SCOTSMAN®

SERVICE MANUAL

CD 40

R 134 A VERSION

Cube Dispenser

001000.41 - REV. 03/2001

INDICE

SPECIFICATIONS

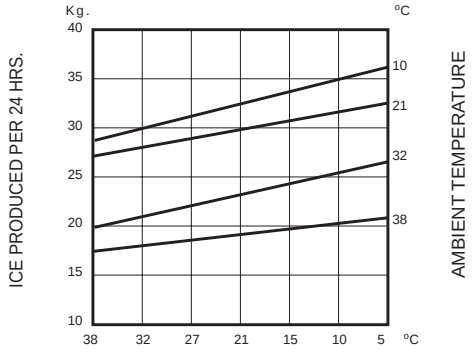
ELECTRONIC CUBE DISPENSER

Important operating requirements:

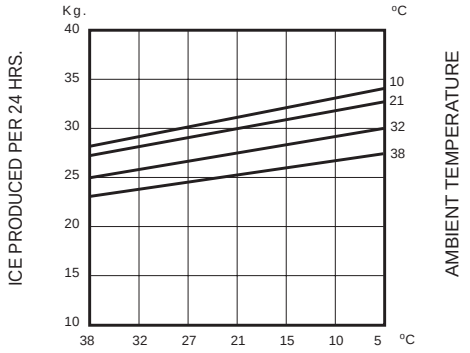
	MIN.	MAX.
Air temperature	10°C	40°C
Water temperature	5°C	40°C
Water pressure	1 bar	5 bar
Electr. voltage variations from voltage rating specified on nameplate	-10%	+10%

