



SECTION 4

THEORY OF OPERATION

OPERATING SYSTEMS

There are three operating systems in the ice maker:

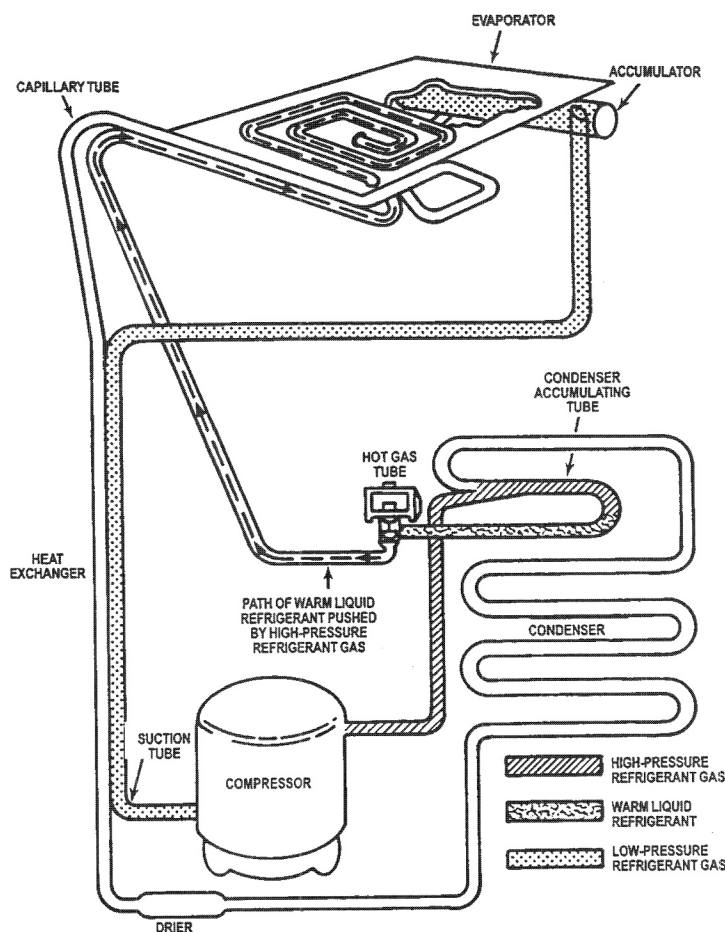
- Refrigeration System
- Water System
- Electrical System

Refrigeration System

The refrigeration system in the ice maker is very similar to the system used in other refrigeration appliances such as a refrigerator or freezer. The refrigerant used in this unit is R-134a.

There are two very important additions to the refrigeration system in the ice maker:

- **Hot Gas Valve** - This valve allows high pressure refrigerant gas to bypass the condenser and flow through the condenser accumulator tube.
- **Condenser Accumulator Tube** - the hot gas pushes liquid refrigerant in the accumulator tube into the evaporator, helping to evenly heat the evaporator plate so the ice slab releases quickly and evenly.

