Ice-O-Matic®

SERVICE MANUAL
ICE UNDERCOUNTER SERIES CUBER

MODEL

ICEU 035

Rev. 05/2010

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FIG. A

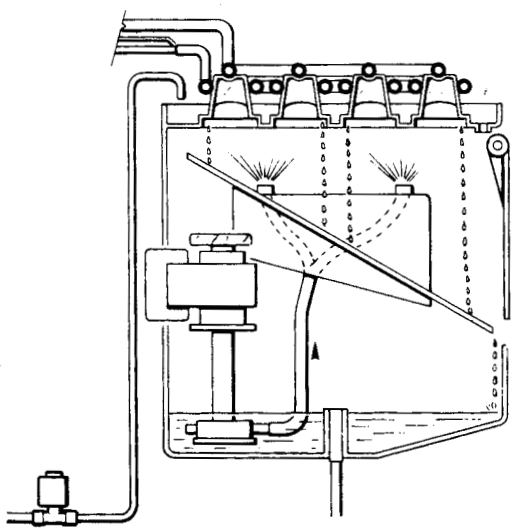


FIG. B

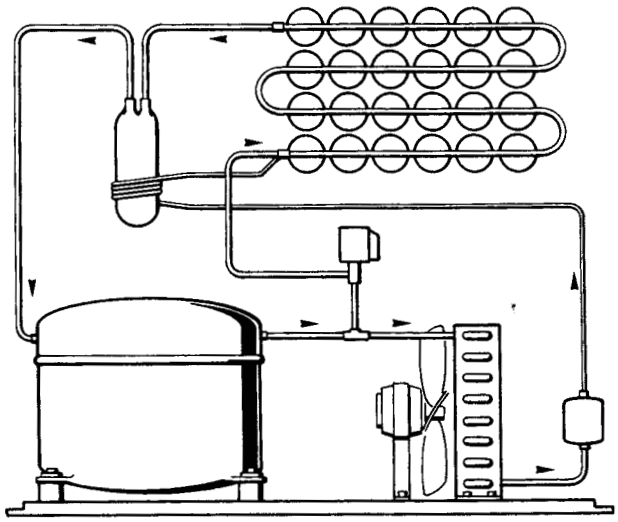


FIG. C

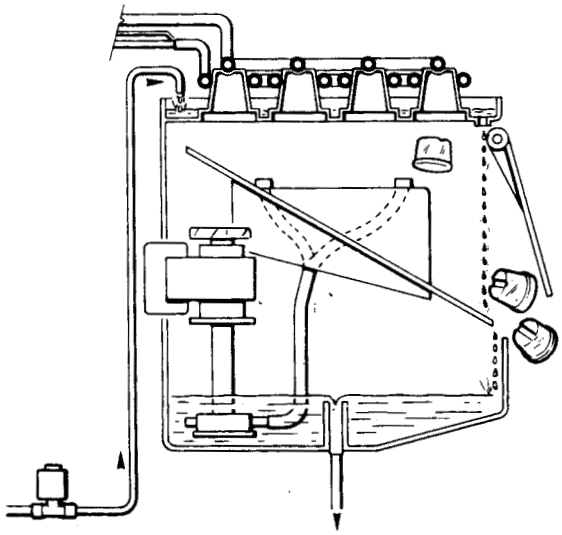
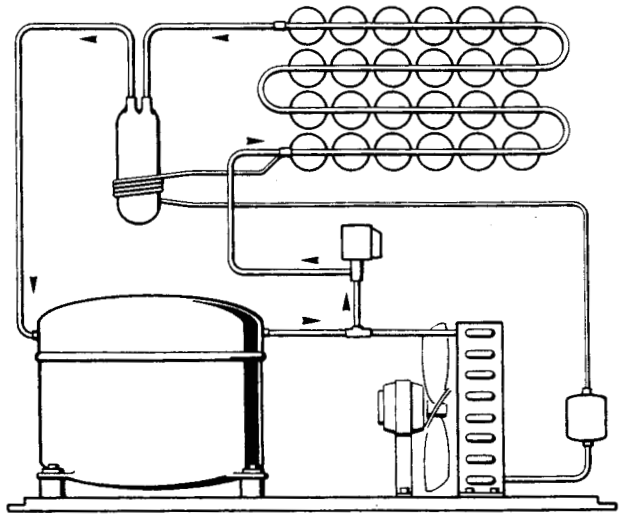


