Scotsman®
Ice Systems

Full Cube – 12 gr Half Cube – 6 gr

NW(H) SERIES DICE & HALFDICE CUBERS

TECHNICAL SERVICE TRAINING

Welcome to another Scotsman Technical Service Presentation that cover all NW models

REV. 03/2018

NW(H) 308

Max. Ice production = 147 Kg/24h*

Max. Storage Bin Capacity

- NB 193 = 129 Kg

* 21/10°C = Air & Water Inlet Temperature

NW(H) 508

Max. Ice production = 215 Kg/24h*

Max. Storage Bin Capacity

- NB 193 = 129 Kg

* 21/10°C = Air & Water Inlet Temperature

NW(H) 458

Max. Ice production = 200 Kg/24h*

Max. Storage Bin Capacity

NB 393 = 178 Kg

NB 530 = 243 Kg

* 21/10°C = Air & Water Inlet Temperature

NW(H) 608

Max. Ice production = 280 Kg/24h*

Max. Storage Bin Capacity

NB 393 = 178 Kg

NB 530 = 243 Kg

* 21/10°C = Air & Water Inlet Temperature

NW(H) 1008

Max. Ice production = 456 Kg/24h*

Max. Storage Bin Capacity

NB 530 = 243 Kg

NB 948 = 406 Kg

* 21/10°C = Air & Water Inlet Temperature

TOPICS

On the next slides are shown the following steps by steps procedures:

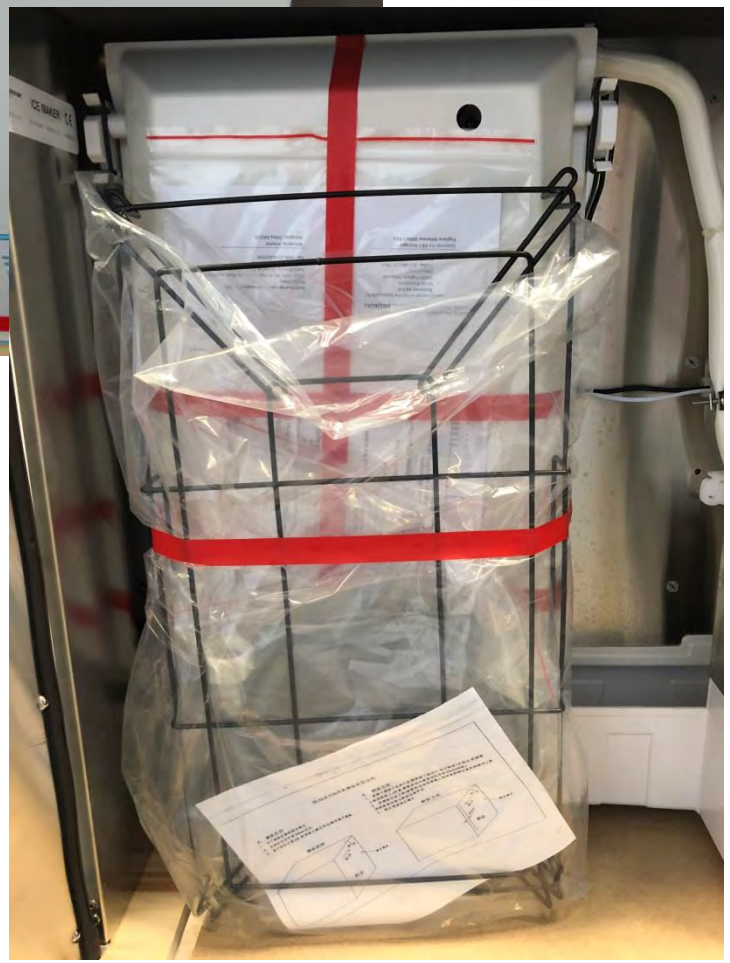
- **UNPACKING**
- **INSTALLATION**
- **START UP AND OPERATIONAL CHECKS**
- **OPERATING PRINCIPLES and COMPONENTS**
- **MAINTENANCE**
- **SERVICE ANALYSIS**

UNPACKING

The machines are supplied in a carton box secured by two plastic strips to a wooden base. Check first the outside conditions of carton box and wooden base then cut the two plastic strips, remove the tape and then the carton box.