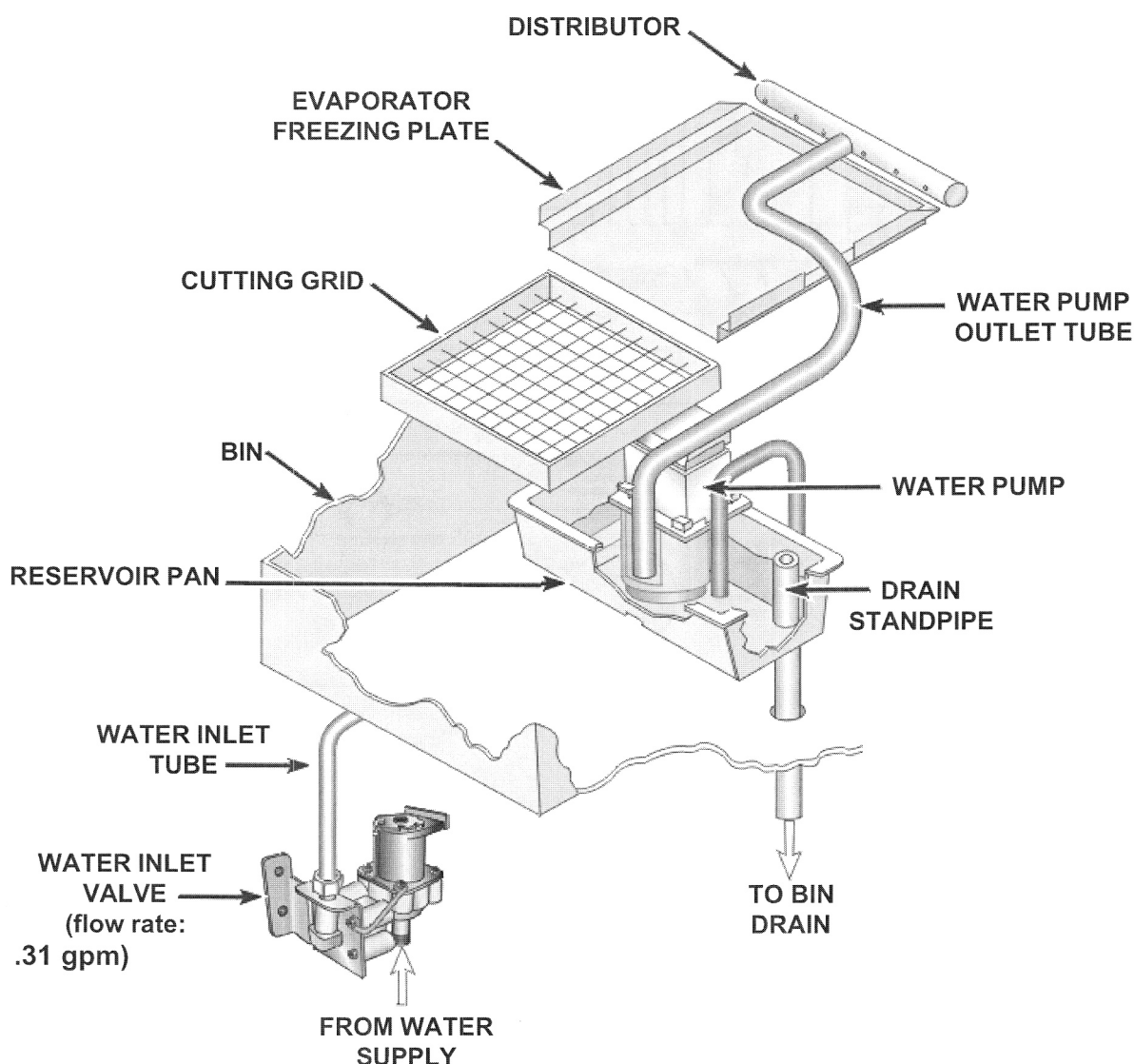


Water System

The water system provides the fresh water necessary for ice production and recycling this water as ice is produced. The water system also flushes away rejected minerals and contaminants, circulates cleaning solution during the CLEAN CYCLE and provides a means of drainage.