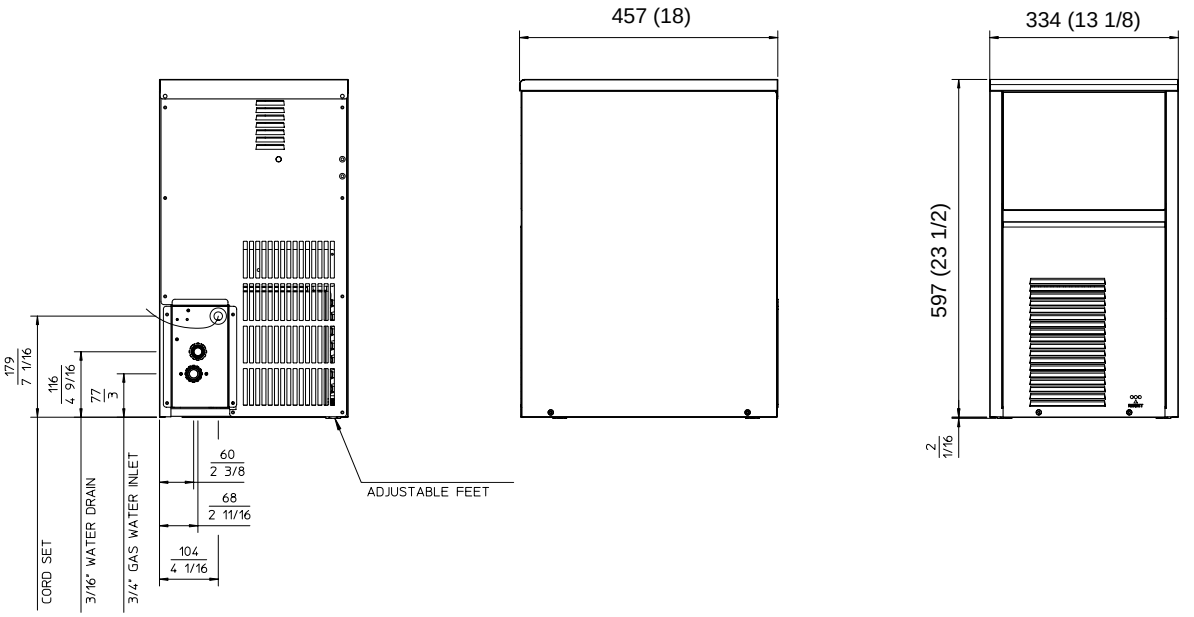
FIG.D



TECHNICAL SPECIFICATIONS

	18A	18W
Electric voltage	230/50/1 -10 ÷ +10%	
Condensation	Air	Water
Bin capacity (kg)	6,5	
Net weight (kg)	30	
Cubes per cycle	15	
Compressor power HP	1/5	
Running amps	2,2	
Start amps	9	
Power (Watts)	310	
Power cons. in 24 hrs (Kwh)	N/A	
Wire size (mm^2)	3 x 1,5	
Water consumption (lt/hr)	N/A	
Refrig. charge R 134 A (gr)	N/A	
Refrigerant metering device	Capillary tube	

Water: 15°C (60°F)



OPERATING PRESSURES

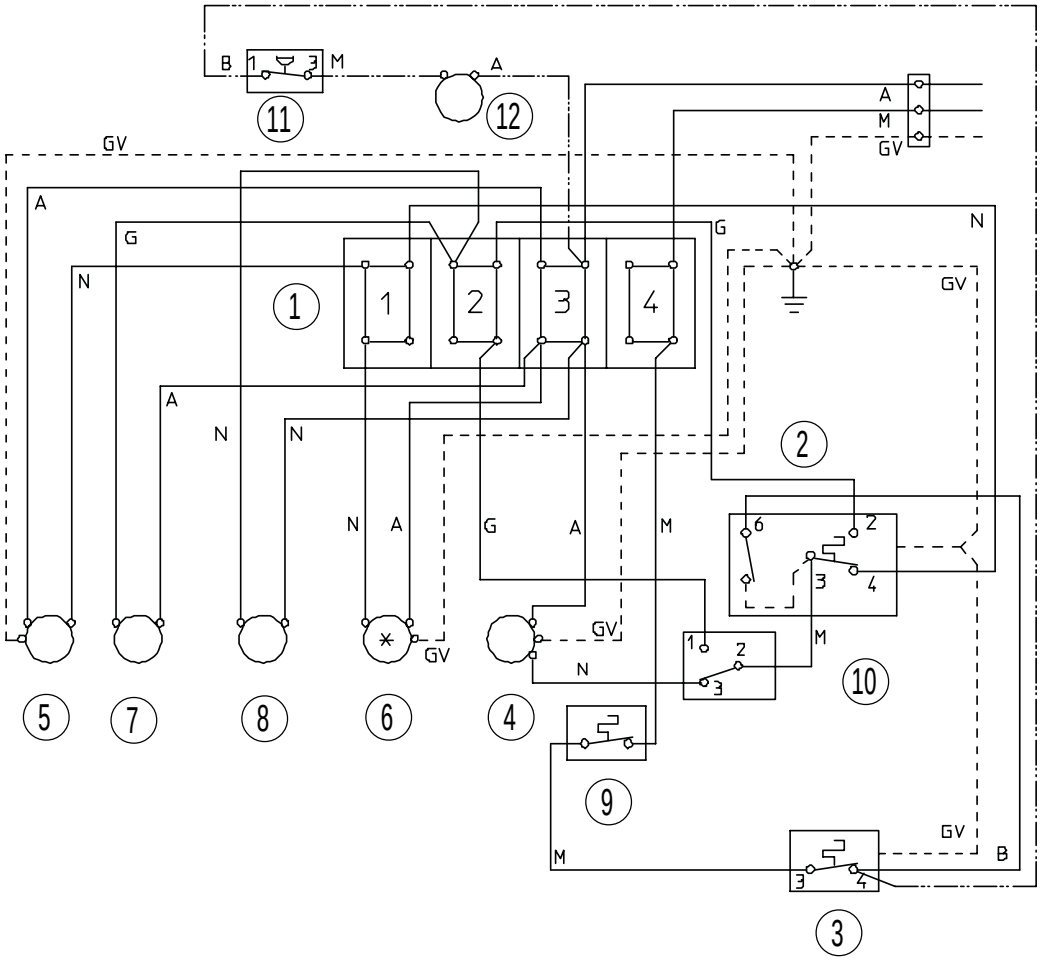
	Discharge pressure	Suction pressure
	Freezing cycle	End of freezing cycle
Air cooled	7÷11 bar 100÷155 psig	0÷0.1 bar 0÷1.5 psig
Water cooled	8.5÷10 bar 120÷140 psig	0÷0.1 bar 0÷1.5 psig

