SCOTSMAN®

SERVICE MANUAL

ACM 45
ACM 55

R 134 A VERSION

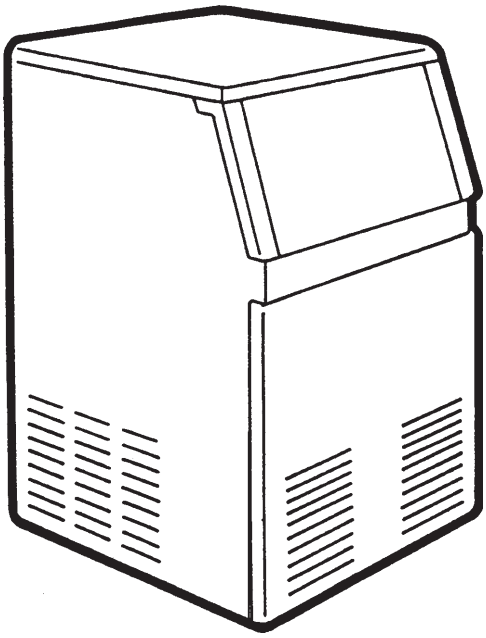
Electronic cubers with storage

MS 1000.04 REV. 06/2000

INDICE

SPECIFICATIONS

ELECTRONIC CUBER MODEL ACM 45

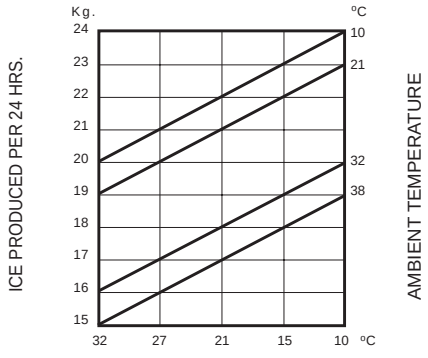


Important operating requirements:

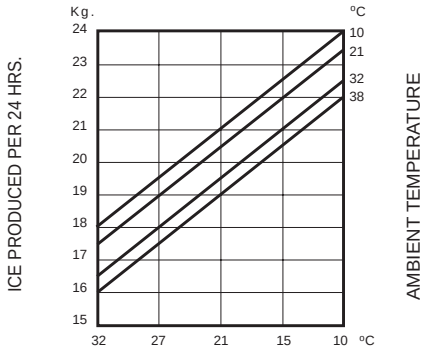
	MIN.	MAX.
Air temperature	10°C	40°C
Water temperature	5°C	40°C
Water pressure	1 bar	5 bar
Electr. voltage variations from voltage rating specified on nameplate	-10%	+10%

ice making capacity

AIR COOLED MODELS

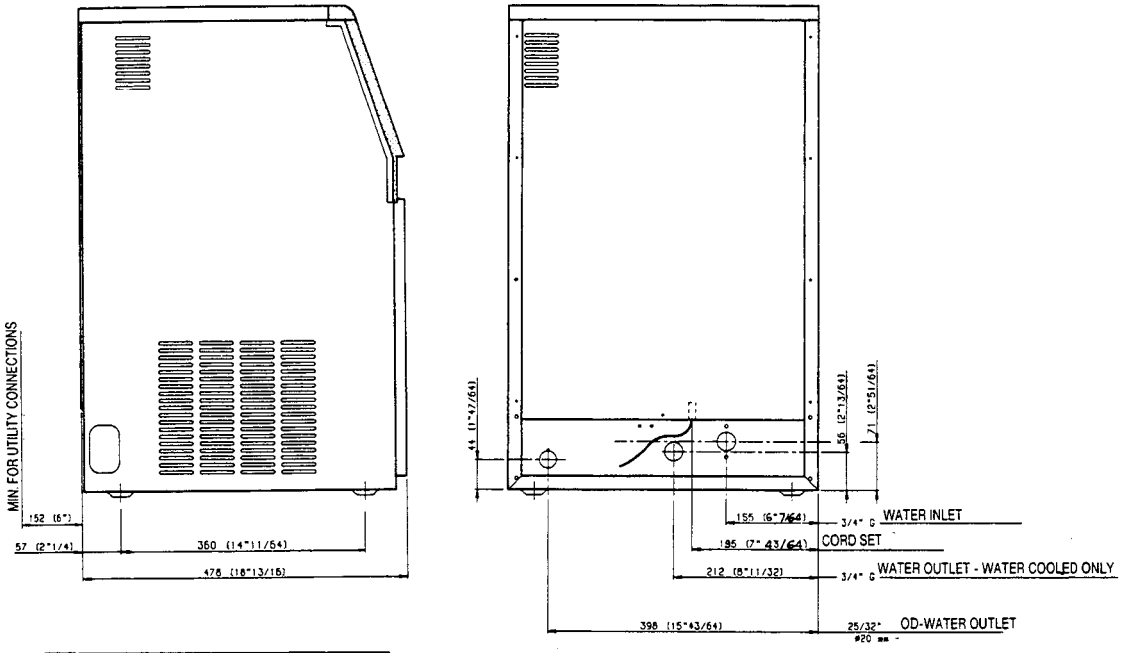


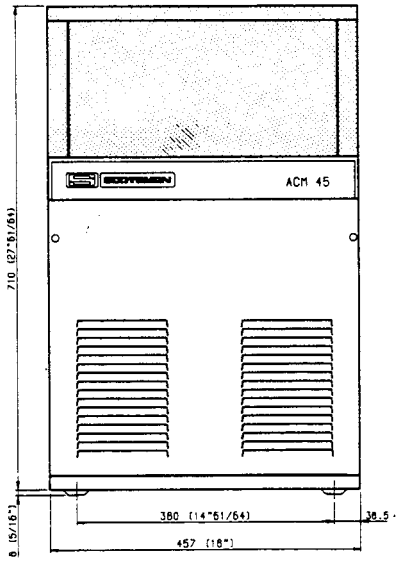
WATER COOLED MODELS



NOTE. *The daily ice-making capacity is directly related to the condenser air inlet temperature, water temperature and age of the machine.*
To keep your SCOTSMAN CUBER at peak performance levels, periodic maintenance checks must be carried out as indicated on page 33 of this manual.

SPECIFICATIONS





Dimensions:

HEIGHT	725 mm.
WIDTH	457 mm.
DEPTH	480 mm.
WEIGHT	39 Kgs.

ACM 45 - CUBER
machine specifications

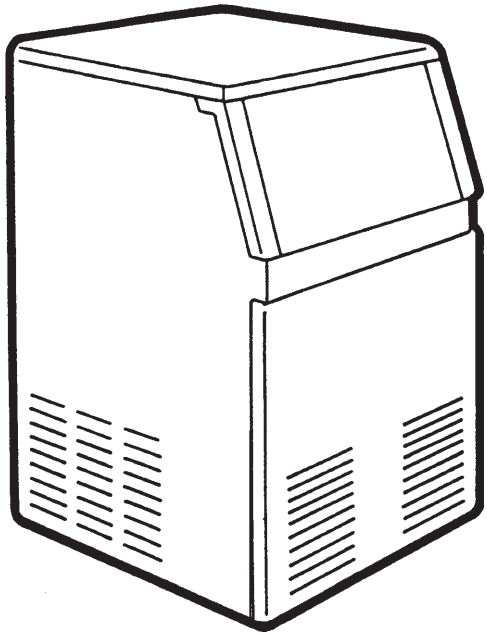
Model	Cond. unit	Finish	Comp. HP	Capacity the cold store	Water req. lt/24 HR
ACM 45 AS 6 ACM 45 WS 6	Air Water	Stainless steel	1/4	14 Kg.	100 270*

Basic electr.	Amps	Start Amps	Watts	Electric power cons. Kwh per 24 Hr	Nr. of wires	Amps fuse
230/50/1	2.2	11	340	6.5	3 x 1.5 mm^2	10

Cubes per harvest: 18 medium
* A 15°C water temperature

SPECIFICATIONS

ELECTRONIC CUBER MODEL ACM 55

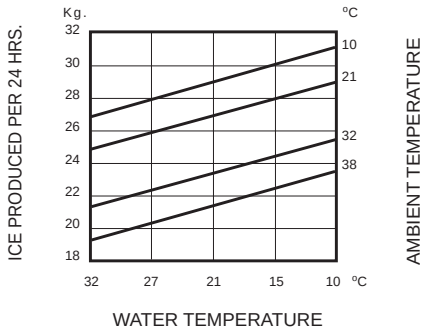


Important operating requirements:

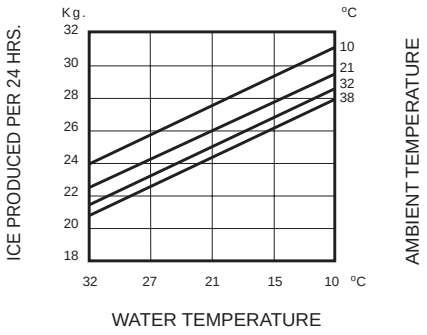
	MIN.	MAX.
Air temperature	10°C	40°C
Water temperature	5°C	40°C
Water pressure	1 bar	5 bar
Electr. voltage variations from voltage rating specified on nameplate	-10%	+10%

ice making capacity

AIR COOLED MODELS

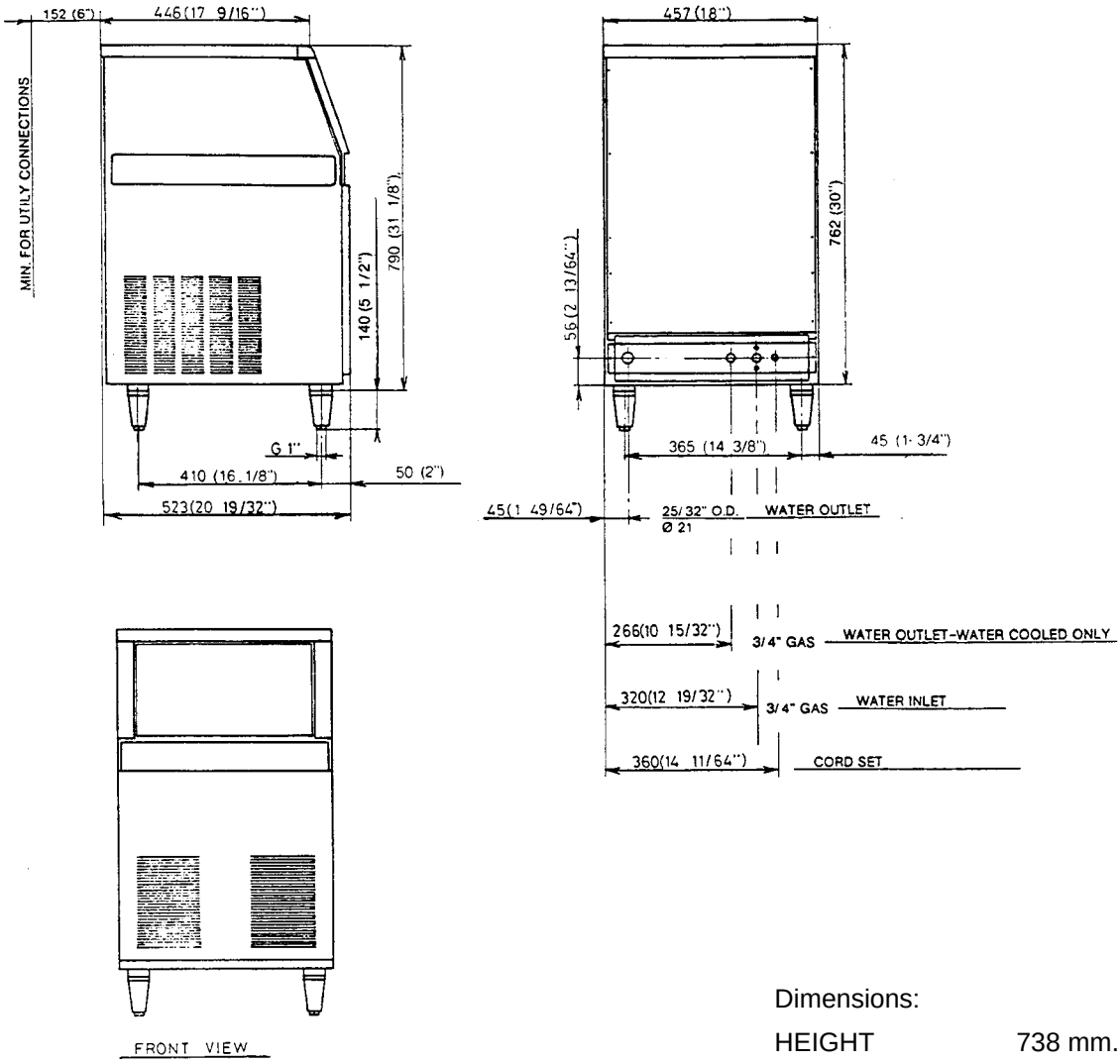


WATER COOLED MODELS



NOTE. *The daily ice-making capacity is directly related to the condenser air inlet temperature, water temperature and age of the machine.*
To keep your SCOTSMAN CUBER at peak performance levels, periodic maintenance checks must be carried out as indicated on page 33 of this manual.