Visually inspect the exterior of the machine, then remove the front and both side panels, unscrews the two sides screws that secure the machine to the wooden base

Remove the water inlet and outlet hoses, the red adhesive tapes and the air baffle deflector



NW308 and 508 are equipped with a top grid

Remove the front plastic deflector and take out the second red adhesive tape securing the ice thickness sensor

The Modular NW machines require for the installation the use of a companion storage bin to store the ice produced.

Storage bins required:

- **NB193 with NW 308 - NW 508**
- **NB 393/530 with NW 458 - NW 608**
- **NB 530/948 with NW 1008**

Unpack the storage bin and visually inspect the exterior then remove from the inside the carton box containing the legs as well as the drain hose and the plastic scoop

INSTALLATION

Install the four legs and their adjusting leveling nuts on the bottom base as well as the water drain tube

... install on top of the

same the ice machine

and secure it with the

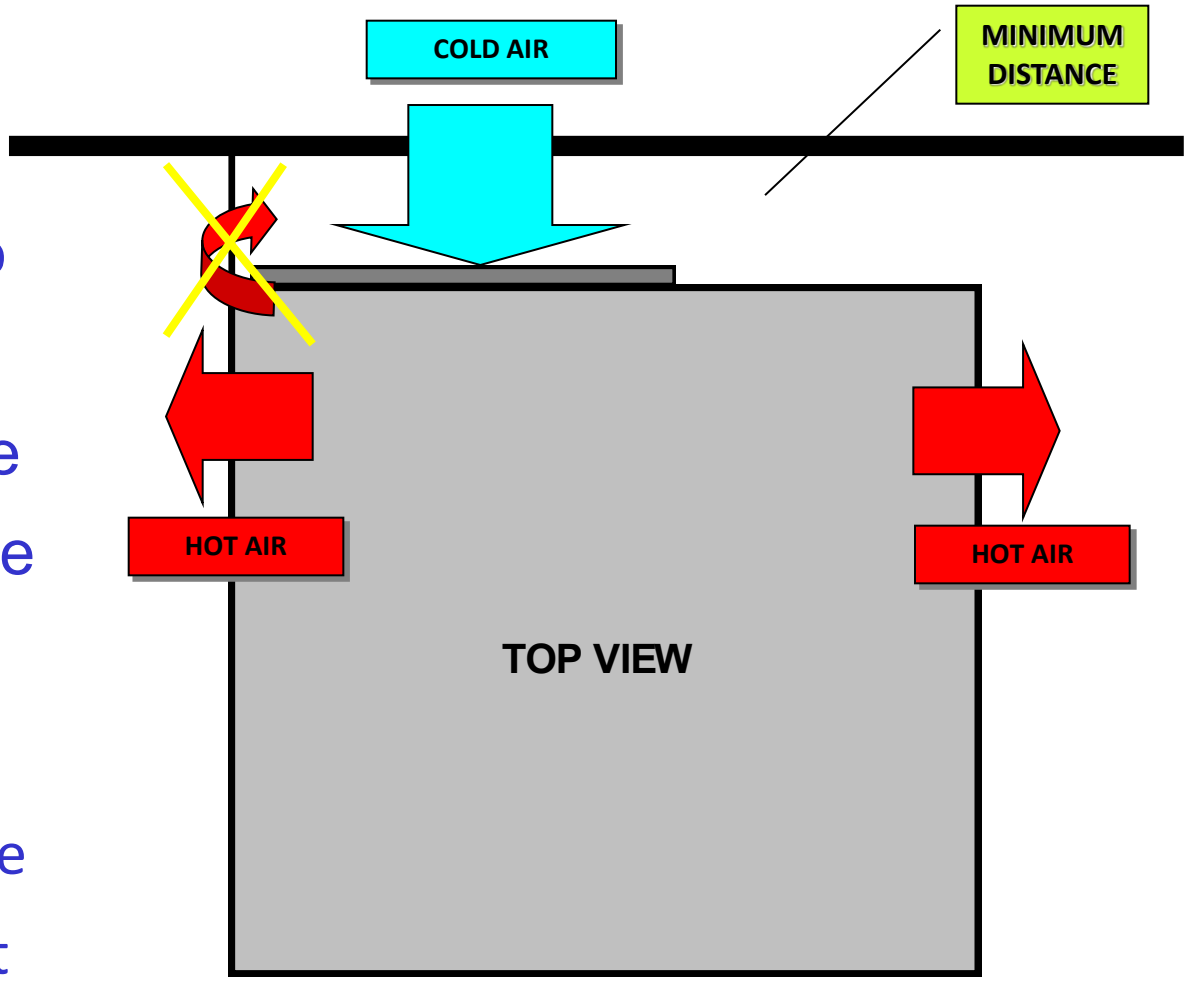
two sides screws.