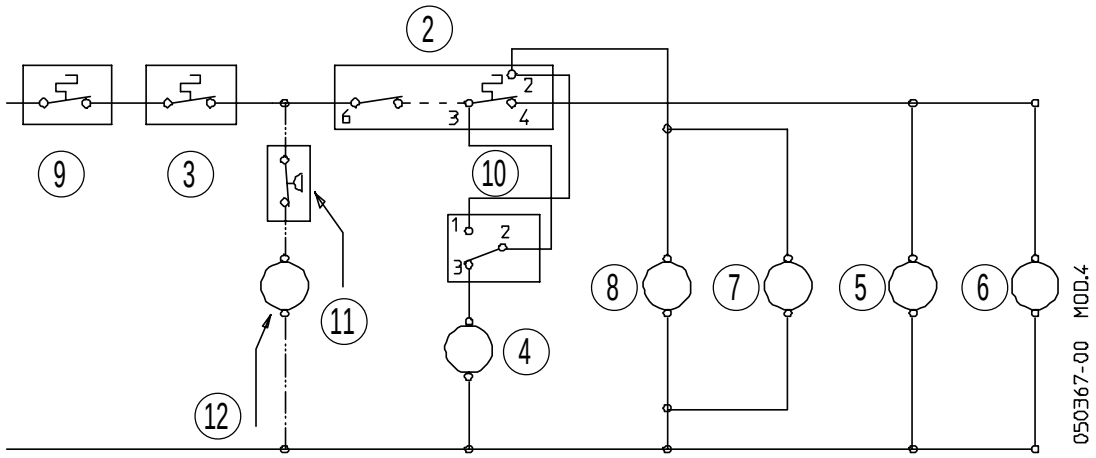
WIRING DIAGRAM

AIR & WATER COOLED

230/50-60/1

B - WHITE
N - BLACK
A - BLUE
M - BROWN
GV - YELLOW GREEN





(A) JUST FOR WATER COOLED UNIT

(B) JUST FOR AIR COOLED UNIT

1 TERMINAL BOARD
2 EVAPORATOR THERMOSTAT
3 BIN THERMOSTAT
4 COMPRESSOR
5 WATER PUMP
6 FAN MOTOR
7 WATER SOL. VALVE
8 HOT. GAS VALVE
9 HI TEMP. THERMOSTAT
10 FILLING SWITCH
11 PRESSURE CTRL
12 COND. WATER SOL. VALVE

GENERAL INFORMATION AND INSTALLATION

A. INTRODUCTION

This Cuber is quality designed, engineered and manufactured.
Its ice making system is thoroughly tested providing the utmost in flexibility to fit the needs of a particular user.
This ice maker has been engineered to our own rigid safety and performence standards.

NOTE. *To retain the safety and performance built into this icemaker, it is important that installation and maintenance be conducted in the manner outlined in this manual.*

B. UNPACKING AND INSPECTION

1. Visually inspect the exterior of the packing and skid. Any severe damage noted should be reported to the delivering carrier and a concealed damage claim form filled in subjet to inspection of the contents with the carrier's representative present.

2. a) Cut and remove the plastic strip securing the carton box to the skid.

b) Cut open the top of the carton and remove the polystyre protection sheet.

c) Pull out the polystyre posts from the corners and then remove the carton.

3. Remove the front and the rear panels of the unit and inspect for any concealed damage. Notify carrier of your claim for the concealed damage as stated in step 1 above.

4. Open the bin door and remove all internal support packing and masking tape.

5. Check that refrigerant lines do not rub against or touch other lines or surfaces, and that the fan blade moves freely.