SPECIFICATIONS



Dimensions:

HEIGHT	738 mm.
WIDTH	457 mm.
DEPTH	522 mm.
WEIGHT	44 Kgs.

ACM 55 - CUBER
machine specifications

Model	Cond. unit	Finish	Comp. HP	Capacity the cold store	Water req. lt/24 HR
ACM 55 AS 6 ACM 55 WS 6	Air Water	Stainless steel	1/4	14 Kg.	110 290*

Basic electr.	Amps	Start Amps	Watts	Electric power cons. Kwh per 24 Hr	Nr. of wires	Amps fuse
230/50/1	2.2	11	390	7	3 x 1.5 mm^2	10

Cubes per harvest: 24 medium
* A 15°C water temperature

GENERAL INFORMATION AND INSTALLATION

A. INTRODUCTION

This manual provides the specifications and the step-by-step procedures for the installation, start-up and operation, maintenance and cleaning for the SCOTSMAN ACM 45 and ACM 55 icemakers. The Electronic Cubers are quality designed, engineered and manufactured.
Their ice making systems are thoroughly tested providing the utmost in flexibility to fit the needs of a particular user.
This product qualifies for the following listings:
These icemakers have been engineered to our own rigid safety and performance 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. Call your authorized SCOTSMAN Distributor or Dealer for proper installation.

2. 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.

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

b) Remove the packing nails securing the carton box to the skid.

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

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

4. Remove the rear panel of the unit and inspect for any concealed damage. Notify carrier of your claim for the concealed damage as steted in step 2 above.

5. Remove all internal support packing and masking tape.

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

7. Check that the compressor fits snugly onto all its mounting pads.

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

9. 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.

10. 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 Frimont factory.

11. On ACM 55, if necessary, fit the four legs into their seats on the machine base and adjust them to the desired level.

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 SCOTSMAN 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 40°C (100°F).

c) Well ventilated location for air cooled models.

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.

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 for electrical connections. All SCOTSMAN icemakers require a solid earth wire.

All SCOTSMAN ice machines are supplied from the factory completely pre-wired and require only electrical power connections to the wire cord provided at rear 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 build-up on parts of the water system.

WATER SUPPLY

Connect the 3/4" male fitting of the solenoid water inlet valve, using a food grade flexible tube or a 3/8" O.D. copper pipe, 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.
If water contains a high level of impurities, it is advisable to consider the use of the Water Drain Valve - or the installation of an appropriate water filter or conditioner.

On Water Cooled version the water inlet solenoid valve has two separate outhets one for the condenser and the second for the production of ice.

WATER DRAIN

The recommended drain tube is a plastic or flexible tube with 18 mm (3/4") I.D. which 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 vent at the unit drain connection is also required for proper sump drainage.

WATER DRAIN - WATER COLLED MODELS

Connect the 3/4" male fitting of the condenser water drain, utilizing a second flexible tubing or a 3/8" O.D. copper tubing, to the open trapped and vented drain.

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 bolts holding the compressor down been checked to ensure that the compressor is snugly fitted onto the mounting pads?

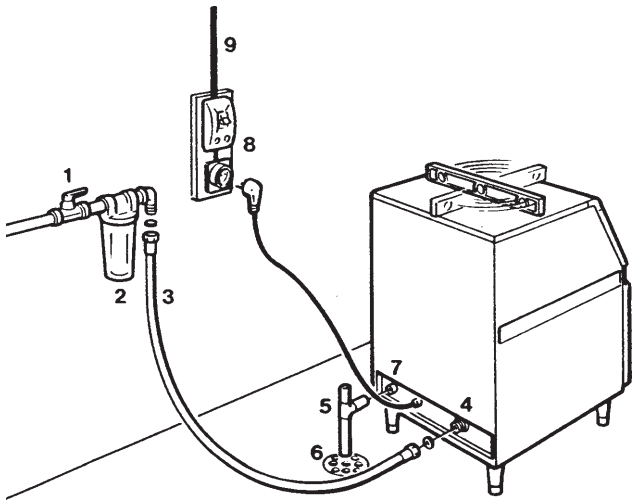
9. Have the bin liner and cabinet been wiped clean?

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

11. 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.

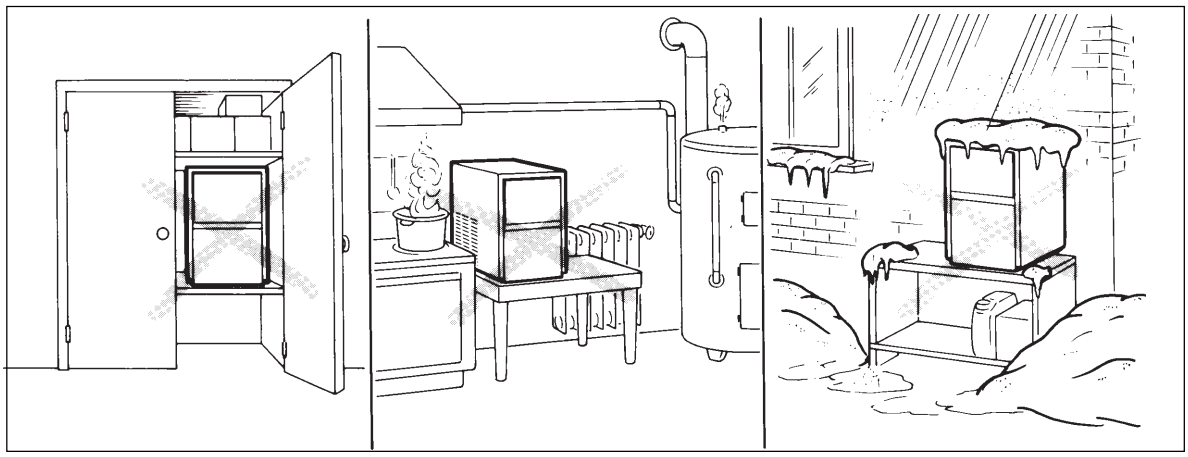
12. Has the owner been given the name and the phone number of the authorized SCOTSMAN Service Agency serving him?

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 40°C (100°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 rear panel, locate the control box and remove its cover.

B. Locate the grooved head (similar to a fillister screw head) of the electronic program selector and with the help of a regular screwdriver turn the selector head in the **OPERATION** position.

C. Give power to the unit to start it up by switching "ON" the power line main disconnect switch.
The **1st GREEN LED** will glow.

NOTE. *Every time the unit returns under power, after having been switched off, the water inlet valve, the hot gas valve and the water drain valve get energized for a period of 5 minutes, thus to admit new water to the machine sump reservoir to fill it up and, eventually, to wash-off any dirt that can have deposited in it during the unit off period (Fig.1).*

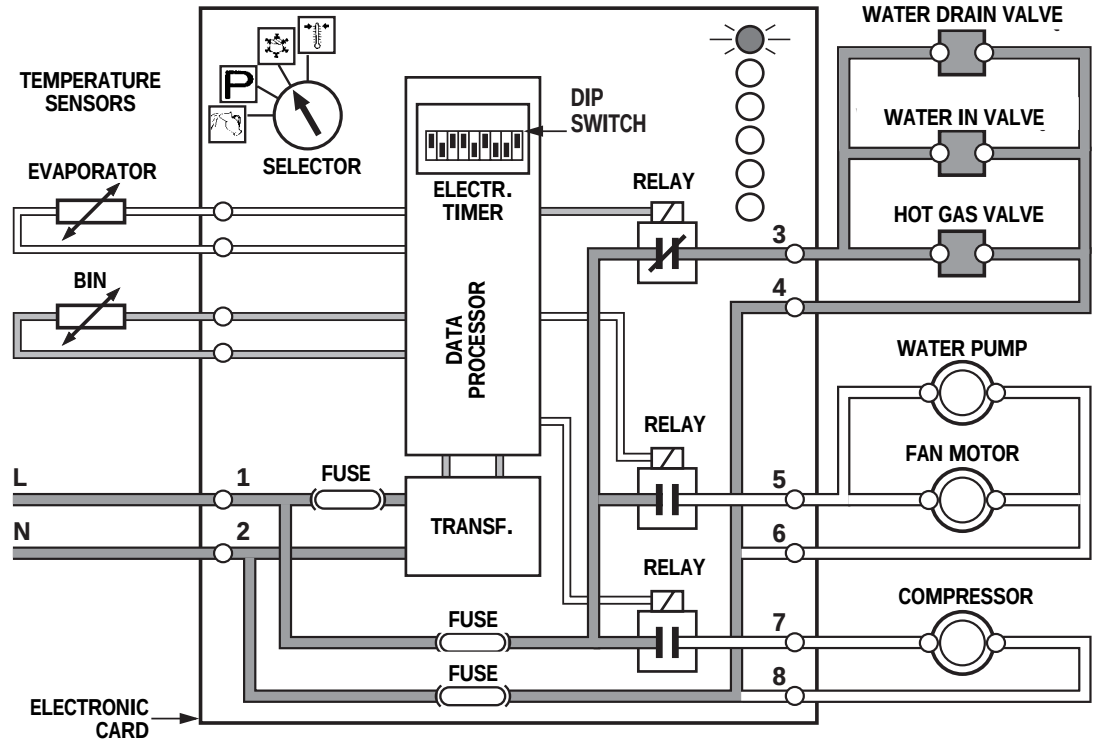
D. During the water filling operation, check to see that the incoming water dribbles, through the evaporator platen dribbler holes, down into the sump reservoir to fill it up and also that the incoming surplus of water flows out through the overflow pipe into the drain line.
During the water filling phase the components energized are:

THE WATER INLET SOLENOID VALVE

THE HOT GAS SOLENOID VALVE

THE WATER DRAIN SOLENOID VALVE

FIG. 1



NOTE. *If in the 5 minutes length of the water filling phase the machine sump reservoir does not get filled with water up to the rim of the overflow pipe, it is advisable to check:*

1.The water pressure of the water supply line that must be at least 1 bar (14 psig) Minimum (Max 5 bar-70 psig).

2.The filtering device installed in the water line that may reduce the water pressure below the Minimum value of 1 bar (14 psig).

3. Any clogging situation in the water circuit like the inlet water strainer and/or the flow control.

NOTE. *On air cooled models the head (condensing) pressure is kept between 11 and 7 bars (155 and 100 psig) with ice machine at 21°C (70°F) ambient temperature. The above mentioned head pressure values change accordingly to the ambient temperature (rising with the rise of the temperature) and to the ventilation of the unit. In the water cooled models, the head pressure is kept between 8.5 and 10 bars (120-140 psig) by the operation of an automatic hi-pressure control that energizes a second outlet of the water inlet solenoid valve.*

E. At completion of the water filling phase (5 minutes) the unit passes automatically into the freezing cycle with the start up of:

COMPRESSOR

WATER PUMP

FAN MOTOR (in air cooled version)

and the glowing of the **6th RED LED** (Fig.2).