ice making capacity

AIR COOLED MODELS

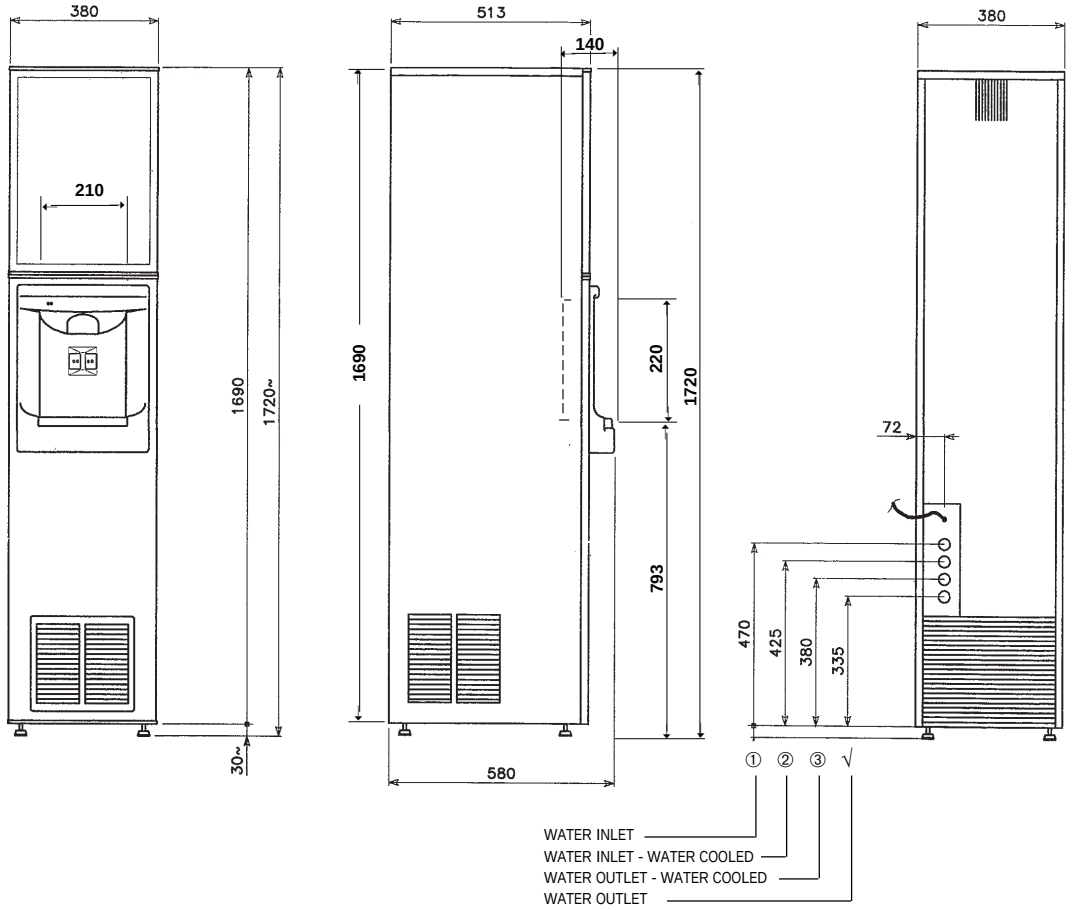


WATER COOLED MODELS



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 CUBER at peak performance levels, periodic maintenance checks must be carried out as indicated on page 22 of this manual.

SPECIFICATIONS



Dimensions:

HEIGHT	1720 mm.
WIDTH	380 mm.
DEPTH	510 mm.
WEIGHT	73 Kgs.

CUBE DISPENSER
machine specifications

Cond. unit	Finish	Comp. HP	Capacity the cold store	Water req. lt/24 HR
Air Water	Stainless stell	3/8	15 Kg.	140 380*

Basic electr.	Amps	Watts	Electric power cons. Kwh per 24 Hr	Nr. of wires	Amps fuse
230/50/1	3.2	500	10	3 x 1 m/m^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 Cube Dispenser.
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.
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 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 top and upper front panel then 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 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 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 icemakers require a solid earth wire.

All 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 the flexible tube 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.
If water contains a high level of impurities, it is advisable to consider the use of an appropriate water filter or conditioner.

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 COOLED MODELS

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.

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?

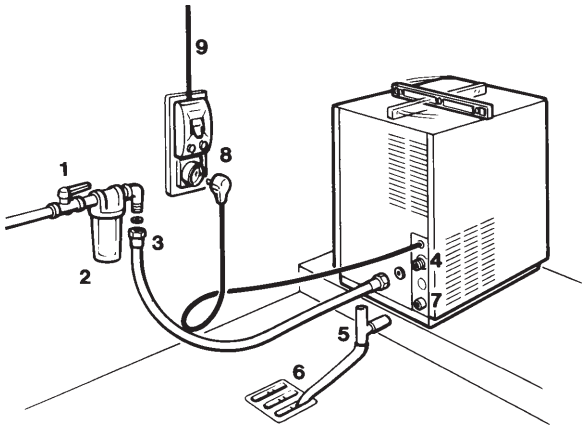
9. Have the bin liner and cabinet been wiped clean?

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 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

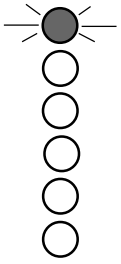
After having correctly installed the ice maker and completed the plumbing and electrical connections, perform the following "Start-up" procedure.

A. Remove top and upper front panel to be sure that the tapes securing the curtain and the spray platen to the evaporator chamber have been removed.

B. Give power to the unit to start it up by switching "ON" the power line main disconnect switch.
The **1st GREEN LED** will glow together with the GREEN LED located in the front of the cube dispenser.

NOTE. *Every time the unit returns under power, after having been switched off, both the water inlet valve and the hot gas 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).*

FIG. 1



C. 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 VALVE

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.

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

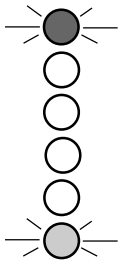
COMPRESSOR

WATER PUMP

FAN MOTOR
(in air cooled version)

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

FIG. 2



OPERATIONAL CHECKS

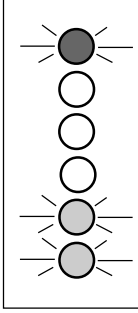
E. Install, if necessary, the refrigerant service gauges on both the high side and low side service valves to check the compressor head and suction pressures.

NOTE. *On air cooled models the head (condensing) pressure is kept between 8 and 10 bar (110 and 140 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 at 9 bar (125 psig) by a water regulating valve.