NW 458-608-1008

On air cooled version unloose a little bit the screws securing the air cooled condenser to the unit frame, then install the metal plate (air baffle) on the back side of the machine

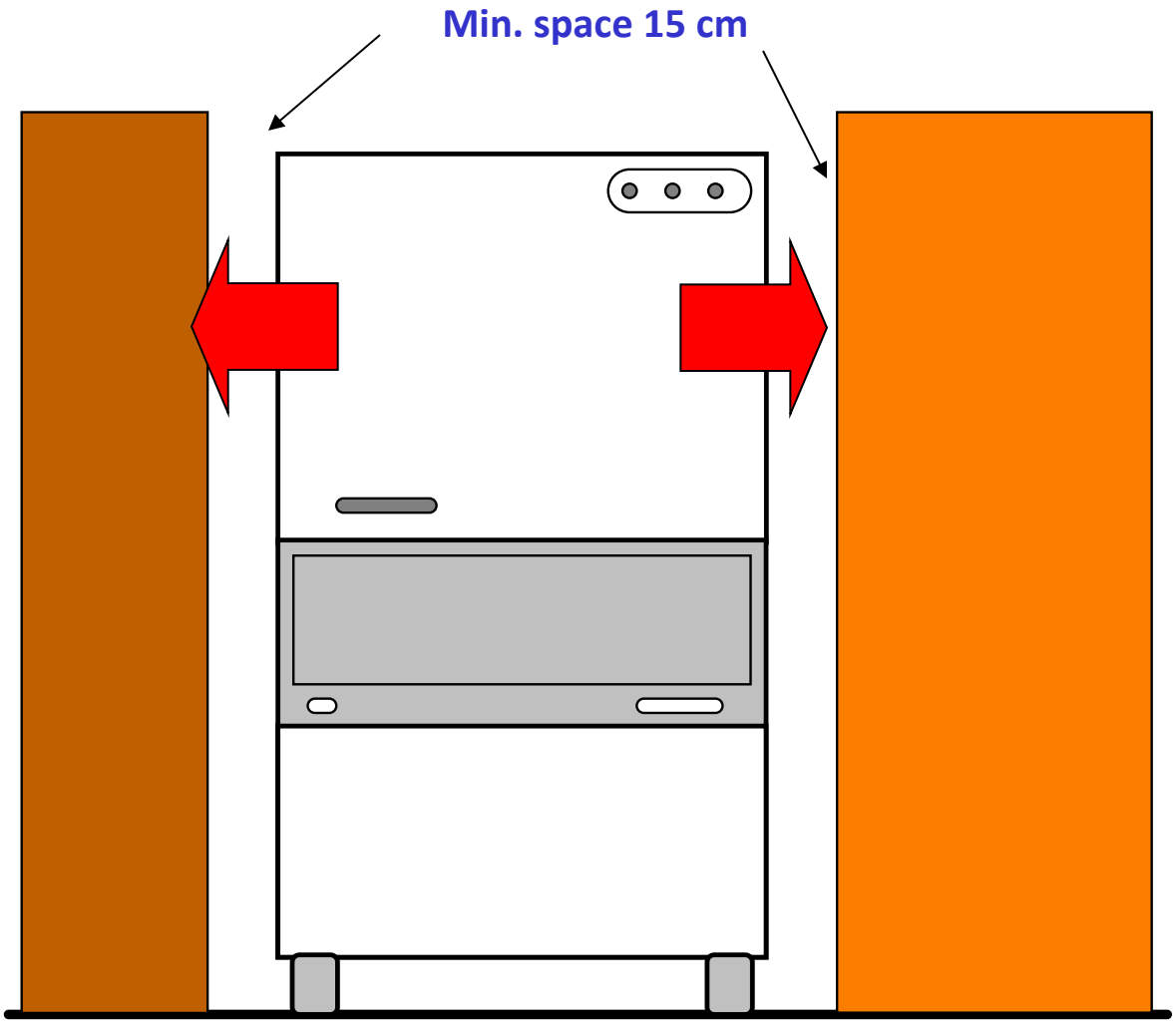
NW 458-608-1008

The installation of the metal plate (air separator) grants also a minimum distance between the back side of the machine and the wall so to assure a correct and adequate ventilation minimize the possible recycling of hot air through the rear panel



NW 458-608-1008

Adequate space must left for proper water and electrical connections on the rear side of the machine and a minimum clearance of 15 cm on right side for best routing air.