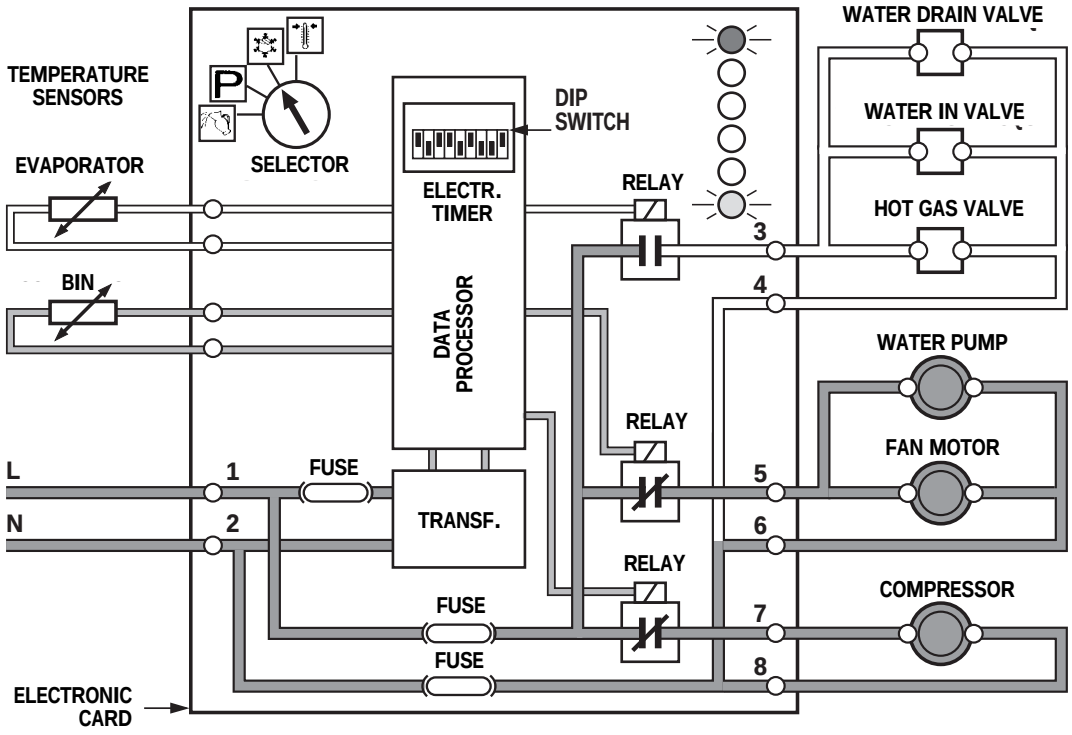
OPERATIONAL CHECKS

F. Install, if necessary, the refrigerant service gauges on both the high side and low side Schräder valves to check the compressor head and suction pressures.

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

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

FIG. 2



During the freezing process, when the evaporator temperature falls to reach **0°C (32°F)** the evaporator temperature sensor, located in contact with the evaporator serpentine, supplies a low voltage power signal to the electronic control device (P.C.BOARD) which in first instance generates the glowing of the **5th RED LED** located in the front of the printed circuit board (Fig.3).

FIG. 3

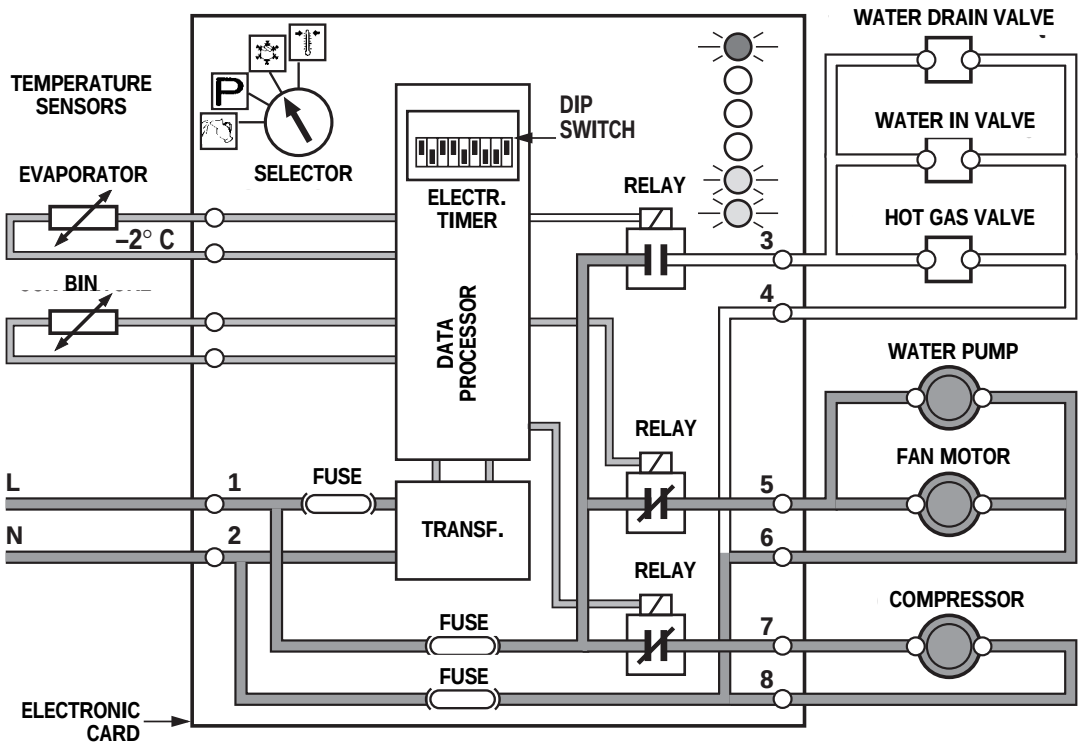
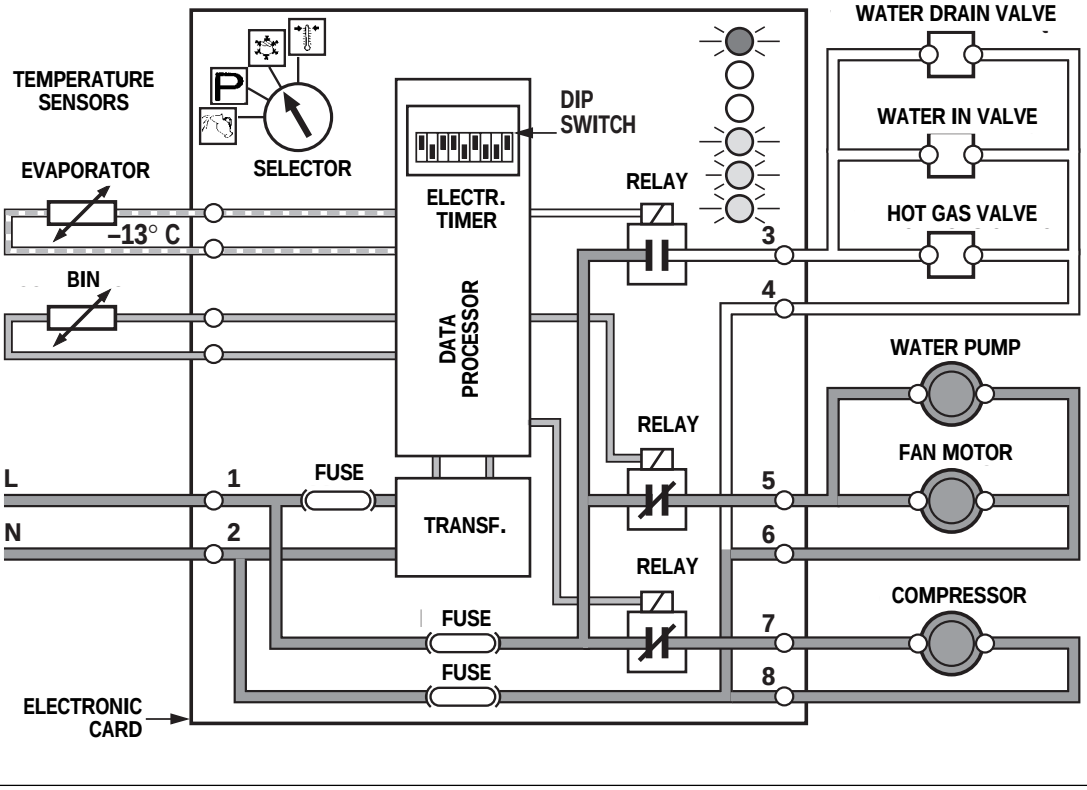


FIG. 4



I. The unit remains however in its normal freezing cycle mode untill the evaporator temperature detected by the sensor reaches the temperature of **-13°C (8.5°F).**
When the evaporator temperature falls below the above value, the evaporator temperature sensor supplies a low voltage power signal to the P.C.BOARD in order to activate the electronic timer. This one takes over the control of the freezing cycle up to the complete formation of the ice cubes (Fig.4) with the lighting up of the **4th RED LED** located just above the previous lighted one.

NOTE. *The length of the entire freezing cycle is the sum of the lengths of* ***three phases****, two of which,* ***(T1+T2) controlled by the evaporator temperature sensor,*** *which has its probe placed in contact with the evaporator serpentine (Non adjustable), and* ***one (Ta) by the electronic timer*** *(Adjustable) incorporated in the P.C.BOARD.*
The lengths of the first two phases, related to the evaporator temperature and controlled by its sensor, are:
T1 *- The time elapsed since the beginning of freezing cycle up to when the evaporator reaches the temperature of* ***0°C (32°F).***
T2 *- The time required for the evaporator to fall from* ***0°C (32°F) to -13°C (8.5°F).***

The third time ***Ta*** *- Time added - is in relation to one of the different combinations of the five keys 3, 4, 5, 6 AND 7 of the* ***DIP SWITCH*** *located in the front of the P.C.BOARD. The combination is factory set in consideration of the ice maker type and of its cooling version. It is possible, however, to vary the timed length of the freezing cycle, by changing the* ***DIP SWITCH*** *keys settings.*
In Table C of PRINCIPLE OF OPERATION are shown the various time extensions of the freezing cycle third phase ***Ta****, in relation with the different DIP SWITCH keys settings.*

J. After about 20-22 minutes from the beginning of the freezing cycle, in an hypothetic ambient temperature of 21°C (70°F), the defrost cycle takes place with the hot gas and the water inlet valves being simoultaneously activated (Fig.5).
The electrical components in operation in this new situation are:

COMPRESSOR

WATER INLET SOLENOID VALVE

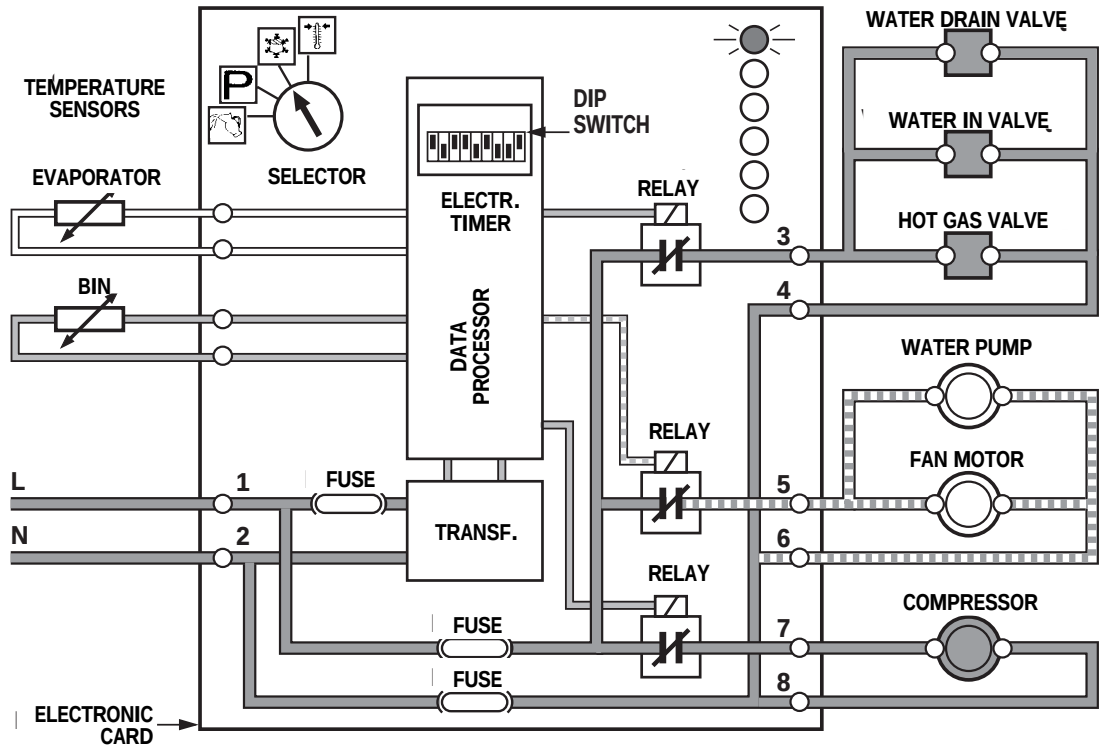
HOT GAS VALVE

WATER DRAIN SOLENOID VALVE

and the

WATER PUMP and FAN MOTOR for the first 15 - 20 seconds

FIG. 5



NOTE. *The length of the defrost cycle (not adjustable) is automatically determinated by the micro processor of P.C.BOARD in relation of the time **T2** necessary for the unit to reduce the evaporator temperature from 0°C (32°F) to -13°C (8.5°F) and of the ambient temperature, as illustrated in Table B of PRINCIPLE OF OPERATION.*
*As shown it is possible to have a different length of the defrost cycle in connection with the different length of the second phase of the freezing cycle **T2** related to the ambient temperature situations; shorter when the ambient temperature is high and longer in colder ambients so to partially compensate the length of the freezing cycle, which is longer in high ambient temperatures and shorter in low ones.*