F. 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.

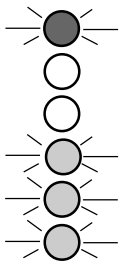
G. The ice making process takes place thereby, with the water sprayed into the molds that gets gradually refrigerated by the heat exchange occuring with the refrigerant flowing into the evaporator serpentine.
During the freezing process, when the evaporator temperature falls to reach **0°C (32°F)** the 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



H. The unit remains however in its normal freezing cycle mode untill the evaporator temperature detected by the sensor reaches the temperature of **-16°C (3°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.

FIG. 4



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 -16°C (3°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.*

I. 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.
The electrical components in operation in this new situation are:

COMPRESSOR

WATER INLET SOLENOID VALVE

HOT GAS VALVE

WATER DRAIN VALVE

and

WATER PUMP for the first 15 seconds.

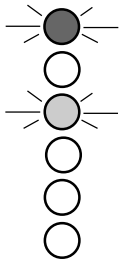
NOTE. *The length of the defrost cycle (not adjustable) is automatically determinated by the micro processor of P.C.BOARD in relation of the time **T2** necessary for the unit to reduce the evaporator temperature from 0°C (32°F) to -16°C (3°F) as illustrated in Table B of PRINCIPLE OF OPERATION.*
*As 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.*

J. 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.

K. 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.

L. To be sure of the correct operation of ice level temperature sensor located in one side of storage bin liner, place during tho defrost cycle one shovel of ice cubes in contact with its probe.
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 just at the end of the defrost cycle with the simul-taneous glowing of the **3rd RED LIGHT**, to monitor the **BIN FULL** situation (Fig.5). 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. 5



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).*

M. Remove if fitted the refrigerant service gauges and re-fit the unit service panels previously removed.

N. Instruct the owner/user on the general operation of the ice machine and about the cleaning and care it requires.

O. To check for the correct operation of the dispensing system place one hand or an ice bucket close to the photoelectric sensor located on the front side of the dispensing compartment. The auger motor starts immediately turning the dispensing auger till the photoelectric sensor is activated by the hand.

NOTE. *The P.C. Board is adjusted to provide power to the auger motor for a maximum of 15 seconds just to avoid to overfill the ice bucket when left in the dispensing compartment.*

The yellow LED, located beside the green one, is lighted ON while the auger motor is energized.

PRINCIPLE OF OPERATION

How it works

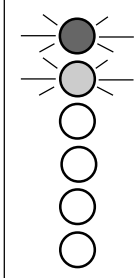
In the cube ice makers the water used to make the ice is kept constantly in circulation by an electric water pump which primes it to the spray system nozzles from where it is diverted into the inverted mold cups of the evaporator (Fig. A).
A small quantity of the sprayed water freezes into ice; the rest 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. 6).*
*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. 6



The length of the second portion 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 -16°C (3°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**.*
*Also in this case, after having eliminated the source of the trip off, to restart the machine it is necessary first to rotate the program selector on **RE-SET** position then put it again on **OPERATION** or, switch OFF and ON the unit at power line Main Switch.*

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 **-16°C (3°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 different versions as they are set in the factory.