6. Use clean damp cloth to wipe the surfaces inside the storage bin and the outside of the cabinet.

7. See data plate on the rear side of the unit and check that local main voltage corresponds with the voltage specified on it.

CAUTION. **Incorrect voltage supplied to the icemaker will void your parts replacement program.**

8. Remove the manufacturer's registration card from the inside of the User Manual and fill-in all parts including: Model and Serial Number taken from the data plate.
Forward the completed self-addressed registration card to the factory.

C. LOCATION AND LEVELLING

WARNING. This Ice Cuber is designed for indoor installation only. Extended periods of operation at temperatures exceeding the following limitations will constitute misuse under the terms of the Manufacturer's Limited Warranty resulting in LOSS of warranty coverage.

1. Position the unit in the selected permanent location.
Criteria for selection of location include:

a) Minimum room temperature 10°C (50°F) and maximum room temperature 40°C (100°F).

b) Water inlet temperatures: minimum 5°C (40°F) and maximum 35°C (90°F).

c) Well ventilated location for air cooled models. Clean the air cooled condenser at frequent intervals.

d) Service access: adequate space must be left for all service connections through the rear of the ice maker. A minimum clearance of 15 cm (6") must be left at the sides of the unit for routing cooling air drawn into and exhausted out of the compartment to maintain proper condensing operation of air cooled models.

NOTE. *With the unit in "built-in" conditions, the ice production is gradually reduced in respect to the levels shown in the graph, up to a maximum of 10% at room temperatures higher than 32°C.*

The daily ice-making capacity is directly related to the condenser air inlet temperature, water temperature and age of the machine.

*To keep your **CUBER** at peak performance levels, periodic maintenance checks must be carried out as indicated on Cleaning Section of this manual.*

2. Level the unit in both the left to right and front to rear directions.

D. ELECTRICAL CONNECTIONS

See data plate for current requirements to determine wire size to be used on electrical connections. All icemakers require **a solid earth wire.**
The ice machine is supplied from the factory completely pre-wired and require only electrical power connections to wire cord provided on the back of the unit.
Make sure that the ice machine is connected to its own circuit and individually fused (see data plate for fuse size).
The maximum allowable voltage variation should not exceed -10% and +10% of the data plate rating. Low voltage can cause faulty functioning and may be responsible for serious damage to the overload switch and motor windings.

NOTE. *All external wiring should conform to national, state and local standards and regulations.*
Check voltage on the line and the ice maker's data plate before connecting the unit.

E. WATER SUPPLY AND DRAIN CONNECTIONS

General

When choosing the water supply for the ice cuber consideration should be given to:

a) Length of run
b) Water clarity and purity
c) Adequate water supply pressure

Since water is the most important single ingredient in producting ice you cannot emphasize too much the three items listed above.
Low water pressure, below 1 bar may cause malfunction of the ice maker unit.
Water containing excessive minerals will tend to produce cloudy coloured ice cubes, plus scale built-up on parts of the water system.

Water supply

Connect the 3/4" male fitting of the solenoid water inlet valve, using the flexible hose supplied, to the cold water supply line with regular plumbing fitting and a shut-off valve installed in an accessible position between the water supply line and the unit.

Water drain

The recommended drain tube is a plastic or flexible tube with 18 mm (3/4") I.D. runs to an open trapped and vented drain. When the drain is a long run, allow 3 cm pitch per meter (1/4" pitch per foot).

A vertical open vent, at the unit drain connection, is also required for proper sump drainage.

NOTE. *The water supply and the water drain must be installed to conform with the local code. In some case a licensed plumber and/ or a plumbing permit is required.*

F. FINAL CHECK LIST

1. Is the unit in a room where ambient temperatures are within a minimum of 10°C (50°F) even in winter months?

2. Is there at least a 15 cm (6") clearance around the unit for proper air circulation?

3. Is the unit level? (IMPORTANT)

4. Have all the electrical and plumbing connections been made, and is the water supply shut-off valve open?

5. Has the voltage been tested and checked against the data plate rating?

6. Has the water supply pressure been checked to ensure a water pressure of at least 1 bar (14 psi).

7. Check all refrigerant lines and conduit lines to guard against vibrations and possible failure.

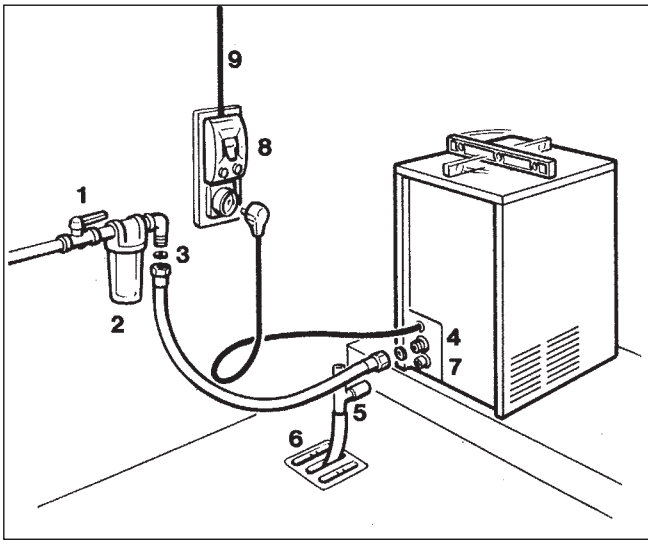
8. Have the bin liner and cabinet been wiped clean?