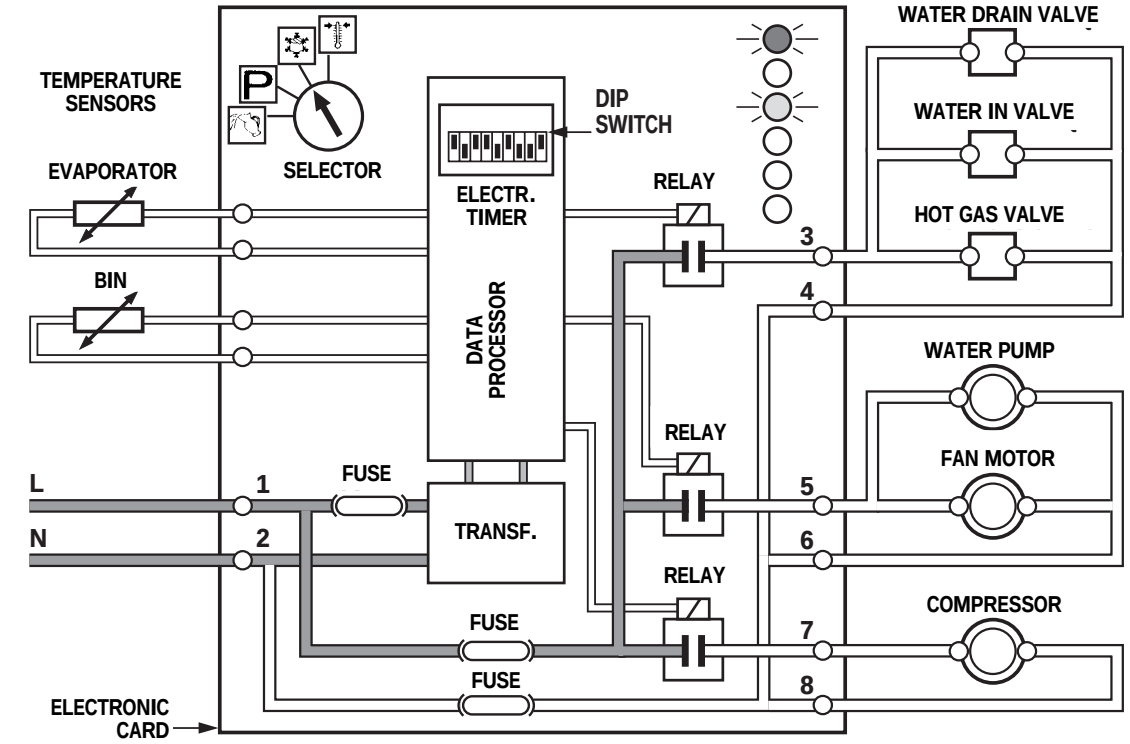
K. Check, during the defrost cycle, that the incoming water flows correctly into the sump reservoir in order to refill it and that its surplus overflows through the overflow drain tube.

L. Check the texture of ice cubes just released. They have to be in the right shape with a small depression of about 5-6 mm in their crown.
If not, wait for the completion of the second cycle before performing any adjustment.

If the ice cubes require a correction of their shape, it is possible to modify the length of the timed freezing cycle by changing the **DIP SWITCH** keys setting as illustrated on table C shown in OPERATING PRINCIPLE.
If the ice cubes are shallow and cloudy, it is possible that the ice maker runs short of water during the freezing cycle second phase or, the quality of the supplied water requires the use of an appropriate water filter or conditioner.

M. To be sure of the correct operation of ice level temperature sensor located in one side of storage bin liner, place one shovel of ice cubes in contact with its probe for approx. 30 sec. 1 minute.
As the temperature of storage bin sensor reaches the value of +2°C (35°F), the ice level control transmits a signal to the micro processor of the P.C. BOARD in order to stop the ice maker operation with the simultaneous glowing of the **3rd RED LIGHT**, to monitor the **BIN FULL** situation (Fig.6).
With no more ice cubes in touch with the ice level control the temperature of its probe progressively rises to reach +4.5°C (40°F) and at this point the ice machine restarts to initiate a new freezing cycle with the simultaneous extinguishing of the **3rd RED LIGHT.**

FIG. 6



NOTE. *The **CUT-IN RANGE OF THE ICE LEVEL CONTROL SENSOR** can be adjusted by means of the DIP SWITCH keys 8 and 9 as shown on table D of PRINCIPLE OF OPERATION; its cut out setting remains however at +2°C (35°F).*

N. Remove the refrigerant service gauges and re-fit the control box cover and the unit service panels previously removed.

O. 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 SCOTSMAN cube ice makers the water used to make the ice is kept constantly in circulation by an electric water pump which primes it to the spray system nozzles from where it is diverted into the inverted mold cups 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

The hot gas refrigerant discharged out from the compressor (Fig. B) 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, due to the heat exchanging action, it looses some of its heat content so that its pressure and temperature are lowered as well. Next the refrigerant enters into the evaporator serpentine (which has a larger I.D. then the capillary) 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 the evaporator temperature sensor (which has its probe in contact with the evaporator serpentine) that determines the length of the first and second portion of it; the starts up of the freezing cycle is signalled by the glowing of the **6th RED LED.**
The first portion length or time T1 (Not adjustable) is equal to the time required by the temperature sensor to fall to **0°C (32°F).** When reached, it is signalled by the glowing of the **5th RED LED.**

NOTE. *If, after **15 minutes,** the evaporator temperature has not yet reached the value of **0°C (32°F)** (due to a partially or total shortage of refrigerant or to a too high condensing temperature, etc.) the sensor, through the P.C. BOARD, causes the unit to stop the operation with the simoultaneous glowing of the **2nd RED WARNING LED** (Fig. 7).*
*After having eliminated the source of the unit trip off, to restart the machine operation it is necessary first to rotate the program selector on **RE-SET** position, then put it again on to **OPERATION** position or, alternatively, switch OFF and ON the hand disconnect Main Switch.*
The ice machine resumes its normal operation by going through the 5 minutes water filling phase.

FIG. 7

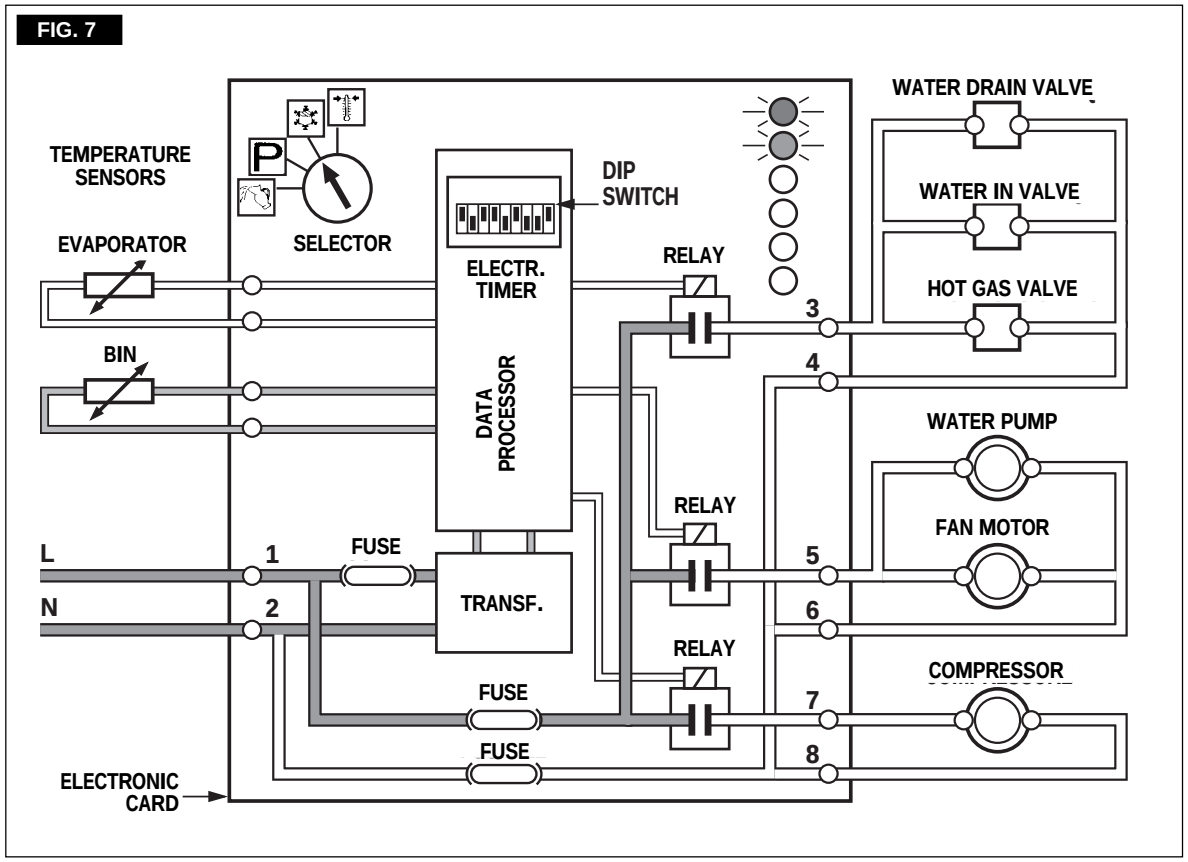


FIG. A

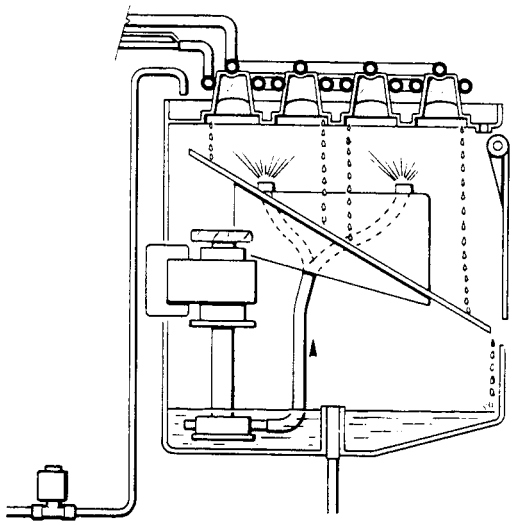


FIG. B

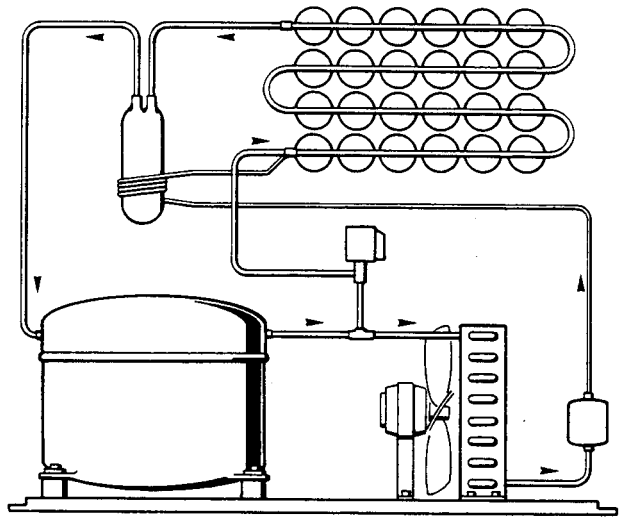


FIG. C

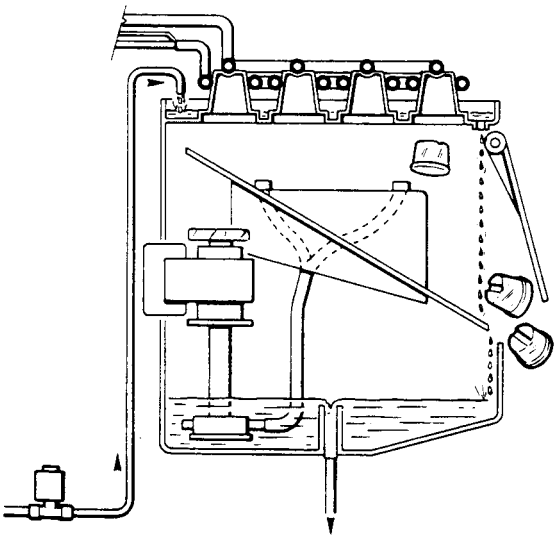
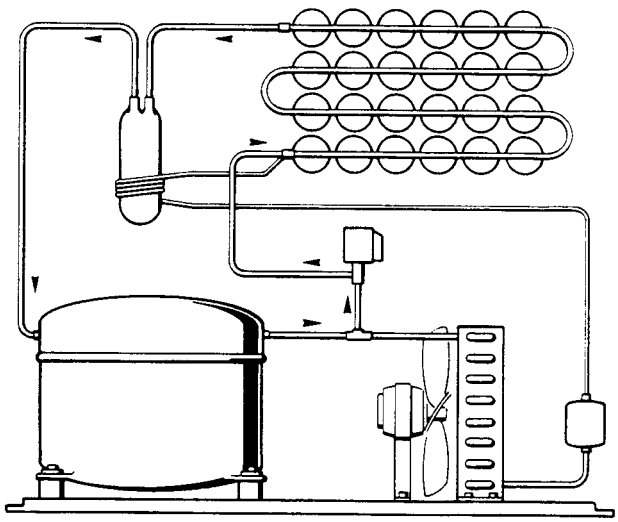