FIG. A

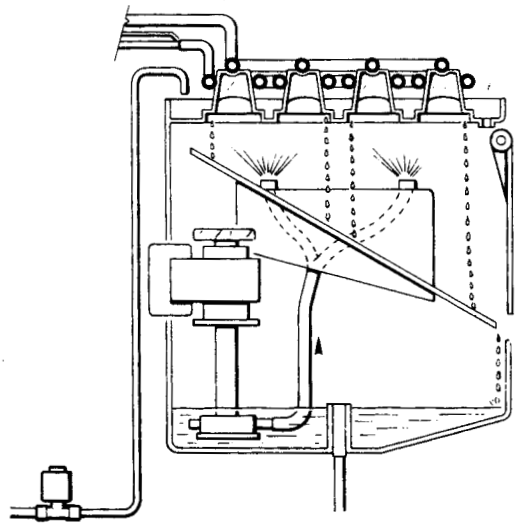


FIG. B

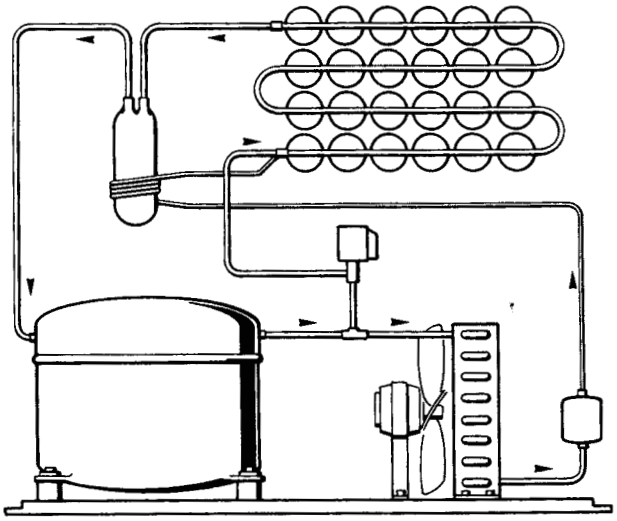


FIG. C

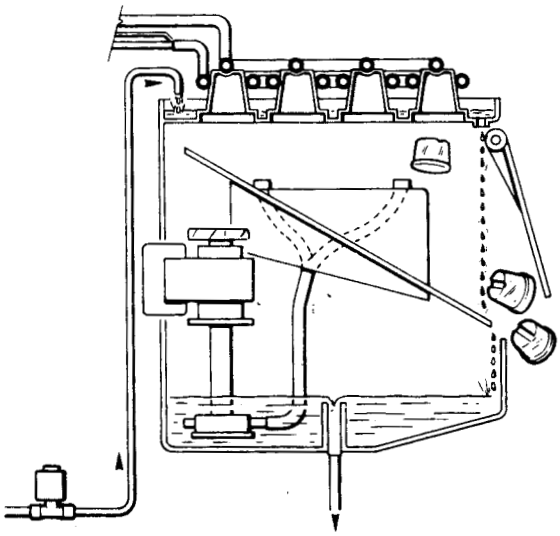
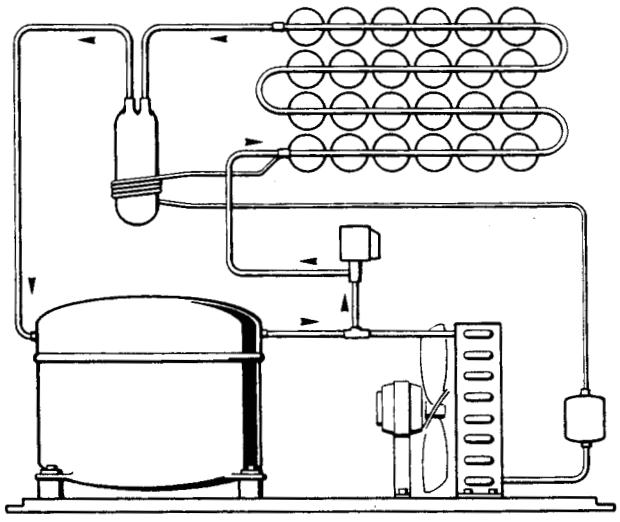


FIG.D



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. **10 bar (140 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. **8 bar (110 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 is stable at **9 bar (125 psig)** being controlled by a water regulating valve.

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 bar (14psig)** 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÷2 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 VALVE

and

WATER PUMP for the first 15 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.
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** .*

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.

TAB. A **DIP SWITCH KEYS FACTORY SETTING COMBINATIONS**

DIP SWITCH	1	2	3	4	5	6	7	8	9	10
Air Cooled	ON	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF
Water cooled	ON	OFF	OFF	ON	OFF	OFF	ON	ON	ON	OFF

OPERATION - ELECTRICAL SEQUENCE

The following charts illustrate which switches and which components are ON or OFF during a particular phase of the icemaking cycle.

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
Water Drain 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	•	

HARVEST
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 and 10 bar (110÷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: 8÷10 bar (110÷140 psig)

Average Discharge Pressure
W/C: 9 bar (125 psig)

Suction Pressure
End Freeze Cycle: 0÷0.1 bar (0÷2 psig)

REFRIGERANT METERING DEVICE:

capillary tube

REFRIGERANT CHARGE (R 134a)

Air Cooled	Water Cooled
320 gr (11.5 oz)	280 gr (10 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 **just at the end of 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. PHOTOELECTRIC SENSOR

The photoelectric sensor, located behind the dispenser plastic panel, is electrically connected to the P.C. BOARD so to provide power to the auger drive motor when the ice backet is place close to its sensitivity probe.
As soon as the ice backet is removed from the dispensing compartment the auger motor stops immediately.