9. Has the owner/user been given the User Manual and been instructed on the importance of periodic maintenance checks?

10. Has the Manufacturer's registration card been filled in properly? Check for correct model and serial number against the serial plate and mail the registration card to the factory.

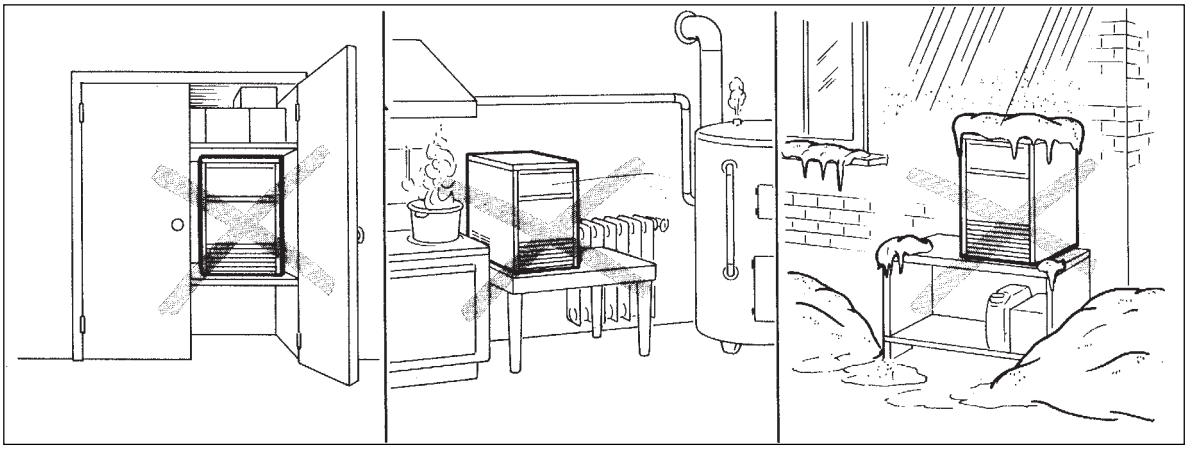
11. Has the owner been given the name and the phone number of the authorized Service Agency serving him?

G. INSTALLATION PRACTICE



1. Hand shut-off valve
2. Water filter
3. Water supply line (flexible hose)
4. 3/4" male fitting
5. Vented drain
6. Open trapped vented drain
7. Drain fitting
8. Main switch
9. Power line

WARNING. This icemaker is not designed for outdoor installation and will not function in ambient temperatures below 10°C (50°F) or above 40°C (100°F).
This icemaker will malfunction with water temperatures below 5°C (40°F) or above 35°C (90°F).



OPERATING INSTRUCTIONS

START UP

After having correctly installed the ice maker and completed the plumbing and electrical connections, perform the following "Start-up" procedure.

A. Remove the unit front panel and locate the cleaning switch on the control box.

B. Set the cleaning switch in the cleaning position (II). This will close the electrical circuit to the water inlet valve and to the hot gas valve.

C. Switch ON the power line disconnect switch. Unit will start up in water filling phase mode.
During this phase the components energized are:

WATER INLET SOLENOID VALVE

HOT GAS SOLENOID VALVE

The **Water pump** and the **Fan motor** are also in operation.

D. Let unit stay in water filling phase mode for about three/four minutes till water is coming out from the drain hose, then move the cleaning switch to the operation position (I).

NOTE. *During the defrost cycle, the water inlet solenoid valve is energized. The water flows through the valve to the back side of the evaporator platen and then down to fill up the icemaker sump tank for the next freezing cycle.*

OPERATIONAL CHECKS

A. The unit now starts its first freezing cycle with the following components in operation:

COMPRESSOR

WATER PUMP

FAN MOTOR in air cooled version

B. Check to see through the ice discharge opening that the spray system is correctly seated and that the water jets uniformely reach the interior of the inverted cup molds; also make sure that the plastic curtain is hanging freely and there is not excessive water spilling through it.

C. The ice making process takes place thereby, with the water sprayed into the molds that gets gradually refrigerated by the heat exchanged with the refrigerant flowing into the evaporator serpentine.

D. When the evaporator temperature reaches a preset value the evaporator thermostat or cube size control changes its contacts; the freezing cycle ends and starts the defrost or harvest cycle.