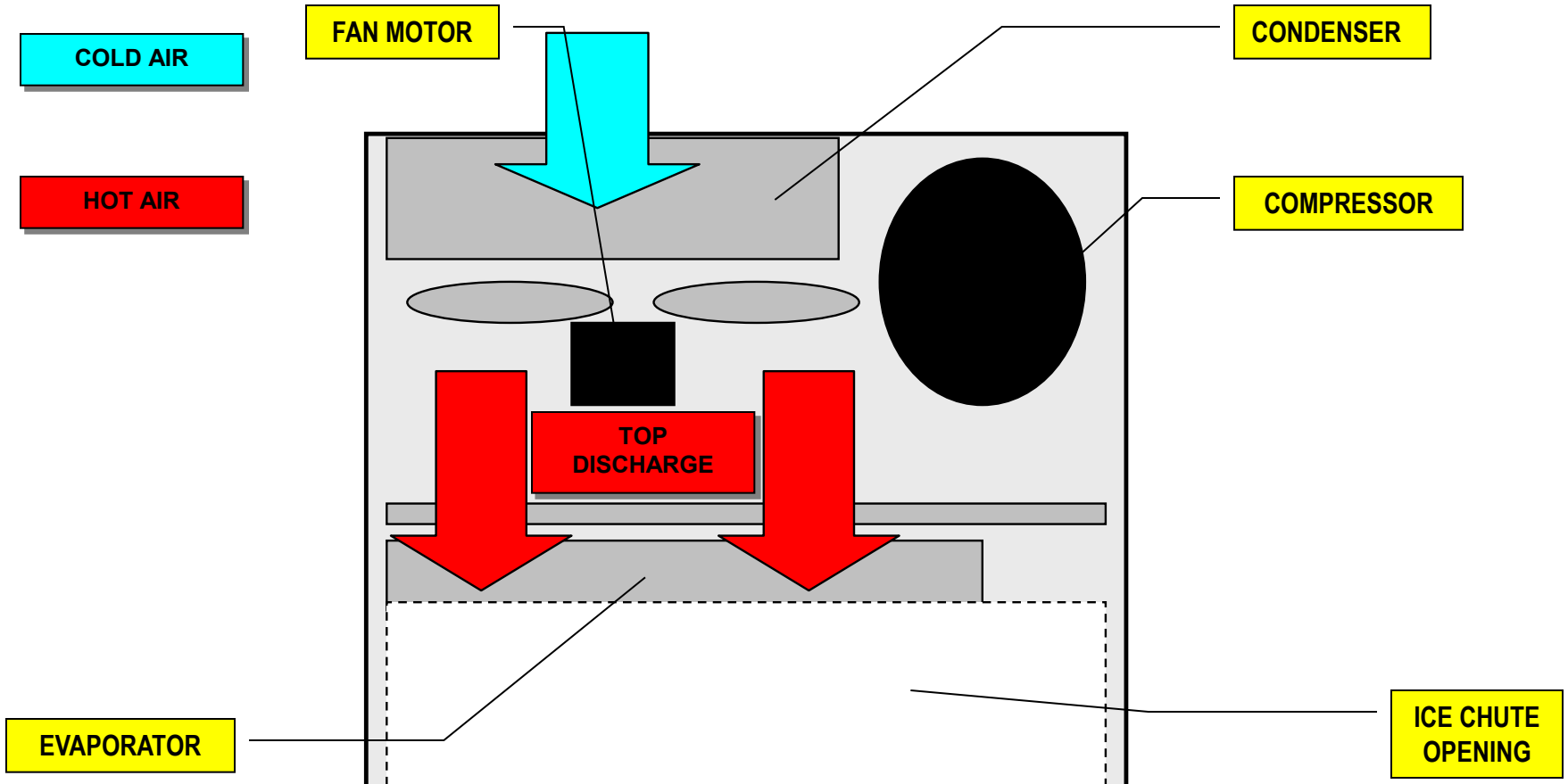


NW 308-508

... install the grids on

top panel

AIR CIRCULATION NW 308-508



NW 308-508 SPACE SAVING VERSION

Hot air exit from the top.

No need of side clearance from walls or other equimpent.