> **NOTE.** *Maximum continuous operating time of the auger motor is 15 seconds controlled by the P.C. BOARD.*

D. P.C. BOARD (Data processor)

The P.C. BOARD, fitted in its plastic box located in the rear 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 three 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 -16°C (3°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.

E. 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.

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.

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"

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

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** is used to control the -13°C (9°F) evaporating temperature and must be left **always in OFF position**.

F. 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.

G. 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.
It is recommended that the pump motor bearings be checked at least every six months.

H. 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.

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. FAN MOTOR (Air cooled version)

The fan motor, electrically connected to the head pressure control, operates during 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.

K. 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.

L. AUGER DRIVE MOTOR

The Auger Motor electrically connected to the PC BOARD is located behind the upper front panel and is used to move the ice cubes towards the dispensing chute placed on the upper side of the dispensing system.

M. WATER REGULATING VALVE

This valve controls the head pressure in the refrigerant system by regulating the flow of water going to the condenser.
As pressure increases, the water regulating valve opens to increase the flow of cooling water.

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

ADJUSTMENT 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.

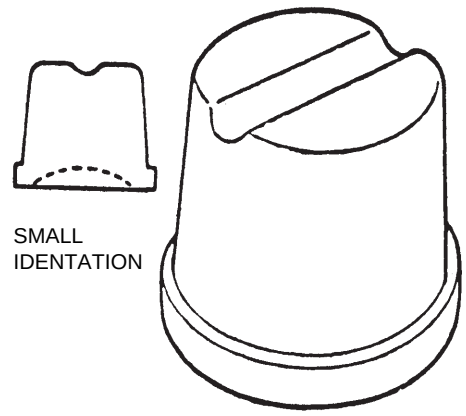
4. Observe the ice cubes in the next two harvests and eventually repeat steps 2 and 3 above until proper ice cubes size is achieved. See figure.

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:

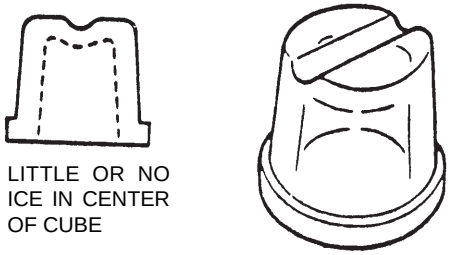
1. Locate the DIP SWITCH on the front of the P.C.Board.

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.

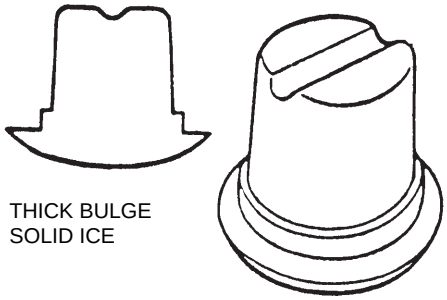
3. Change the same DIP SWITCH KEYS setting so that it will correspond to the combination on table C pre-ceding the one remarked at step 2.
This will reduce an the freezing cycle length of one minute.