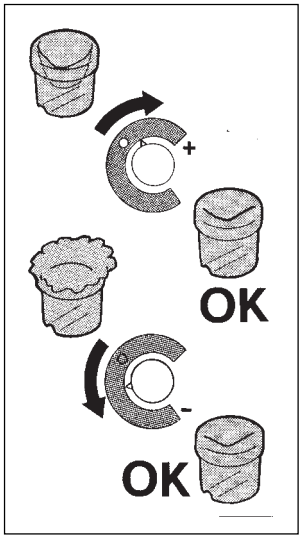
E. Check, during the first defrost/harvest cycle, that the incoming water flows correctly into the sump reservoir in order to re-fill it and the surplus overflows through the overflow drain tube.

F. Check the texture of ice cubes just released. Right size must have a small depression (about 5-6 mm) in their crown.
If not, wait for the second defrost/harvest cycle before performing any adjustment.

G. If required the length of the freezing cycle can be modified by turning the knob of the cube size control or evaporator thermostat located in front of the control box until the desired size is achieved.

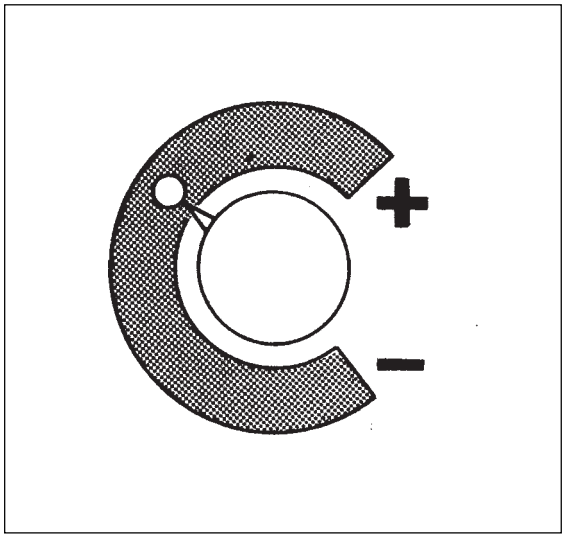
• If the temperature of the room in which the machine is place is below 20°C, the cubes will tend to be partly hollowed out (see fig. on right).

• If, on the other hand, the room temperature is above 30°C the cubes produced will have a jagged rim of ice around the crown.



If it is thought necessary, the above situations can be rectified by, in the first case, turning the control knob (as little or as much as is required) clockwise and, in the second case, turning the knob to the right counterclockwise.

It should, however, be remembered that if the room temperature returns later to the 20 ÷ 30°C range, the knob indicator must once again be turned to point to the dot (see fig. below).



If the ice cubes are shallow and cloudy, it is possible that the ice maker runs short of water during the end of the freezing cycle or, the quality of the supplied water requires the use of an appropriate water filter or conditioner.

H. At the end of the defrost or harvest cycle hold a handful of ice cubes against the bulb of the storage bin thermostat; the icemaker switch OFF in about one-two minutes.
Take out the ice from the storage bin thermostat. The ice maker should restart automatically in three-four minutes.

NOTE. *The bin thermostat is factory set at 1°C (35°F) OUT and 4°C (39°F) IN.*

I. Re-fit the unit front panel then instruct the owner/user on the general operation of the ice machine and about the cleaning and care it requires.

PRINCIPLE OF OPERATION

How it works

In the ice makers the water used to make the ice is kept constantly in circulation by a water pump which primes it to the spray system nozzles from where it is diverted into the inverted cup molds of the evaporator (Fig. A).
A small quantity of the sprayed water freezes into ice; the rest of it cascades by gravity into the sump assembly below for recirculation.

FREEZING CYCLE (Fig. B)

The hot gas refrigerant discharged out from the compressor reaches the condenser where, being cooled down, condenses into liquid. Flowing into the liquid line it passes through the drier/filter, then it goes all the way through the capillary tube where it looses its pressure.
Next the refrigerant enters into the evaporator serpentine (which has a larger diameter then the capillary tube) and starts to boil off; this reaction is emphasized by the heat transferred by the sprayed water.
The refrigerant then increases in volume and changes entirely into vapor.
The vapor refrigerant then passes through the suction accumulator (used to prevent that any small amount of liquid refrigerant may reach the compressor) and through the suction line. In both the accumulator and the suction line it exchanges heat with the refrigerant flowing into the capillary tube (warmer), before to be sucked in the compressor and to be recirculated as hot compressed refrigerant gas.
The freezing cycle is controlled by only the evaporator thermostat which has its bulb in contact with the evaporator serpentine.

The electrical components in operation during the freezing cycle are:

COMPRESSOR

WATER PUMP

FAN MOTOR (in air cooled version)

On air cooled versions the refrigerant head pressure is gradually reduced from a value of approx. **11 bars (155 psig)** at the beginning of the freezing cycle with the unit at 21°C (70°F) ambient temperature, to a minimun value of approx. **7 bars (100 psig)** just at the end of the freezing cycle few seconds before the starting of the defrost cycle.
The declining of the pressure is relied to the reduction of the evaporating pressure, caused by the progressive growth of the ice thickness into the inverted cup molds and to the flow of air drown through the air cooled condenser by the fan motor. The above values are in relation as well to the ambient temperature of the ice maker site and they are subject to rise with the increase of this temperature.