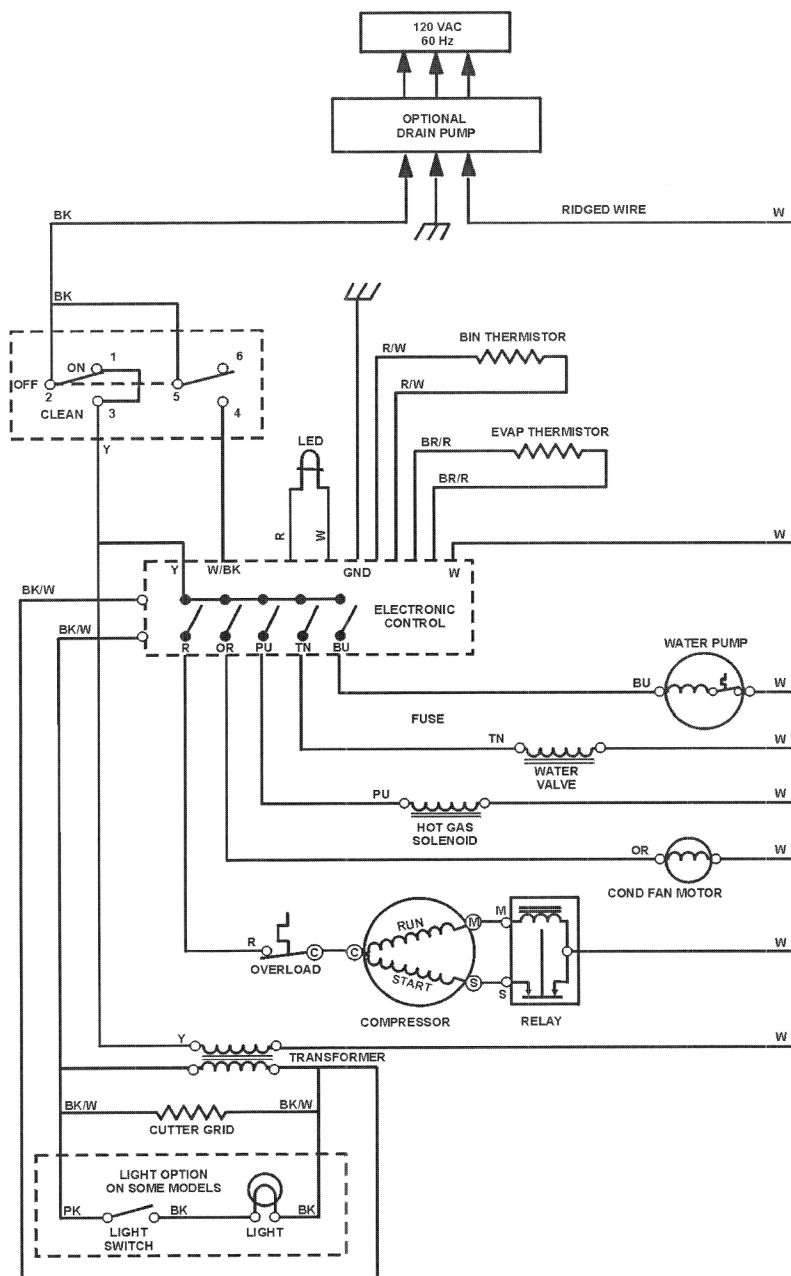
The hardness of the water supplied to the ice maker will affect the quality of the ice produced and may also affect the operation of the water system. (See the chart "WATER AND IT'S EFFECT ON ICE MAKING" later in this manual.)

A water softener or polyphosphate feeder will not cure all the problems associated with hard water, but they can be used to reduce scale buildup in the ice maker. **NOTE:** Some polyphosphate feeders will cause a slime buildup in the water system when the water supply has a low mineral content.



ELECTRICAL SYSTEM

The ice maker's electrical system provides power for the refrigeration and water systems to operate, and controls the operational cycling of the ice maker.



Wiring Diagram shows unit in Ice Making Mode



OPERATIONAL CYCLES

There are three operational cycles of the ice maker:

- **ICE MAKING CYCLE**
- **HARVEST CYCLE**
- **DIAGNOSTIC/CLEAN CYCLE**

In addition, there are two operational **OFF** cycles of the ice maker:

- **OFF CYCLE** when the bin is full of ice and the service control switch is turned "**ON**."
- **OFF CYCLE** when the bin is full and the service control switch is turned "**OFF**" while power is still supplied to the unit.

Ice Making Cycle

Electrical System

In the electrical system, power is supplied through the service control switches to the primary side of the voltage step down transformer (120VAC to 8.7VAC for the cutter grid and bin light) and the electronic control board. The electronic control board in turn supplies 120 VAC to the water pump, water inlet valve, hot gas solenoid, condenser fan motor and compressor.

Refrigeration System

In the refrigeration system, the hot gas refrigerant, under high pressure, is forced through the condenser into a liquid, and flows through the drier and capillary tube into the evaporator. Under low pressure in the evaporator, the liquid refrigerant absorbs heat from the water flowing over the evaporator. The refrigerant evaporates into a gas and passes into the accumulator. As a low-pressure gas, the refrigerant flows back through the heat exchanger and suction tube to the compressor.