NORMAL SIZE-AHAPE



SHALLOW SIZE



OVER SIZE

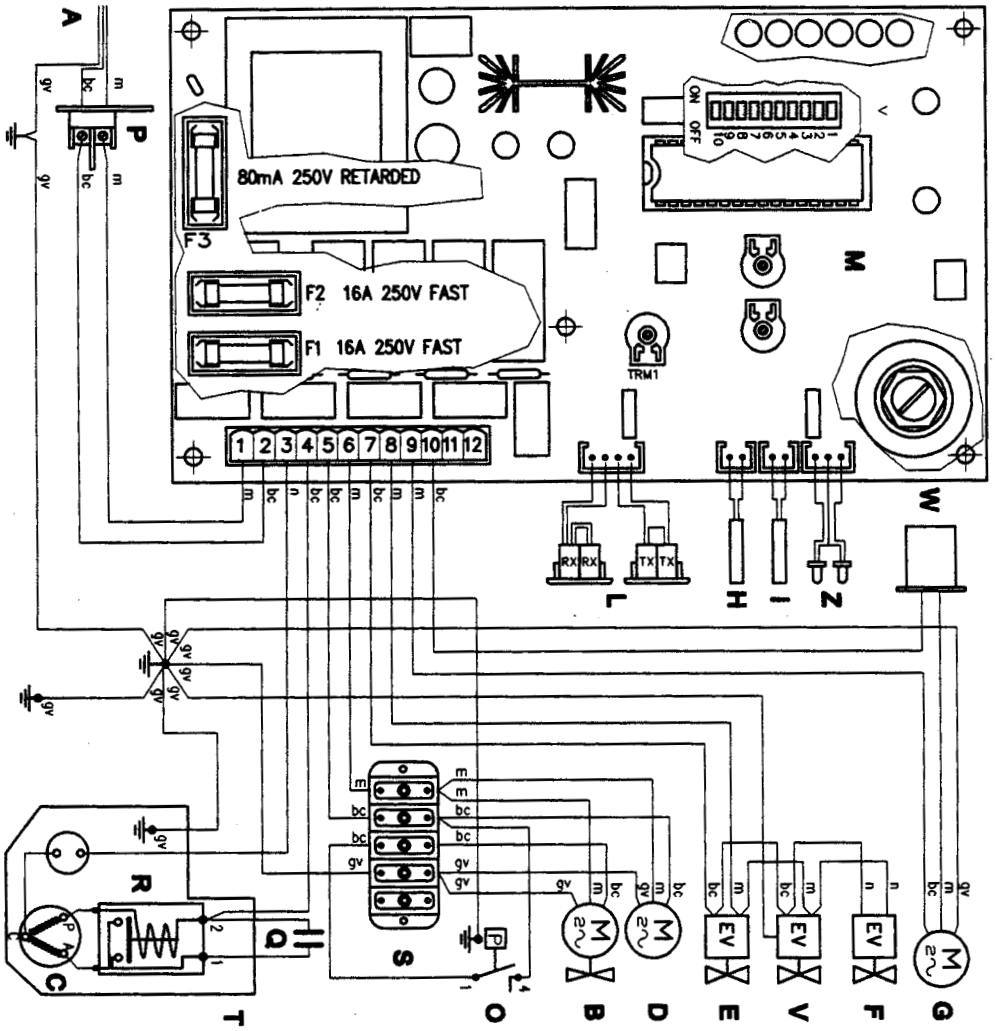
4. Observe the ice cubes in the next two harvests and repeat eventually steps 2 and 3 above until proper ice cubes size is achieved. See figure.