On water cooled versions the refrigerant head pressure ranges between **8.5 and 10 bars (120÷140 psig)** being controlled by an automatic hi pressure control that energizes a water solenoid valve located on the water line to the condenser, which rates the cooling water to the condenser.

At starting of freezing cycle the refrigerant suction or lo-pressure lowers rapidly to **1.0 bar - 14 psig** then it declines gradually - in relation with the growing of the ice thickness - to reach, at the end of the cycle, approx. **0÷0.1 bar - 0÷1.5 psig**.
The total length of the freezing cycle ranges from 23 to 25 minutes.

DEFROST OR HARVEST CYCLE (Fig. D)

The temperature of the evaporator thermostat, in contact with the evaporator serpentine, drops to a pre-set value it changes its electrical contacts energizing the herebelow shown components.

COMPRESSOR

WATER INLET SOLENOID VALVE

HOT GAS SOLENOID VALVE

The incoming water, passing through the water inlet valve and the flow control, runs over the evaporator platen and then flows by gravity through the dribbler holes down into the sump/ reservoir (Fig. C).
The water filling the sump/reservoir forces part of the surplus water from the previous freezing cycle to go out to the waste through the overflow pipe. This overflow limits the level of the sump water which will be used to produce the next batch of ice cubes.
Meanwhile the refrigerant, as hot gas discharged from the compressor, flows through the hot gas valve directly into the evaporator serpentine by-passing the condenser.
The hot gas circulating into the serpentine of the evaporator warms up the copper molds causing the harvest of the ice cubes. The ice cubes, released from the cups, drop by gravity onto a slanted cube chute, then through a curtained opening they fall into the storage bin.
When the temperature of the evaporator thermostat bulb reaches the value of +3÷4°C their electrical contacts move back to the previous position activating a new freezing cycle and deenergizing both the hot gas and the water inlet valves (closed).

***NOTE**. The length of the defrost/harvest cycle (not adjustable) changes according to the ambient temperature (shorter for hi ambient temperature and longer for low one).*

COMPONENTS DESCRIPTION

A. WATER PUMP

The water pump operates continually throughout the freezing cycle. The pump primes the water from the sump to the spray system and through the spray nozzles sprays it into the inverted cup molds to be frozen into crystal clear ice cubes.

B. WATER INLET SOLENOID VALVE - 3/4 MALE FITTING

The water inlet solenoid valve is energized only during the defrost cycle.
When energized it allows a metered amount of incoming water to flow over the evaporator cavity to assist the hot gas in defrosting the ice cubes. The water running over the evaporator cavity drops by gravity, through the dribbler holes of the platen, into the sump reservoir.
On water cooled versions the water inlet solenoid valve has one inlet and two outlets with two separate solenoids energized the first (ice productioon) by the contacts 3-2 of the evaporator thermostat and the second (water cooled condenser) by a specific hi pressure control.

C. HOT GAS SOLENOID VALVE

The hot gas solenoid valve consists basically in two parts: the valve body and the valve coil.
During the defrost cycle the hot gas valve coil is activated so to attract the hot gas valve piston in order to give way to the hot gas discharged from compressor to flow directly into the evaporator serpentine to defrost the formed ice cubes.

D. BIN THERMOSTAT

The bin thermostat control body is located in the front of control box behind the front panel.
The thermostat sensing tube is located into a bulb holder on the side wall of the ice storage bin where it automatically shuts the icemaker OFF when in contact with the ice and re-starts the icemaker when the ice is removed. Factory settings are 1°C (35°F) OUT and 4°C (39°F) IN.

E. CUBE SIZE CONTROL (EVAPORATOR THERMOSTAT)

The cube size control (evaporator thermostat) body is located in the control box behind the front panel; it's basically a reverse acting temperature control which closes the contacts 3-2 when its temperature decreases and closes the opposite contacts 3-4 when the temperature rises.
The thermostat sensing bulb is located into a plastic tube (bulb holder) secured by two clips directly to the evaporator serpentine.
This control determines the length of the freezing cycle and correspondingly the size of the cubes. A lower setting will produce a larger cube (oversize) while a higher setting a smaller cuber (shallow size).
When closed on contacts 3-2 it activates the defrost or harvest cycle components.
The cube size control is set up in the factory (knob in the black dot position) and doesn't require any adjustment when the ambient temperature remains between 20 and 30°C (70 and 90°F).

F. FAN MOTOR (Air cooled version)

The fan motor is electrically connected in parallel to the water pump and it operates continuously only during the freezing cycle keeping the proper head pressure by circulating air through the condenser fins.

G. COMPRESSOR

The hermetic compressor is the heart of the refrigerant system and it is used to circulate and retrieve the refrigerant throughout the entire system. It compresses the low pressure refrigerant vapor causing its temperature to rise and become high pressure hot vapor (hot gas) which is then released through the discharge valve.