Natural direction of hot air flow, from bottom to top.

Check the data plate of the machine located on the rear panel for correct voltage as well as for the proper wiring/fuse size.

Remember that all machines require a solid earth wire.

Check for the correct water and ambient conditions that should be:

- Min. ambient temperature 10ºC (50F)
- Max. ambient temperature 40ºC (100F)
- Min. water temperature 5ºC (40F)
- Max. water temperature 35ºC (90F)
- Min. water pressure 1 bar (14 PSI)
- Max. water pressure 5 bar (70 PSI)

Level the unit on both directions front to rear and right to left side using the adjustable legs of the storage bin

Install, on the cable supply with the machine, an adequate electrical plug according to the local standards and regulations.

Maximum voltage variation should be ±10%.

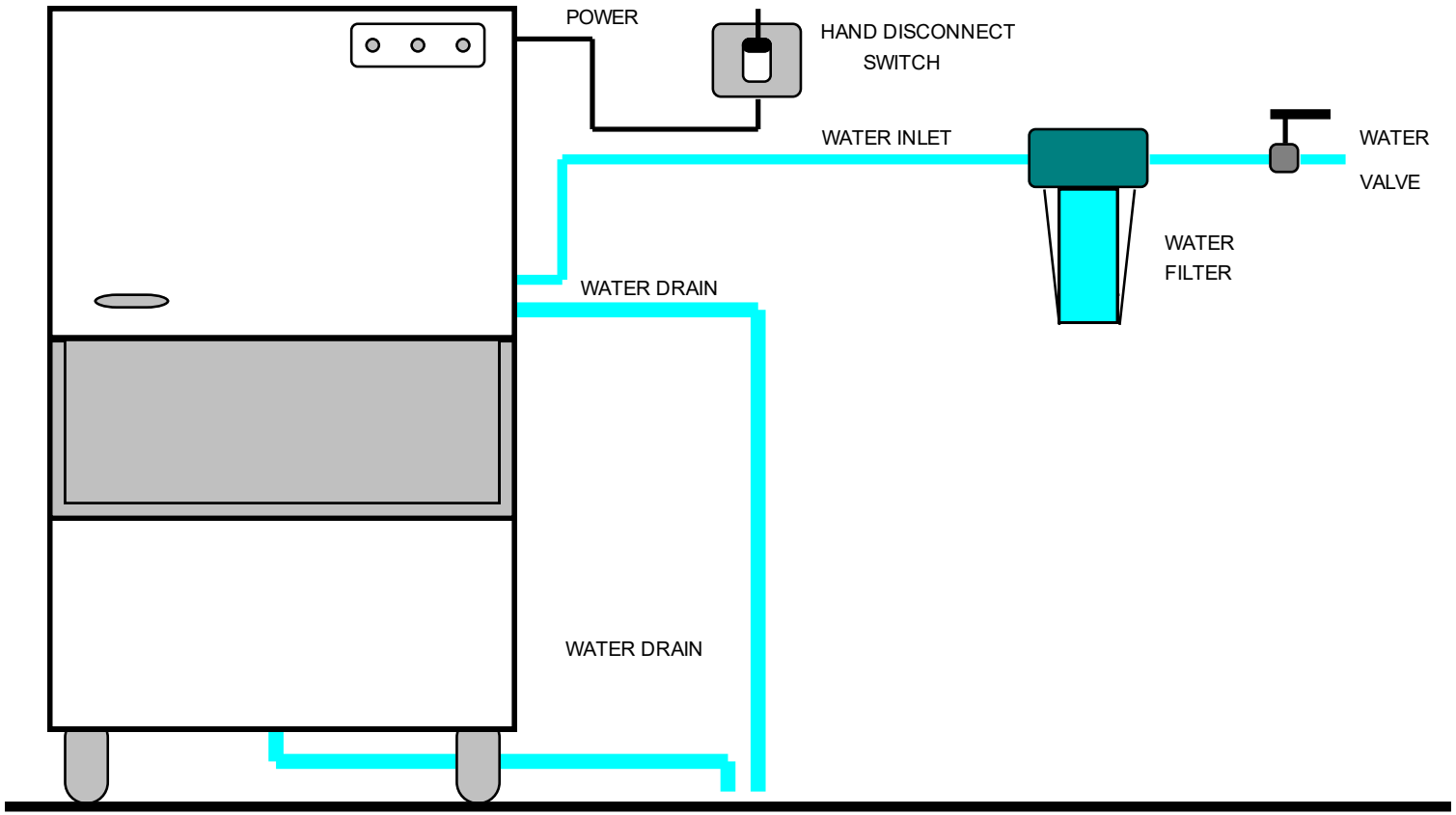
Machine must be individually fuse protected.