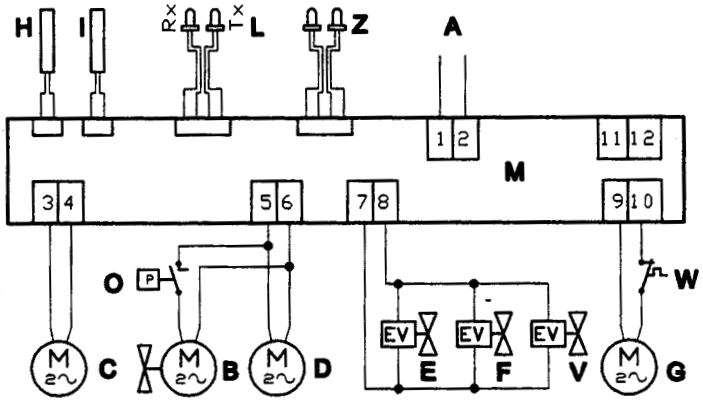
WIRING DIAGRAM

AIR COOLED - 230/50/1

COLOUR CABLES

m = brown
n = black
bc = light blue
gv = yellow-green





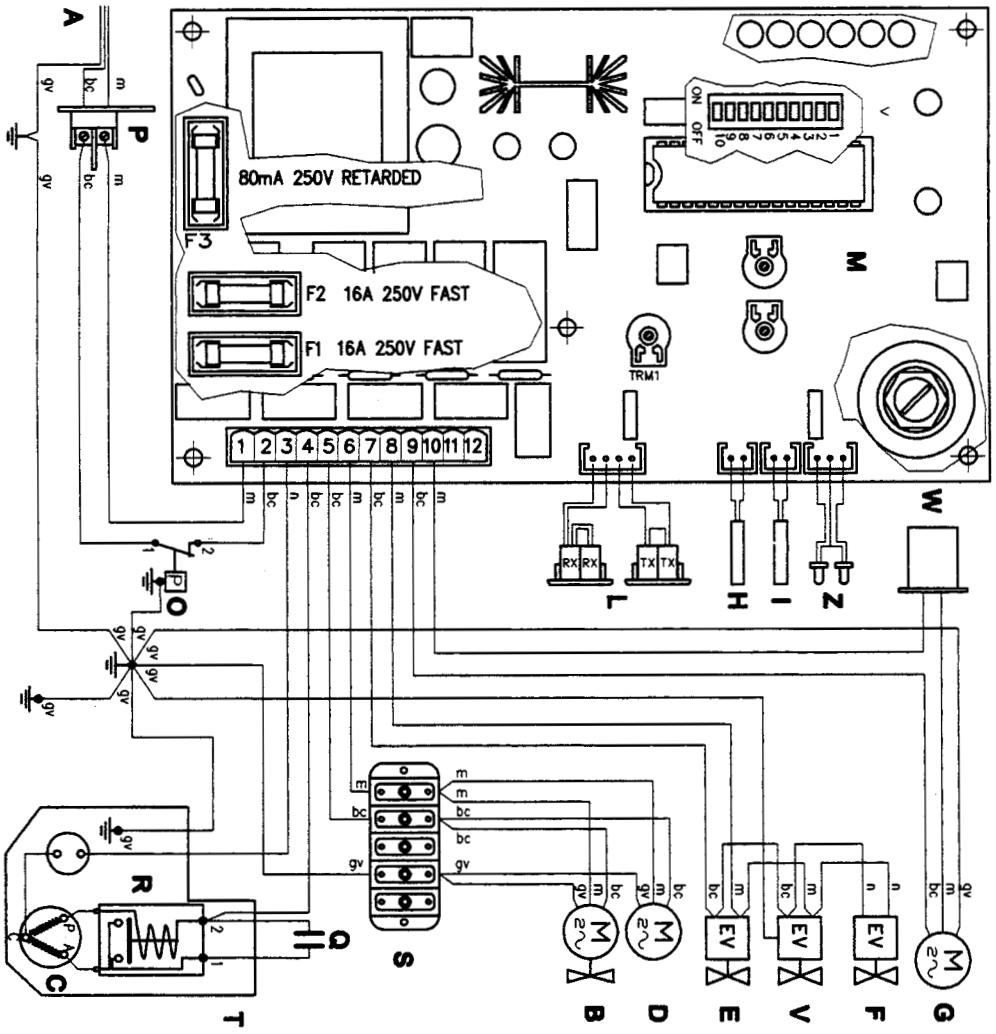
A) POWER CABLE
B) FAN MOTOR
C) COMPRESSOR MOTOR
D) PUMP
E) WATER INPUT EL. VALVE
F) DEFROST EL. VALVE
G) AUGER GEAR-MOTOR
H) BIN TEMP. PROBE
I) EVAPORATOR PROBE
L) ICE PHOTOSWITCHES
M) ELECTRONIC CARD
O) FAN PRESSURE SWITCH
P) ANTI-STRIP
Q) START CAPACITOR
R) START RELAY
S) TERMINAL BOARD
T) COMPRESSOR BOX
V) WATER OUT EL. VALVE
W) THERMOSTAT
Z) LEDS