H. WATER SPRAY SYSTEM

Through its nozzles it sprays the water in each individual cup to be frozen into ice.

I. SAFETY HI TEMPERATURE THERMOSTAT

Located in the control box it is a manual reset switch that trips OFF the operation of the machine when its bulb (located on the liquid line just before the drier) reaches the temperature of 70°C (158°F).

J. CLEANING SWITCH

Located on the bottom left side of the control box is used to energize the water inlet and the hot gas valves so to charge the water into the sump tank of the machine.

K. HI PRESSURE CONTROL (Water cooled version)

Used only on water cooled versions it operates to keep between 8.5 and 10 bars (120 ÷ 140 psig) the hi-side or discharge pressure of the refrigerant system by energizing the coil of the water inlet solenoid valve that control the cooling water flow to the condenser.

MAINTENANCE AND CLEANING INSTRUCTIONS

CLEANING INSTRUCTIONS OF WATER SYSTEM

1. Remove the front and top panels to gain access either to the control box and to the evaporator.

2. Make sure that all ice cubes have been released from their cups, then switch OFF the machine at main power switch.

3. Scoop out all the ice cubes stored into the bin in order to prevent them from being contaminated with the cleaning solution.

4. Remove the plastic cup located on the bottom of sump/freezing chamber to drain out all water and scale deposits.

5. Remove the curtain then, using a bottle, poor fresh water into the bottom of the sump/ freezing chamber to clean out any possible scale deposit.

6. Install again the curtain as well as the bottom plastic cup.

7. On all other models, flush out the water from the sump reservoir by removing the overflow stand pipe.

8. Prepare the cleaning solution by diluting in a plastic container one or two liters of warm water (45°-50°C) with a 0,1-0,2 liters of Ice Machine Cleaner.

WARNING. The Ice Machine Cleaner contains Phosphoric and Hydroxyacetic acids.
These compounds are corrosive and may cause burns if swallowed, DO NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately.
In case of external contact flush with water. KEEP OUT OF THE REACH OF CHILDREN.

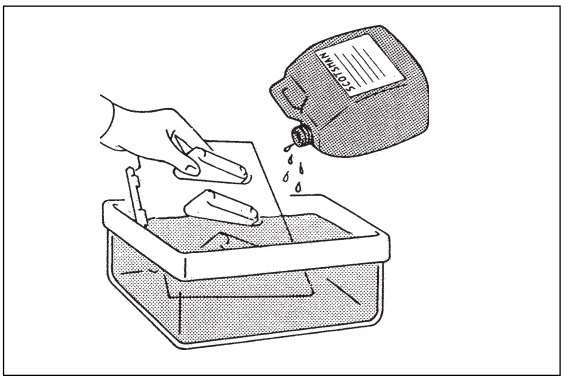
9. Remove the evaporator cover then slowly pour onto the evaporator platen the cleaning solution. With the help of a brush dissolve the most resistant and remote scale deposits in the platen.

10. Switch ON again the machine at main power switch to start the icemaking process.
Allow the ice maker to operate for about 20 minutes. Then turn the cleaning toggle switch to the "cleaning" position (II) till the release of the ice cubes from their cups.

NOTE. *The amount Cleaner and the time needed for the cleaning of water system depends of the water conditions.*

11. Turn the cube size control knob counterclockwise to the OFF position to shut-off the ice maker then flush out the cleaning solution from the sump reservoir then pour onto the evaporator cavity two or three liters of clean potable water to rinse the mold cups and the platen.

12. If necessary remove the water spray platen to clean it separately.



13. Turn again the cube size control knob to the normal operating position (black dot). The water pump is again in operation to circulate the water in order to rinse the entire water system.
Do the operation as per steps 8 and 9 twice so to be sure no more traces of descaling solution remains into the sump.
Pour on the upper side of the evaporator platen fresh water with a capfull of disinfectant solution then turn again the machine in normal operating mode so to sanitize all the water system for approx. 10 minutes.

NOTE. *Do not mix descaling with disinfectant solution to avoid the generation of a very aggressive acid.*

14. Flush out the disinfectant solution from the sump reservoir then with the switch in "cleaning" position, turn the cube size control knob to the normal operating position.
When water starts overflowing through the drain line, set the switch to "operation" position. The unit is now ready to resume normal operation.

15. Place again the evaporator cover and the unit service panels.

16. At completion of the freezing and harvest cycle make sure of proper texture and clearness of the ice cubes and that, they do not have any acid taste.

ATTENTION. In case the ice cubes are cloudy-white and have an acid taste, melt them immediately by pouring on them some warm water. This to prevent that somebody could use them.

17. Wipe clean and rinse the inner surfaces of the storage bin.

REMEMBER. *To prevent the accumulation of undesirable bacteria it is necessary to sanitize the interior of the storage bin with an anti-algae disinfectant solution every week.*