FIG.D



The second portion length of freezing cycle or time **T2** (Not adjustable) is equal to the time required by the evaporator temperature to go from **0°C (32°F) to -13°C (8.5°F)**. The sensor will light-up the **4th RED LED.**

NOTE. *In case the time **T2** gets **longer than 45 minutes**, the unit stops with the glowing of the **2nd RED WARNING LED**.*

The **third portion** or time **Ta** (Added time) of the freezing cycle is controlled by the electronic timer of P.C. BOARD. As the evaporator temperature reaches the value of **-13°C (8.5°F)**; the sensing probe of the evaporator sensor (in contact with the serpentine) changhes its electrical resistance causing a low voltage current to flow to the P.C. BOARD which, thereby, activates an **electronic timer.**

NOTE. *The activation of the timer (Time mode) of P.C. BOARD is signalled by the glowing of **4th RED LED** located in the front of the P.C. BOARD.*

ATTENTION. In case the length of the second portion of freezing cycle or time T2, lasts as long as between 35 and 45 minutes, the third portion or time Ta gets skipped by the P.C. BOARD which puts the unit directly in the defrost or harvest cycle.

The length of the third portion of the freezing cycle (adjustable) is pre-fixed and related to the setting of the **DIP SWITCH keys 3, 4, 5, 6 and 7.** In Table C are indicated the various lengths of the third portion of freezing cycle (Time mode) in accordance with the different combinations of the DIP SWITCH KEYS. In Table A, herebelow illustrated, are indicated the DIP SWITCH keys combinations for the ACM 45 and ACM 55 at different versions as they are set in the factory.
The electrical components in operation during the freezing cycle are:

COMPRESSOR

FAN MOTOR (in air cooled version)

WATER PUMP
and during the timed phase of freezing cycle (Time mode) they are joined by the

ELECTRONIC TIMER

On the air cooled versions the refrigerant head pressure is gradually reduced from a value of approx. **11 bars (155 psig)**, generally recorded 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 subordinated 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 the water cooled versions the refrigerant head pressure ranges between **8.5 and 10.5 bars (120÷140 psig)** being controlled by the automatic hi pressure control that energizes a water solenoid valve located on the inlet water line to the condenser, which modulates the cooling water rate to the condenser.

NOTE. *In case the length of the first portion of freezing cycle **T1** or of the second portion **T2** gets longer respectively than **15 and 45 minutes** for one of the following abnormal reasons:*
***CLOGGED CONDENSER** (Air cooled version)*
***INSUFFICIENT FLOW OF COOLING WATER** (Water cooled version)*
***FAN MOTOR OUT OF OPERATION** (Air cooled version)*
AMBIENT TEMPERATURE HIGHER THAN 40°C (100°F)
*the Micro Processor of the P.C. BOARD causes the total and immediate SHUT-OFF of the machine in order to prevent the unit from operating in abnormal and dangerous conditions. When the ice maker stops on account of this protective device, there is a simultaneous glowing of the **2nd RED LED**, warning the user of the **abnormal** situation. Once eliminated the source of the condenser hi-temperature, to restart the machine first, it is necessary to rotate for a while the program selector on **RE-SET** position then, rotate it again on **OPERATION** position or alternatively switch OFF and ON the unit power line Main Switch. The ice machine resumes its normal operation by going through the usual 5 minutes water filling phase.*

TAB. A **DIP SWITCH KEYS FACTORY SETTING COMBINATIONS PER MODEL AND VERSION**

DIP SWITCH	1	2	3	4	5	6	7	8	9	10
ACM 45 A & W	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON
ACM 55 A & W	ON	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	OFF

With the unit installed in a normal location (21°C ambient temperature) at the start of the freezing cycle the refrigerant suction or lo-pressure lowers rapidly to **1.0÷0.9 bars (14÷12 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 bars (0÷1.5 psig)** with the cubes fully formed in the cup molds.
The total length of the freezing cycle ranges from 20 to 22 minutes.

DEFROST OR HARVEST CYCLE

As the electronic timer has carried the system throughout the third phase of freezing cycle or as soon as the second phase T2 is over (when its length has been as long as 35 to 45 minutes) the defrost cycle starts.

NOTE. *The length of the defrost cycle (not adjustable) is related to the length of the second phase of freezing cycle **T2** as detailed in Table B.*

The electrical components in operation during this phase are:

COMPRESSOR

WATER INLET SOLENOID VALVE

HOT GAS SOLENOID VALVE

WATER DRAIN SOLENOID VALVE

WATER PUMP and FAN MOTOR for the first 15-20 seconds

The incoming water, passing through the water inlet valve and its flow control (Fig. C) runs over the evaporator platen and then flows by gravity through the dribbler holes down into the sump/ reservoir.
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 (Fig. D) 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 defrost 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.
On the versions equipped with the water drain valve, the water pump remains in operation, during the first 15-20 seconds of the defrost cycle, to pump out, trough the opened water drain valve, the remaining water (reach of minerals and deposits) of the previous freezing cycle.

NOTE. *The length of the defrost cycle (not adjustable) changes in accordance with the duration of the second portion of the freezing cycle **T2** and is related as well to the ambient temperature (as shown on Table B). Infact in high ambient temperature situation the defrost cycle is abbreviated so to recover some of the time used for the longer freezing cycle.*

At the end of the defrost cycle, both the hot gas and the water inlet valves close and the machine starts again a new freezing cycle.

OPERATION - CONTROL SEQUENCE

At the start of freezing cycle the **evaporator temperature sensor** controls the length of the first **T1** and second **T2** portion of the freezing cycle. As it senses the predetermined evaporating temperature of -13°C (8.5°F) it supplies a low voltage current to the P.C. BOARD in order to activate the el**ectronic timer** which takes over the control of the remaining portion of the freezing cycle for a pre-fixed time **Ta** subordinated to the DIP SWITCH keys setting (see Tab. C).

NOTE. *The evaporator temperature sensor, factory pre-set, is the same for all the models and is not adjustable in the field.*

During the normal operation mode the length or the total time of the freezing cycle ie equal to the sum of the three partial times i.e.:

Tc = T1 + T2 + Ta

In case the length of the second portion of the freezing cycle or time T2 gets long as to be between 35 and 45 minutes, the total length of the freezing cycle will be limited to:

Tc = T1 + T2

skipping the added time Ta, controlled by the electronic timer.
If instead the time **T2** gets longer than 45 minutes the unit stops immediately with the lighting up of the warning **2nd RED LIGHT.**
The same could happen in case the time **T1** (1st portion of freezing cycle) gets longer than 15 minutes.
Once completed the freezing cycle 2nd or 3rd phase (this last one is dependent of the length of the second phase of freezing cycle - **T2**) the system goes automatically into the defrost cycle **Ts.**
The defrost cycle also has a pre-fixed length that can vary in relation to the time **T2,** as shown in Table B.
At completion of the defrost cycle the P.C. BOARD put the unit into a new freezing cycle.

OPERATION - ELECTRICAL SEQUENCE

The following charts illustrate which switches and which components are ON or OFF during a particular phase of the icemaking cycle.
Refer to the wiring diagram for a reference.

BEGINNING FREEZE (Time T1 and T2)

Electrical components (Loads)	**ON**	**OFF**
Compressor	•	
Water Pump	•	
Fan Motor (Air cooled only)	•	
Hot Gas Valve		•
Water Inlet Valve		•
Water Drain Valve		•
P.C.Board Relay 1 Coil		•
P.C.Board Relay 2 & 3 Coil	•	
Electronic Timer		•

Electronic Controls & Sensors	**ON**	**OFF**
Evaporator Sensor		•
Ice Level Sensor	•	

TIMED FREEZE (Time Ta)

Electrical components (Loads)	**ON**	**OFF**
Compressor	•	
Water Pump	•	
Fan Motor (Air cooled only)	•	
Hot Gas Valve		•
Water Inlet Valve		•
Water Drain Valve		•
P.C.Board Relay 1 Coil		•
P.C.Board Relay 2 & 3 Coil	•	
Electronic Timer	•	

Electronic Controls & Sensors	**ON**	**OFF**
Evaporator Sensor	•	
Ice Level Sensor	•	

HARVEST (Time Ts)

Water Drain Phase (15-20 sec.)

Electrical components (Loads)	**ON**	**OFF**
Compressor	•	
Water Pump	•	
Fan Motor (Air cooled only)	•	
Hot Gas Valve	•	
Water Inlet Valve	•	
Water Drain Valve	•	
P.C.Board Relay 1 & 3 Coil	•	
P.C.Board Relay 2 Coil	•	
Electronic Timer	•	

Electronic Controls & Sensors	**ON**	**OFF**
Evaporator Sensor		•
Ice Level Sensor	•	

HARVEST (Time Ts)

Water Filling Phase

Electrical components (Loads)	**ON**	**OFF**
Compressor	•	
Water Pump		•
Fan Motor (Air cooled only)		•
Hot Gas Valve	•	
Water Inlet Valve	•	
Water Drain Valve	•	
P.C.Board Relay 1 & 3 Coil	•	
P.C.Board Relay 2 Coil		•
Electronic Timer	•	

Electronic Controls & Sensors	**ON**	**OFF**
Evaporator Sensor		•
Ice Level Sensor	•	

OPERATING CHARACTERISTICS

On air cooled models, during the freezing cycle, the discharge pressure will slowly decline as the unit freezes ice and at the same time the suction pressure will also decline, reaching its lowest point just before harvest. Compressor amps experience a similar drop.
On water cooled models, the discharge pressure is maintened during the freeze cycle between 8.5 and 10 bars (120÷140 psig) by the combination of a pressure control and a water inlet solenoid valve. However, suction pressure and compressor amps will still decline as the machine freezes ice.

Freeze Cycle

Average Discharge Pressure
A/C: 7÷11 bars (100÷155 psig)

Average Discharge Pressure
W/C: 8.5÷10 bars (120÷140 psig)

Suction Pressure
End Freeze Cycle: 0÷0.1 bar (0÷1.5 psig)

REFRIGERANT METERING DEVICE:

capillary tube

REFRIGERANT CHARGE (R 134 A)

Model	Air Cooled	Water Cooled
ACM 45	250 gr (9.0 oz)	250 gr (9.0 oz)
ACM 55	260 gr (9.3 oz)	250 gr (9.0 oz)

COMPONENTS DESCRIPTION

A. EVAPORATOR TEMPERATURE SENSOR

The evaporator temperature sensor probe, located in contact with the evaporator serpentine, detects the dropping of the evaporator temperature during the freezing cycle and signals it by supplying a current flow to the Micro Processor of P.C. BOARD.
According to the current signal and to after how long this is received, the Micro Processor may or not give the consent to the ice maker to complete the freezing cycle.
The low voltage current transmitted, from the evaporator temperature sensor to the P.C. BOARD, is signalled by the lighting up of the fourth (Time T1) and fifth (Time T2) **RED LED** placed in the front of the P.C. BOARD to inform the service engineer, of the normal (regular) progressing of the freezing cycle.