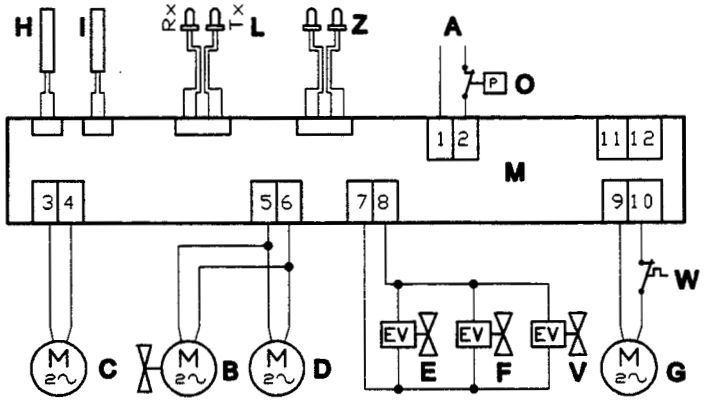
WIRING DIAGRAM

WATER COOLED - 230/50/1

COLOUR CABLES

m = brown
n = black
bc = light blue
gv = yellow-green





A) POWER CABLE
B) FAN MOTOR
C) COMPRESSOR MOTOR
D) PUMP
E) WATER INPUT EL. VALVE
F) DEFROST EL. VALVE
G) AUGER GEAR-MOTOR
H) BIN TEMP. PROBE
I) EVAPORATOR PROBE
L) ICE PHOTOSWITCHES
M) ELECTRONIC CARD
O) MAX PRESSURE SWITCH
P) ANTI-STRIP
Q) START CAPACITOR
R) START RELAY
S) TERMINAL BOARD
T) COMPRESSOR BOX
V) WATER OUT EL. VALVE
W) THERMOSTAT
Z) LEDS

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
	Blown 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. It not replace PC Board.
	Fan motor doesn't run during freezing.	Replace fan motor Check for correct operation of pressure control (Cut in at 10 bar - 140 psi)
	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 inoperative water regulating valve. Check for shortage of water.
Compressor cycles intermittently	Low voltage	Check circuit for overloading Check voltage at the supply to the building. If low, contact the power company
	Contactor with burnt contacts	Clean or replace
	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 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
Cubes too large	Freezing cycle too long	Review setting of DIP SWITCH keys
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
	Hot gas solenoid valve leaking	Replace valve
	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
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.

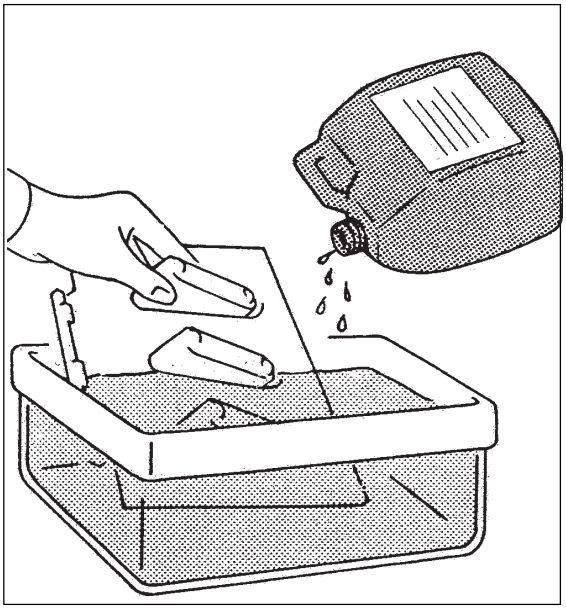
B. ICEMAKER

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 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 handfull of ice cubes in contact with the control sensor during the defrost cycle.
This should cause the ice maker to shut off at the end of the defrost cycle and the light up of the 3rd RED LED.

Within few seconds after the removal of the handfull 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).*

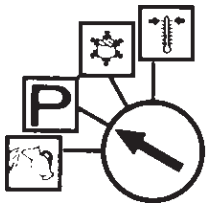
8. Check for refrigerant leaks.

C. CLEANING INSTRUCTIONS OF WATER SYSTEM

1. Remove the rear 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 a screwdriver, turn the program selector head on **STAND BY** position to temporaly stop the operation (Fig.7).

FIG. 7



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

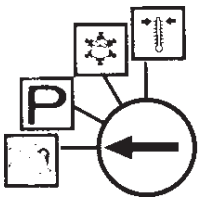
WARNING. The Ice Machine Cleaner contains Phosphoric and Hydroxyacetic acids.
These compounds are corrosive and may cause burns if swallowed, DO NOT induce vomiting. Give large amounts of water or milk. Call Physician immediately.
In case of external contact flush with water. KEEP OUT OF THE REACH OF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

4. Take 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 plastic plug.

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. 8).

FIG. 8



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 disinfectant solution to avoid the generation of a very aggressive acid.*

12. Flush out the sump reservoir then turn the program selector 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.*