During ICE MAKING cycle, some of the hot gas that is in the condenser accumulating tube condenses to a liquid and remains in the accumulating tube.

During the later stages of the ICE MAKING cycle, as the ice slab forms on the evaporator freezing plate, some of the refrigerant passing through the evaporator will not evaporate into a gas, but will remain a liquid. This liquid refrigerant will settle in the accumulator while the refrigerant vapor will be sucked off through the suction tube at the top of the accumulator. This accumulated liquid refrigerant will be evaporated eventually by the warmed refrigerant gas passing through the accumulator during the HARVEST cycle and during the beginning of the next ICE MAKING cycle.

NOTE: *It is very important the accumulator is not tilted out of a horizontal position.*

Water System

In the water system, the water pump moves the water from the reservoir pan up to the distributor, where it flows out over the evaporator freezing plate.

Water that does not freeze on the evaporator plate runs off the front edge and falls back into the reservoir, where it is recycled back to the distributor.

As the ice slab forms, the minerals in the water are on the surface of the ice. The water flowing over the top of the ice slab washes these minerals back into the water reservoir pan. The water continues to recycle until the ice slab reaches the desired thickness.

Harvest Cycle

Electrical System

In the electrical system, when the set temperature of the evaporator thermistor is reached, the evaporator thermistor terminates power to the fan and water pump, and supplies power to the hot gas valve solenoid and the water fill valve solenoid.

Refrigeration System

In the refrigeration system, the hot gas valve opens, allowing high pressure refrigerant gas to bypass the condenser and flow through the condenser accumulating tube. The hot gas pushes the liquid refrigerant that has accumulated in the accumulator tube up into the evaporator. The warmed liquid refrigerant helps to evenly heat the evaporator plate so the ice slab releases quickly and evenly.

The ice slab, when released, slides off of the evaporator plate onto the cutter grid, where it begins to be divided into individual cubes that fall into the bin.

Water System

In the water system, the water valve opens allowing water to flow into the water reservoir pan. As the reservoir fills, the mineral-laden water from the previous ICE MAKING cycle is flushed out to the drain.

When the evaporator temperature rises, because of the hot gas flow and because the ice slab has slid off, the evaporator thermistor switches the unit to the ICE MAKING cycle. This cycling, between the ICE MAKING cycle and the HARVEST cycle, continues until the ice bin is full.

Table 1-1 shows how the electronic control board controls the various components and systems in the ice maker for each of the **ICE MAKING CYCLE** and **HARVEST CYCLE**.

When the ice maker's service control switch is in the "ON" position, and the bin is not full of ice, the evaporator thermistor determines whether the unit will be in the **ICE MAKING CYCLE** or the **HARVEST CYCLE**.












SECONDS	ON CYCLE						
	POWER ON START UP ONLY			OPERATION			
	120	60	120	ICE MAKING	HARVEST	ICE BIN FULL	*ICE BIN NOT FULL
WATER VALVE				>6.5°F	<52°F	<35°F	>41°F
CONDENSER FAN							
HOT GAS VALVE							
WATER PUMP							
COMPRESSOR							

Table 1-1

Clean Cycle

Electrical System

In the electrical system, power is supplied to the water pump through the service control switch.

Water System

In the water system, the water pump circulates the cleaning solution that has been added to the reservoir up to the distributor, across the evaporator, and back into the reservoir where it is recirculated while the service control switch is in the "CLEAN" position.

Table 1-2 shows how the electronic control board controls the various components and systems during the **DIAGNOSTIC/CLEAN CYCLE**.

CLEAN CYCLE						
SECONDS	DIAGNOSTICS					CLEAN CYCLE 47 MINUTES
	5	5	5	5	5	
WATER VALVE	■					
CONDENSER FAN		■				
HOT GAS VALVE			■			■
WATER PUMP				■		■
COMPRESSOR					■	■
LED	■	■	■	■	■	■

The first 25 seconds of this cycle will operate each one of the electrical components for five (5) seconds each.

Table 1-2