B. ICE BIN LEVEL SENSOR

The ice bin level temperature sensor, secured to one of the storage bin walls, stops the operation of the entire ice maker only at the end of the defrost cycle when its sensing probe (in contact with the stored ice) reaches the temperature of +2°C (35°F) lighting up, in the meantime, the third **RED LED**.
Once the ice is removed from the sensing probe, its temperature progressively rise up and as it reaches the value of +4.5°C (40°F) the ice bin level temperature sensor transmits a low voltage current flow to the P.C. BOARD so to restart the operation of the unit.

> **NOTE.** *The ice maker, after the interruption of its operation due to the ice level control cut-out always restarts from the beginnig of the freezing cycle.*

By changing the combination of the **DIP SWITCH Keys number 8 and 9** it is possible to change the range of the ice level control temperature sensor. This is shown on table D, keeping its cut out temperature always at +2°C (35°F).

C. P.C. BOARD (Data processor)

The P.C. BOARD, fitted in its plastic box located in the front of the unit, consists of two separated printed circuits one at high and the other at low voltage integrated with a program selector; of six aligned **LEDS** monitoring to the service engineer the operation of the machine; of one **DIP SWITCH** with ten keys; of input terminals for the leads of the two sensor probes and of input and output terminals for the leads of the ice maker electrical wires.

The P.C. BOARD is the brain of the system and it elaborates, through its Micro Processor, the signals received from the two sensors in order to control the operation of the different electrical components of the ice maker (compressor, water pump, solenoid valves, etc.).
By turning the program selector it is possible to put the unit in the following different situations:

CLEANING/RINSING. The water pump is the only electrical component in operation and it must be used during the cleaning or the rinsing procedure of the water system of ice machine.
STAND BY. The unit remain under electrical power but OUT of operation. It can be used by the service engineer in order to stop the unit during the service and inspection operations.

IN OPERATION. The unit is running through the freezing and defrost cycles stopping automatically only at full bin situation.

RE-SET. To be selected to resume the unit operation when the ice maker shuts off due to the intervention of the security of the P.C. BOARD in relation to the exceeding time of freezing cycle portion T1 and T2.

The **six LEDS** (not visibles trough the panel) placed in a vertical row in the front of the P.C. BOARD, monitor, from the top to the bottom, the following situations:

GREEN LIGHT Unit under electrical power

RED LIGHT Unit shut-off due to P.C. BOARD security (T1 > 15' o T2 > 45')

RED LIGHT Unit shut-off at full storage bin

RED LIGHT Evaporator sensor at -13°C (8.5°F)

RED LIGHT Evaporator sensor at 0°C (32°F)

RED LIGHT Compressor under power

The Micro Processor of the P.C. BOARD has also the important function to establish the length of the defrost cycle **Ts** in relation with the duration of the second phase of the freezing cycle or time **T2** as shown on table B.

D. DIP SWITCH

The P.C.BOARD which controls the entire operation of the ice maker, has a **DIP SWITCH with ten switching keys** which allow to set up the micro processor program in order to extend or to shorten the length of freezing cycle in relation to the different models and versions of ice machines and to modify the sensing range of the ice bin level temperature sensor.

The 1st DIP SWITCH key is used to supply power to the water pump during the first 15-20 seconds of the defrost cycle to pump out all remaining water from the sump tank when is set to ON position.

The 2nd DIP SWITCH key allows to make a rapid check up (auto-diagnosis) of the P.C. BOARD output connections (compressor, water pump, fan motor, water inlet and hot gas solenoid valves) energizing them in rapid sequence (2 seconds) one by one.
DURING THE AUTOMATIC OPERATION OF THE ICE MAKER THIS KEY MUST BE SET IN OFF POSITION.

ATTENTION. The check up of the P.C.BOARD output must be performed in a very short time in order to avoid frequent start and stop (every few seconds) of the electrical components which may damage them especially the compressor.

TAB. B **LENGTH OF THE DEFROST CYCLE Ts ACCORDING TO THE LENGTH OF T2**

T2	Ts
T2 < 5'	210"
5' < T2 < 6'	195"
6' < T2 < 6' 30"	180"
6' 30" < T2 <7'	165"
7' < T2 < 8'	150"
8' < T2 < 9'	135"
9' < T2 < 10' 30"	120"
10' 30" < T2 < 12'	105"
12' < T2	90"

The setting of the DIP SWITCH keys 3, 4, 5, 6 and 7 determines the length of the 3rd phase of freezing cycle (controlled by the electronic timer) as detailed in table C.

The DIP SWITCH keys 8 and 9 setting determines the range between cut in and cut out temperature of the ice bin level temperature sensor as specified in table D.

The 10th DIP SWITCH key is used to change the setting of the evaporator temperature sensor **from -13°C (8.5°F) - OFF position** (ACM 55) **to -16°C (3°F) - ON position** on model ACM 45.

E. WATER SPRAY SYSTEM

Through its nozzles, the water pumped, is sprayed in each individual cup to be frozen into ice.
It consists of one spray platform which has six spray nozzles each.

F. WATER PUMP

The water pump operates continually throughout the freezing cycle priming 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.
On machines equipped with the water drain valve, the water pump remains in operation for 15-20 seconds at the beginning of the defrost cycle, in order to pump out to the drain all the remaining water which is generally rich of minerals and sediments deposited into the sump tank during the previous freezing cycle.
It is recommended that the pump motor bearings be checked at least every six months.

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

The water inlet solenoid valve is activated by the Micro Processor of the P.C. BOARD during the first 5 minutes of water filling phase and as well 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 where it will be sucked by the water pump and primed to the spray system.

TAB. C — **LENGHTS OF TIMED PORTION OF FREEZING CYCLE ACCORDING TO THE DIP SWITCH SETTING COMBINATIONS**

3	4	5	6	7	Ta min.	3	4	5	6	7	Ta min.
ON	ON	ON	ON	ON	0	OFF	ON	OFF	OFF	ON	13
OFF	ON	ON	ON	ON	1	ON	OFF	OFF	OFF	ON	14
ON	OFF	ON	ON	ON	2	OFF	OFF	OFF	OFF	ON	15
OFF	OFF	ON	ON	ON	3	ON	ON	ON	ON	OFF	16
ON	ON	OFF	ON	ON	4	OFF	ON	ON	ON	OFF	17
OFF	ON	OFF	ON	ON	5	ON	OFF	ON	ON	OFF	18
ON	OFF	OFF	ON	ON	6	OFF	OFF	ON	ON	OFF	19
OFF	OFF	OFF	ON	ON	7	ON	ON	OFF	ON	OFF	20
ON	ON	ON	OFF	ON	8	OFF	ON	OFF	ON	OFF	21
OFF	ON	ON	OFF	ON	9	ON	OFF	OFF	ON	OFF	22
ON	OFF	ON	OFF	ON	10	OFF	OFF	OFF	ON	OFF	23
OFF	OFF	ON	OFF	ON	11	ON	ON	ON	OFF	OFF	24
ON	ON	OFF	OFF	ON	12	OFF	ON	ON	OFF	OFF	25

TAB. D — **ICE LEVEL SENSOR CONTROL TEMPERATURE RANGE ACCORDING TO THE DIP SWITCH SETTING COMBINATIONS**

8	9	DELTA T (°C)
ON	ON	1
OFF	ON	1,5
ON	OFF	2
OFF	OFF	2,5

H. WATER INLET SOLENOID VALVE - 3/4 MALE FITTING (Water cooled version)

A second water inlet solenoid valve, operating trough an automatic hi pressure control, is used on water cooled versions to supply water to the condenser.
When activated it supplies a metered amount of water to the condenser in order to limit its temperature and the refrigerant operating high pressure.

I. HOT GAS SOLENOID VALVE

The hot gas solenoid valve consists basically of two parts: the valve body and the valve coil.
Located on the hot gas line, this valve is energized through the Micro Processor of P.C. BOARD during the defrost cycle and during the water filling phase.
During the defrost cycle the hot gas valve coil is activated so to attract the hot gas valve stem in order to give way to the hot gas discharged from the compressor to flow directly into the evaporator serpentine to defrost the formed ice cubes.

J. WATER DRAIN SOLENOID VALVE

The water drain solenoid valve, electrically connected in parallel to the water inlet and to the hot gas solenoid valves, is energized for all the length of the defrost cycle.
By means of the water pump, that remains energized for 15-20 seconds at the beginning of the defrost cycle, it allows the drain out of all remaining water (rich of minerals deposited during the previous freezing cycle) from the sump tank.
By doing so it allows to the ice maker to make every new freezing cycle with new fresh water, avoiding thereby the accumulation of sediments and scales, which soon or later will cause the partial or total clogging of the water system of the unit.

K. FAN MOTOR (Air cooled version)

The fan motor, connected in parallel with the water pump, operates only during the freezing cycle to draw cooling air through the condenser fins keeping the the condensing temperature and the condensing pressure between the operating values according to the ambient temperature.

L. 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 which is then released through the discharge valve.

M. HI PRESSURE CONTROL (Water cooled version)

Used only on the 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.

ADJUSTMENT, REMOVAL AND REPLACEMENT PROCEDURES

A. ADJUSTMENT OF THE CUBE SIZE

CAUTION. Before performing actual adjustment of the cube size, check other possible causes for cube size problems, refer to the Service Diagnosis Section for problem review and analysis.
Do not perform any adjustment till the icemaking system has progressed through several complete freezing and harvest cycle, to observe size and quality of ice cubes and whether or not the cube size problem exists.

I. If the cubes are shallow size (Indentation is too deep) probably the length of the third phase of the freezing cycle is too short so, to extend such length you have to:

1. Locate the DIP SWITCH on the front of the P.C.Board.

2. Take note of the combination of the DIP SWITCH KEYS 3, 4, 5, 6 and 7 and check the corrisponding length of freezing cycle 3rd phase as shown on Table C.

3. Change the same DIP SWITCH KEYS setting so that it will correspond to the combination on table C coming next to the one remarked at step 2.
This will allow an extension of the freezing cycle of one more minute.

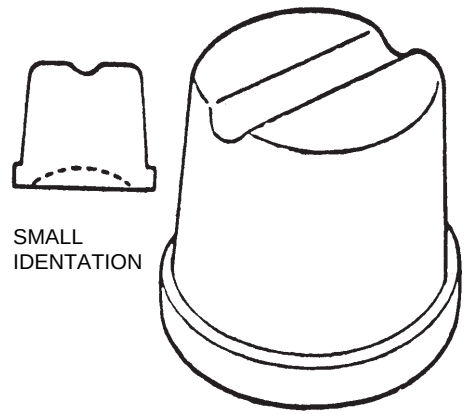
4. Observe the ice cubes in the next two harvests and eventually repeat steps 2 and 3 above until proper ice cubes size is achieved. See figure.

II. If the cubes are oversize size (Indentation is too full) probably the length of the second phase of the freezing cycle is too long.
To shorten such length you have to:

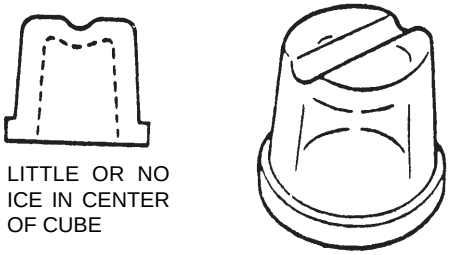
1. Locate the DIP SWITCH on the front of the P.C.Board.

2. Take note of the combination of the DIP SWITCH KEYS 3, 4, 5, 6 and 7 and check the corrisponding length of freezing cycle 3rd phase as shown on Table C.

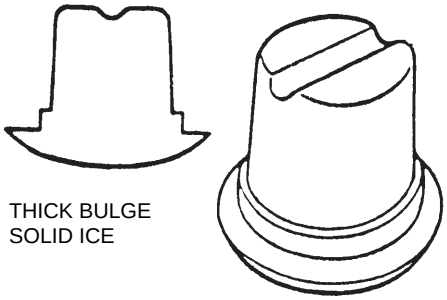
3. Change the same DIP SWITCH KEYS setting so that it will correspond to the combination on table C pre-ceding the one remarked at step 2.
This will reduce an the freezing cycle length of one minute.



NORMAL SIZE-AHAPE



SHALLOW SIZE



OVER SIZE

4. Observe the ice cubes in the next two harvests and repeat eventually steps 2 and 3 above until proper ice cubes size is achieved. See figure.

