; and how long the harvest cycle should be.

The AutoIQ Controller also responds to human input. The push button switches allow: adjustment of the amount of water purge; initiating the freeze, harvest or clean cycles; or switching the machine off.

Diagnostic indicator lights provide a servicer information on possible system malfunctions. The Refrigeration Light indicates problems such as: loss of charge, hot gas valve sticking, fan motor failure, TXV sticking, contactor/compressor open. The Water Light indicates water system problems such as: water pump failure, water valve sticking, or no water.

Water Level Sensor



The water level sensor provides the AutoIQ Controller with two important pieces of information.

1. **Cube size.** As the machine freezes ice, the water level sensor's top photo-electric eye receives infrared light through the open slot in the float stem. When the water falls far enough, the float stem's slot is too low to allow the light to pass, and the stem "breaks" the top electric eye beam. This signals the AutoIQ Controller to stop the freeze cycle and start the harvest cycle.

2. **Water fill.** When water flows into the reservoir, the float lifts the float stem. When the bottom electric eye beam is blocked by the solid plastic body of the float stem, the AutoIQ Controller knows that the reservoir is full. Water will continue to flow in for a pre-determined amount of time to overfill and rinse the reservoir.

AutoIQ Controller - Initial Start



Description

All lights blink once when power is re-supplied to an AutoIQ Controller that has been switched Off and disconnected (initial start up).

Pushing and releasing the Freeze button will start up the machine.

After there has been a power interruption, the AutoIQ Controller will Restart. During Restart, the Freeze light blinks and the machine goes into a short Freeze cycle. After that the unit goes through a complete harvest cycle and resumes normal operation.

AutoIQ Controller - Freeze Cycle



Description

When the unit is in the process of freezing ice, the Freeze cycle light will be on. The compressor, fan motor, and water pump will also be ON.

Under certain conditions, early in the freeze cycle, the water pump may stop for a short time and the inlet water valve will open to add a small amount of water.

AutoIQ Controller - Harvest Cycle



Description

When the unit is in the process of releasing the ice cubes, the Harvest cycle light will be on. The compressor and hot gas valve will be ON throughout the Harvest cycle. The inlet water valve and water pump will be on part of the time during the cycle.

As harvesting ice falls through the "light curtain" the Bin Full light will blink. When the bin becomes full, and the Bin Full light has been ON steadily for more than 20 seconds, all other components will switch off at the end of the current or next Harvest cycle.

The machine will not restart of 4 minutes after it has shut off on bin full.

AutoIQ Controller - Clean Cycle



Description

From an Off mode, pushing and releasing the Clean button places the machine in the beginning of a Clean cycle.

After adding the ice machine cleaner, the person cleaning the machine now has control of how long the ice machine cleaner circulates. After 10 minutes, pushing and releasing the Clean button again starts the rinse period of the clean cycle.

After about 20 minutes of rinsing, pushing and releasing the Off button stops the cleaning process and shuts the machine off, or the person cleaning the machine may push and release the Freeze button to stop the cleaning process and restart ice making.

AutoIQ Controller - Diagnostic Lights



Description

The Water Diagnostic light indicates a malfunction within the water system of the cuber.

When the Refrigeration Diagnostic light is ON it indicates a problem somewhere in the refrigeration system.

Either one will indicate additional information by the frequency of the light's blinking.

AutoIQ Controller - Adjust Purge



Description

1. Push and hold OFF button until machine shuts down.
2. Push and hold OFF button until all lights flash, then release it. Some or all of the green lights will be on.
3. The number of glowing green lights corresponds to the degree of purge. More lights on equals more purge water.
4. Adjust purge level by pushing and releasing the Freeze button to turn on more or fewer green lights.
5. The machine will reset to Off after 60 seconds of no further input or reset when the Off button is pushed and held in (for 3 seconds). After that, push and release the Freeze button to start normal operation.

Controller & Sensor Diagnostics

If the machine is Off and the	This could be the cause:
Water Diagnostic Light blinks once and repeats:	Water Pump not pumping
Water Diagnostic Light blinks twice and repeats:	Water does not fill reservoir fast enough
Water Diagnostic Light is on continuously	Rapid leak through of inlet water valve
Refrigeration Diagnostic Light blinks once and repeats:	The maximum harvest time limit was reached twice consecutively, some ice may have harvested
Refrigeration Diagnostic Light blinks twice and repeats:	The maximum harvest time limit was reached twice consecutively, no ice was sensed
Refrigeration Diagnostic Light blinks three times and repeats:	Discharge temperature too high
Refrigeration Diagnostic Light is on continuously - maximum freeze time limit has been exceeded	Loss of charge
	Plugged water distributors
	Hot gas valve stuck open
	Hot gas valve leaks thru
	TXV stuck open or closed; bulb not clamped securely
	Water cooled condenser regulating valve sticks open or closed
	Fan not turning (in low ambients)
	Compressor does not start
Bin Full Light is ON	Bin is full
	Ice sensors may be dirty
	Ice sensor failed or not seated properly
If the machine is ON and	This could be the cause:
Both Diagnostic Lights are on continuously, and the machine is still making ice:	Discharge or Water temperature sensor failure
The Refrigeration Diagnostic light is on continuously, and the machine is still making ice:	Water temperature not falling properly in the freeze cycle