Connect the water inlet 3/4” male threat of the water inlet fitting to the water supply line by means of the rubber hose provided with machine.

Connect also the 20 mm O.D. fitting of the water drain with the flexible hose supply with the machine with its proper clamp.

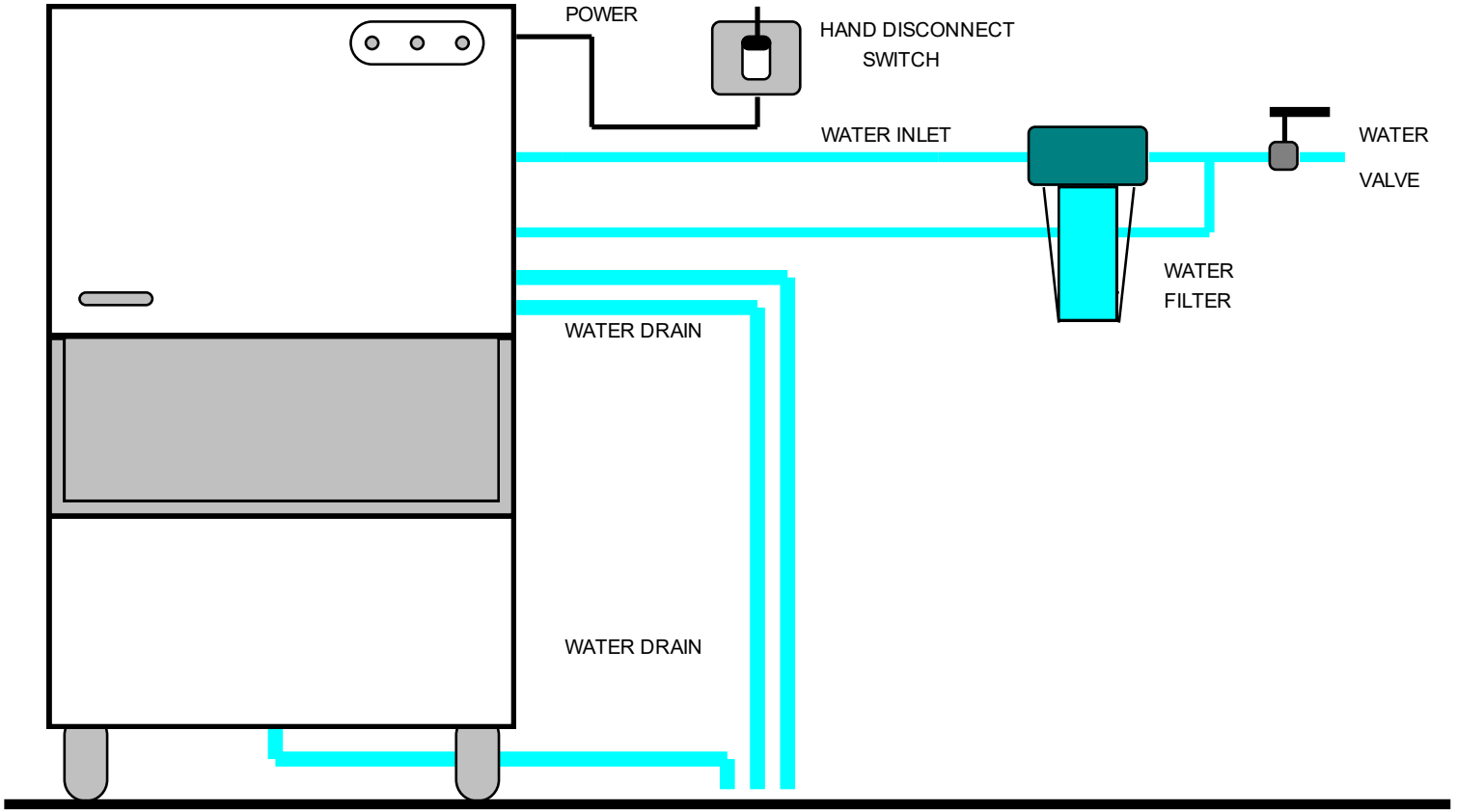
TYPICAL INSTALLATION

AIR COOLED



TYPICAL INSTALLATION

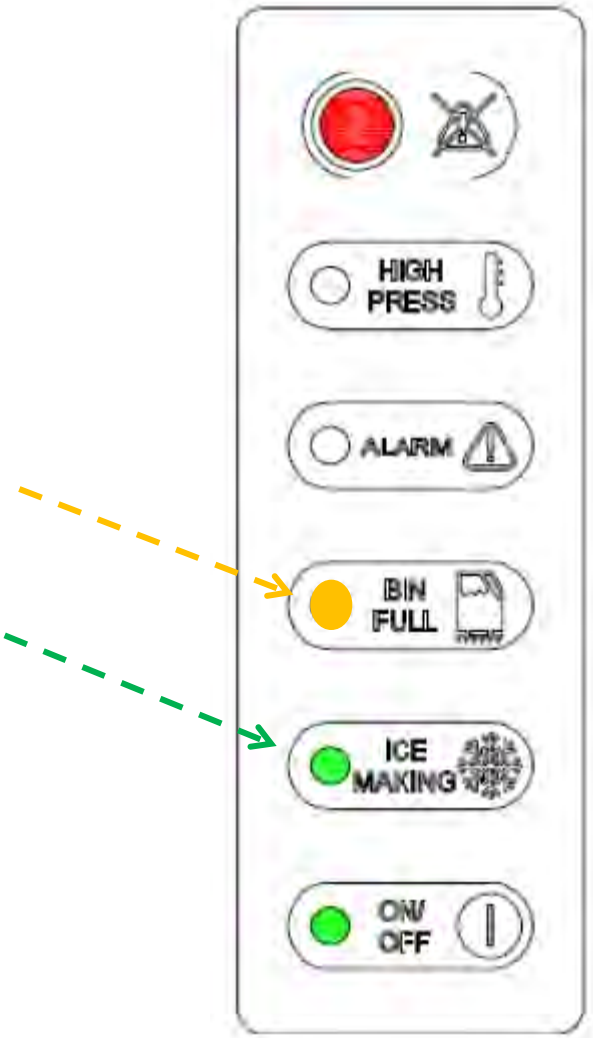
WATER COOLED