B. REPLACEMENT OF EVAPORATOR TEMPERATURE SENSOR

1. Remove front and top panel.

2. Remove the evaporator cover and snap off the two metal clip securing the sensor probe to the serpentine.

3. Trace the evaporator sensor terminal plug on the rear side of the control box and remove it from its socket by carefully pulling out the terminal plug securing clip.

4. To install the replacement evaporator sensor follow the above steps in reverse.

C. REPLACEMENT OF ICE LEVEL CONTROL SENSOR

1. Remove rear and front panel.

2. Remove the sensor probe of the ice level control from its holder located on the left side wall of storage bin.

3. Trace the ice level control terminal plug on the rear side of control box and remove it from its socket by carefully pulling out the terminal plug securing clip.

4. Withtraw the ice level sensor probe through the hole located on the rear side of storage bin.

5. To install the replacement ice level control follow the above steps in reverse.

D. REPLACEMENT OF P.C. BOARD

1. Remove front and top panel.

2. Trace the evaporator and the ice level sensor terminal plugs on the rear side of the control box and remove them from their sockets by carefully pulling out the terminal plug securing clips.

3. Disconnect the terminal board connection plug from the rear side of P.C. BOARD then unloose the four screws holding the same to the plastic control box and remove it.

4. To install the replacement P.C. BOARD follow the above steps on reverse.

E. REPLACEMENT OF THE WATER PUMP

1. Remove top panel.

2. Open the sliding bin door. Water pump is located in small compartment at the right side of curtained ice discharge opening.

3. Unloose the screws securing the pump bracket to the unit frame.

4. Locate the plastic hose on the pump discharge port of the pump and disconnect it.

5. Unloose the nut and the jellow/green ground wire. Cut the pump electrical wires.

6. Unloose screw, washer and lockwasher and take the water pump off the bracket.

7. To install the replacement pump follow previous steps in reverse.

F. REPLACEMENT OF THE WATER INLET SOLENOID VALVE

1. Remove the rear panel.

2. Close the hand shut-off valve on the water supply line and disconnect it from the water inlet fitting at the rear of the cuber.

3. Disconnect the electrical leads from the solenoid valve.

4. Unscrew the two screws securing the inlet solenoid valve to the cabinet.

5. Remove the corbin clamps and water hose; the valve is now free.

6. To install the replacement water inlet solenoid valve follow the above steps in reverse.

G. REPLACEMENT OF THE WATER DRAIN SOLENOID VALVE

1. Remove the rear panel.

2. Unloose the two screws securing the water drain solenoid valve and its metal bracket to the unit frame.

3. Trace and disconnect the electrical leads from the water drain solenoid valve coil.

4. Remove the corbin clamps and the plastic hoses from the valve.

5. Unloose the screws securing the valve to its metal bracket.

6. To install the replacement water drain solenoid valve follow the above steps in reverse.

NOTE. *When installing the new valve pay attention to the water flow direction.*

H. REPLACEMENT OF THE CONDENSER WATER INLET SOLENOID VALVE (Water cooled models)

1. Remove the rear panel.

2. Close the shut-off valve on the water supply line and disconnect it from the water inlet fitting at the rear of the cuber.

3. Disconnect the electrical leads from the solenoid valve.

4. Unscrew the two screws securing the inlet solenoid valve to the cabinet.

5. Remove the corbin clamps and water hose; the valve is now free.

6. To install the replacement water inlet solenoid valve follow the above steps in reverse.

NOTE. *Pay attention of the two different typesd of flow controls (located into the outlet ports of the valve) so to connect each one to the correct use (production or condenser).*

I. REPLACEMENT OF HOT GAS VALVE COIL

1. Remove rear panel.

2. Remove the hardware securing the hot gas valve coil to its body.

3. Trace the electric wires belonging to the hot gas valve coil and disconnect them; then lift the valve coil from the valve body.

4. To install the replacement hot gas valve coil follow previous steps in reverse.

J. REPLACEMENT OF FAN MOTOR

1. Remove back panel.

2. Remove screws and yellow green ground wire. Trace the electrical leads of fan motor and disconnect them.

3. Remove the bolts securing the fan motor bracket to the cabinet base and then remove the assembly.

4. To install the replacement fan motor follow the above steps in reverse.

NOTE. *When installing a new fan motor check that the fan blades do not touch any surfaces and move freely.*

K. REPLACEMENT OF PLASTIC CURTAIN

1. Open the storage bin door to gain access to the curtain.

2. Remove the plastic curtain from the clips holding it, and take out.

3. To install the replacement plastic curtain follow the above steps in reverse.

L. REPLACEMENT OF SPRAY PLATFORM AND CHUTE

1. Follow the steps in procedure L to remove the plastic curtain.

2. Lift the plastic spray system from the evaporator housing and remove the corbin clamp fastening the plastic hose to the port at the bottom of the spray platform.

3. Disconnect the plastic hose from the spray platform inlet port and remove it.

4. To install the replacement spray platform follow above steps in reverse.

M. REPLACEMENT OF DRIER

1. Remove front and back panels .

2. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

3. Unsolder the refrigerant line and the capillary tube from the two sides of the drier.

4. To install the replacement drier remove factory seals and solder the refrigerant line and the capillary tube taking precautions to NOT OVERHEAT the drier body.

5. Thoroughly evacuate the system to remove moisture and non condensable after drier replacement.

6. Charge the system with refrigerant 22 by weight (see data plate of machine) and check for leaks.

7. Replace panels previously removed.

N. REPLACEMENT OF HOT GAS VALVE BODY

1. Follow the steps in procedures J to remove the hot gas valve coil.

2. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

3. Unsolder the refrigerant lines from the hot gas valve body and remove it from the unit.

NOTE. *Always install a replacement drier whenever the sealed refrigeration system is open.*
Do not replace the drier until all other repairs or replacements have been completed.

4. To install the replacement hot gas valve body follow the above steps in reverse.

NOTE. *Thoroughly evacuate the system to remove moisture and non condensables after hot gas valve replacement.*

O. REPLACEMENT OF EVAPORATOR PLATEN

1. Remove front top and rear panels.

2. Remove the plastic cover from the upper part of the evaporator platen.

3. Remove the evaporator sensor probe taking off the two metal clips securing it to the evaporator serpentine.

4. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

5. Remove the water inlet copper tube from the evaporator chamber after unloosing the appropriate screws.

6. Unsolder and disconnect the capillary tube and hot gas line from one serpentine of evaporator and the suction discharge line from the other serpentine.

7. Lift the evaporator platen assembly out of its seat.

NOTE. *Always install a replacement drier whenever the sealed refrigeration system is open.*
Do not replace the drier until all other repairs or replacements have been completed.

8. To install the replacement evaporator follow the above steps in reverse.

NOTE. *Thoroughly evacuate the system to remove moisture and non condensables after evaporator replacement.*

P. REPLACEMENT OF AIR COOLED CONDENSER

1. Remove front and rear panels.

2. Remove the two bolts attaching the condenser to the base.

3. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

4. Unsolder the refrigerant lines from the condenser and remove it from the unit.

NOTE. *Always install a replacement drier whenever the sealed refrigeration system is open.*
Do not replace the drier until all other repairs or replacements have been completed.

5. To install the replacement condenser follow the above steps in reverse.

NOTE. *Thoroughly evacuate the system to remove moisture and non condensables after condenser replacement.*

Q. REPLACEMENT OF HI PRESSURE CONTROL (Water cooled models)

1. Remove front and rear panels.

2. Remove screws which secure the hi pressure control to the unit frame.

3. Disconnect the terminal wires from the hi pressure control.

4. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

5. Trace the hi pressure control capillary tube and unsolder and disconnect it from the refrigerant system.

NOTE. *Always install a replacement drier whenever the sealed refrigeration system is open.*
Do not replace the drier until all other repairs or replacements have been completed.

6. To install the replacement hi pressure control follow the above steps in reverse.

NOTE. *Thoroughly evacuate the system to remove moisture and non condensables after hi pressure control replacement.*

R. REPLACEMENT OF WATER COOLED CONDENSER

1. Remove front and rear panels.

2. Remove bolts which secure the condenser to the unit base.

3. Remove the corbin clamps and disconnect the plastic hoses from the water cooled condenser.

4. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

5. Unsolder the refrigerant lines from the condenser and remove it from the unit.

> **NOTE.** *Always install a replacement drier whenever the sealed refrigeration system is open.*
> *Do not replace the drier until all other repairs or replacements have been completed.*

6. To install the replacement condenser follow the above steps in reverse.

> **NOTE.** *Thoroughly evacuate the system to remove moisture and non condensables after condenser replacement.*

S. REPLACEMENT OF COMPRESSOR

1. Remove front and rear panels.

2. Remove the cover and disconnect the electrical leads from the compressor junction box.

3. Recover the refrigerant from the system and transfer it in a container so to reclaim or recycle it.

4. Unsolder and disconnect both the suction line and the discharge line from the compressor.

5. Remove the four compressor mounting bolts and the compressor from the unit base.

> **NOTE.** *Always install a replacement drier whenever the sealed refrigeration system is open.*
> *Do not replace the drier until all other repairs or replacements have been completed.*

6. To install the replacement compressor follow the above steps in reverse.

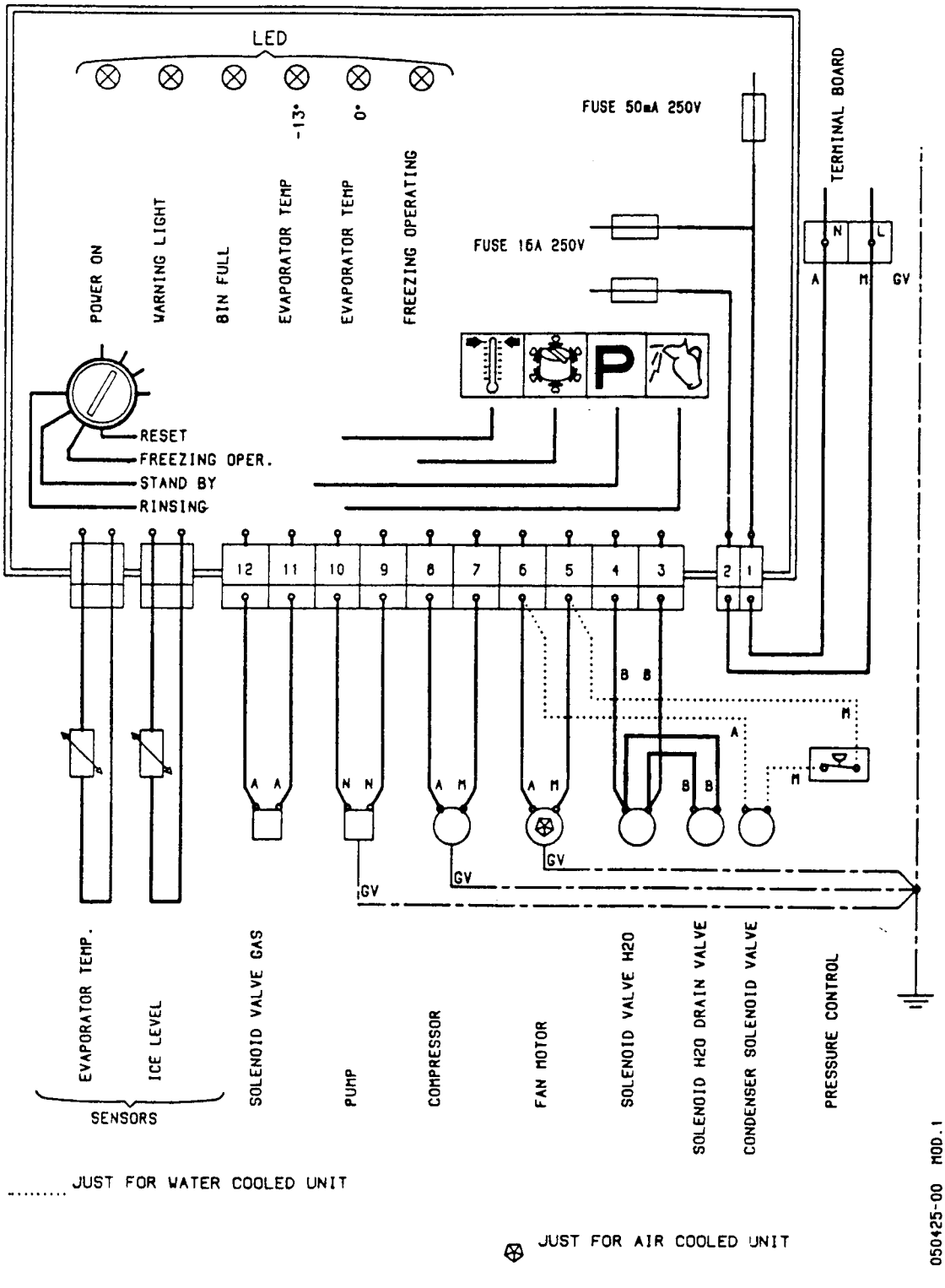
> **NOTE.** *Thoroughly evacuate the system to remove moisture and non condensables after compressor replacement.*

WIRING DIAGRAM

ACM 45-55 -AIR AND WATER COOLED - 220-240/50/1

The unit is shown on freezing cycle

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



SERVICE DIAGNOSIS

SYMPTON	POSSIBLE CAUSE	SUGGESTED CORRECTION
Unit will not run (No warning LEDS glows)	Blown fuse in P.C.Board	Replace fuse & check for cause of blown fuse
	Main switch in OFF position	Turn switch to ON position
	Burn-out transformer	Replace P.C. Board
	Inoperative P.C.Board	Replace P.C.Board
	Loose electrical connections	Check wiring
(Green LED-Power ON glows)	P.C.Board selector in STAND BY	Move to OPERATING position
	Blow 16 A fuse in P.C. Board	Replace fuse
(Bin full LED glows)	Inoperative ice level control	Replace ice level control
(Red-alarm LED glows)	Evaporator sensor unplugged	Check for properly plug
	Evaporator sensor out of order	Check with an ohmmeter for electrical conductivity. If zero or infinitive replace it
	Evaporator sensor probe loose on its cable	Replace it
	Compressor doesn't run	Check for power on compressor PC Board outlet. If so replace compressor. If not replace PC Board.
	Fan motor doesn't run during freezing	Replace fan motor
	Hot gas valve open during freezing	Replace hot gas valve
	Water inlet valve open during freezing	Replace water inlet valve
	No water to the water cooled condenser	Check for correct operation of water solenoid valve Check for cleannes of water inlet valve strainer Check for cleannes of water inlet valve flow control Check for shortage of water Check for correct operation of pressure control (Cut in at 10 bar - 140 psi)
Compressor cycles intermittently	Low voltage	Check circuit for overloading Check voltage at the supply to the building. If low, contact the power company
	Non-condensable gas in system	Purge the system
	Compressor starting device with loose wires	Check for loose wires in starting device
Cubes too small	Freezing cycle too short	Review setting of DIP SWITCH keys
	Capillary tube partially restricted	Blow charge, add new gas & drier, after evacuating system with vacuum pump
	Moisture in the system	Same as above
	Shortage of water	See remedies for shortage of water
	Shortage of refrigerant	Check for leaks & recharge
	Inoperative evaporator sensor	Replace sensor

SERVICE DIAGNOSIS

SYMPTON	POSSIBLE CAUSE	SUGGESTED CORRECTION
Cloudy cubes	Shortage of water	See remedies for shortage of water
	Dirty water supply	Use water softner or water filter
	Accumulated impurities	Use SCOTSMAN Ice Machine cleaner
Shortage of water	Water spilling out through curtain	Check or replace curtain
	Water solenoid valve not opening	Replace valve
	Water leak in sump area	Locate and repair
	Water flow control plugged	Remove and clean
Irregular cubes size & some cloudy	Some jets plugged	Remove jet cover and clean
	Shortage of water	See shortage of water
	Unit not levelled	Level as required
Cubes too large	Freezing cycle too long	Review setting of DIP SWITCH keys
	Inoperative evaporator sensor	Replace sensor
Decreased ice capacity	Inefficient compressor	Replace
	Leaky water valve	Repair or replace
	Non-condensable gas in system	Purge the system
	Poor air circulation or excessive hot location (Red-alarm LED glows)	Relocate the unit or provide for more ventilation
	Overcharge of refrigerant	Correct the charge. Purge off slowly
	Capillary tube partially restricted	Blow charge, add new gas & drier, after evacuating system with vacuum pump
	Undercharge of refrigerant	Charge to data plate indication
	Discharge head pressure too high	See incorrect discharge pressure
Poor harvest	Restriction in incoming water line	Check water valve strainer and flow control. If necessary enlarge the flow control orifice
	Water inlet valve not opening	Valve coil with open winding Replace valve
	Hot gas valve orifice restricted	Replace hot gas valve assy
	Air vented holes in mold cups plugged	Clean out holes
	Discharge head pressure too low	See incorrect discharge pressure
Unit won't harvest	Inoperative P.C.Board	Replace P.C.Board
	Hot gas valve not opening	Valve coil with open winding Replace valve
	Water solenoid valve not opening	Valve coil with open winding Replace valve
Incorrect discharge pressure	Inoperative fan motor (Air cooled)	Replace
	Inoperative hi press control (Water cooled)	Replace
	Water inlet valve to condenser clogged or inoperative	Clean or replace
Excessive water in unit base	Water tubing leaking	Check. Tighten or replace

MAINTENANCE AND CLEANING INSTRUCTIONS

A. GENERAL

The periods and the procedures for maintenance and cleaning are given as guides and are not to be construed as absolute or invariable.
Cleaning, especially, will vary depending upon local water and ambient conditions and the ice volume produced; and, each icemaker must be maintened individually, in accordance with its particular location requirements.

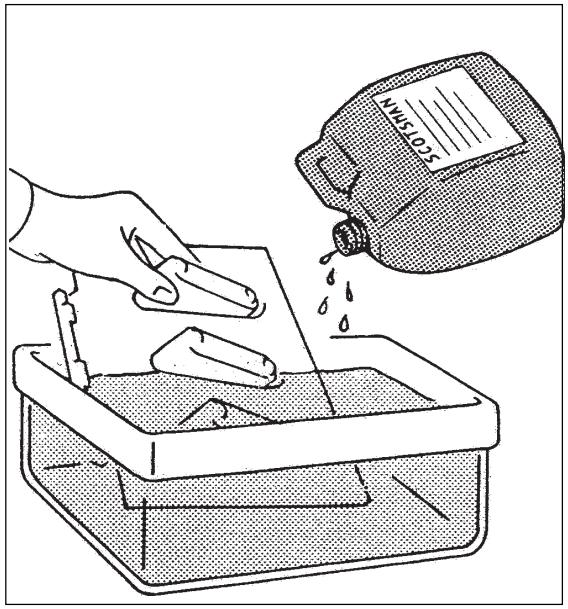
B. ICEMAKER

The following maintenance should be scheduled at least two times per year on these icemakers.

1. Check and clean the water line strainer.

2. Check that the icemaker is levelled in side to side and in front to rear directions.

3. Clean the water system, the evaporator, the bin and spray platen using a solution of SCOTSMAN Ice Machine Cleaner.
Refer to procedure C cleaning instructions and after cleaning will indicate frequency and procedure to be followed in local areas.



NOTE. *Cleaning requirements vary according to the local water conditions and individual user operation. Continuous check of the clarity of ice cubes and visual inspection of the water spraying parts before and after cleaning will indicate frequency and procedure to be followed in local areas.*

4. With the ice machine and fan motor OFF on air cooled models, clean condenser using vacuum cleaner, whisk broom or non metallic brush.

5. Check for water leaks and tighten drain line connections. Pour water down bin drain line to be sure that drain line is open and clear.

6. Check size, condition and texture of ice cubes. Perform adjustment of DIP SWITCH keys as required.

7. Check the ice level control sensor to test shut-off.
Put a showelfull of ice cubes in contact with the control sensor for at least one minute.
This should cause the ice maker to shut off and the light up of the 3rd RED LED.

IMPORTANT. Perform the above check only at the end of harvest cycle or at the beginning of freezing cycle in order to do not cause to the unit to make a double freezing cycle.

Within few seconds after the removal of the showelfull of ice from the sensing probe, the icemaker restarts in freezing cycle.

NOTE. *The RANGE OF THE ICE LEVEL CONTROL SENSOR can be adjusted as shown on table D of PRINCIPLE OF OPERATION; its cut out setting remains however at +2°C (35°F).*

8. Check for refrigerant leaks.

C. 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. Wait till the end of defrost cycle then, with the help of a normal screwdriver, turn the program selector head on **STAND BY** position to temporaly stop the operation (Fig.8).

3. 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 **SCOTSMAN** Ice Machine Cleaner.

WARNING. The SCOTSMAN 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

4. Scoop out all the ice cubes stored into the bin in order to prevent them from being contaminated with the cleaning solution then flush out the water from the sump reservoir by removing the overflow stand-pipe.

5. 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.

6. Set the program selector head on **CLEANING/RINSING** (Fig. 9).

NOTE. *With the system in CLEANING/RINSING mode the water pump is the only component in operation to circulate the cleaning solution in the entire water system.*

7. Let the unit to remain in the **CLEANING/RINSING** mode for about 20 minutes then turn the program selector on **STAND BY** again.

8. 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.
If necessary remove the water spray platen to clean it separately as per step 3 of paragraph B.

9. Turn again the program selector on **CLEANING/RINSING.** The water pump is again in operation to circulate the water in order to rinse the entire water system.

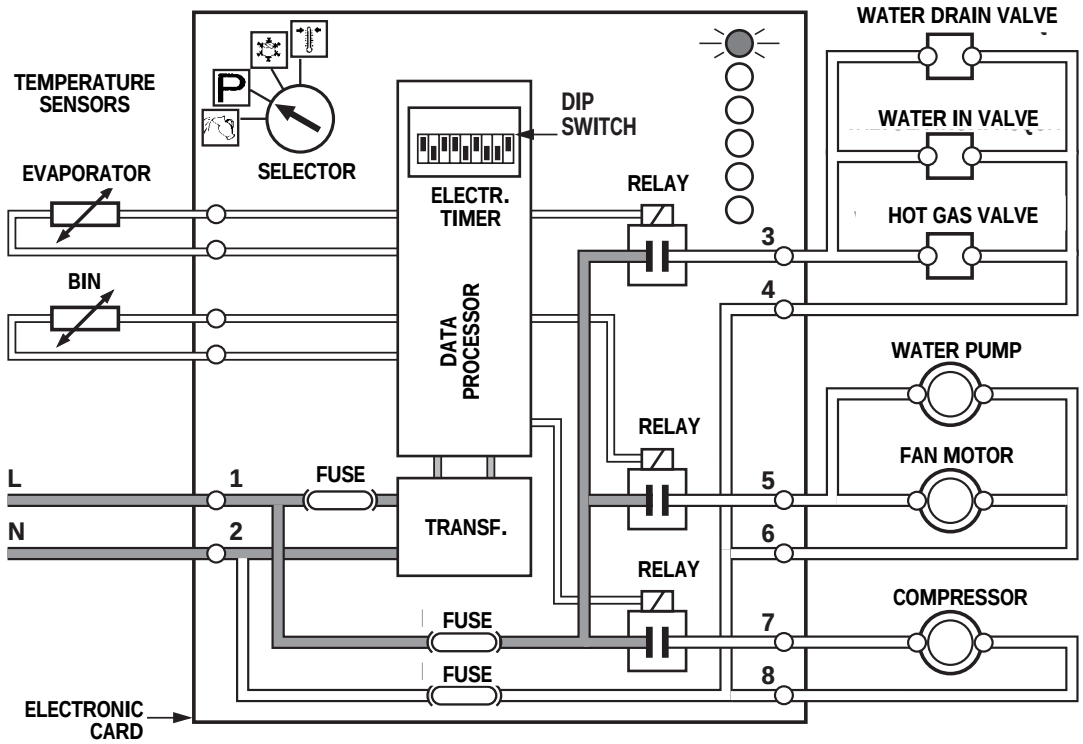
10. Do it twice so to be sure no more traces of descaling solution remains into the sump.

11. Pour on the upper side of the evaporator platen fresh water with a capfull of disinfectant solution then turn again the machine in cleaning mode so to sanitize all the water system for approx. 10 minutes.

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

12. Flush out the disinfectant solution from the sump reservoir then turn the program selector

FIG. 8



on **RESET/HI TEMPERATURE** position and immediately afterward to **FREEZING OPERATION.**

NOTE. *By setting the selector on **RE-SET** first and then to **FREEZING OPERATION** the ice maker will perform the 5 minutes WATER FILLING phase i.e. the water inlet solenoid valve opens to allow the incoming water to rinse again the water system and to properly fill-up the sump reservoir for the next freezing cycl*e.

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

14. 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.

15. 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.*

FIG. 9