START UP AND OPERATIONAL CHECKS

Open the water tap/valve and switch ON the power on the electrical supply line.

The machine enters in the first part of Start-up (Automatic clean) cycle that is used to rinse the water reservoir with the LED of ICE MAKING and BIN FULL blinking for 2 minutes.

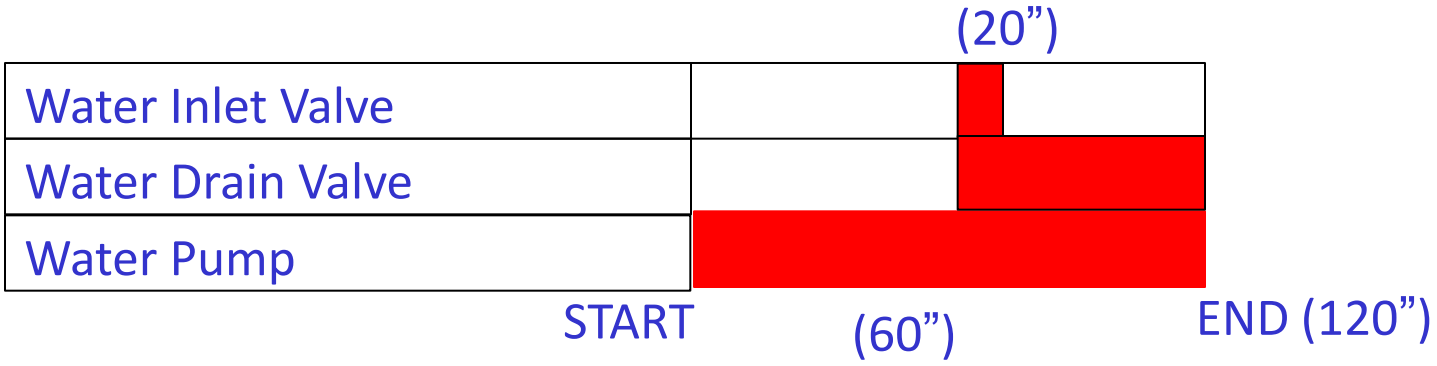


During these 2 minutes the components of water system work to purge and refill the water reservoir

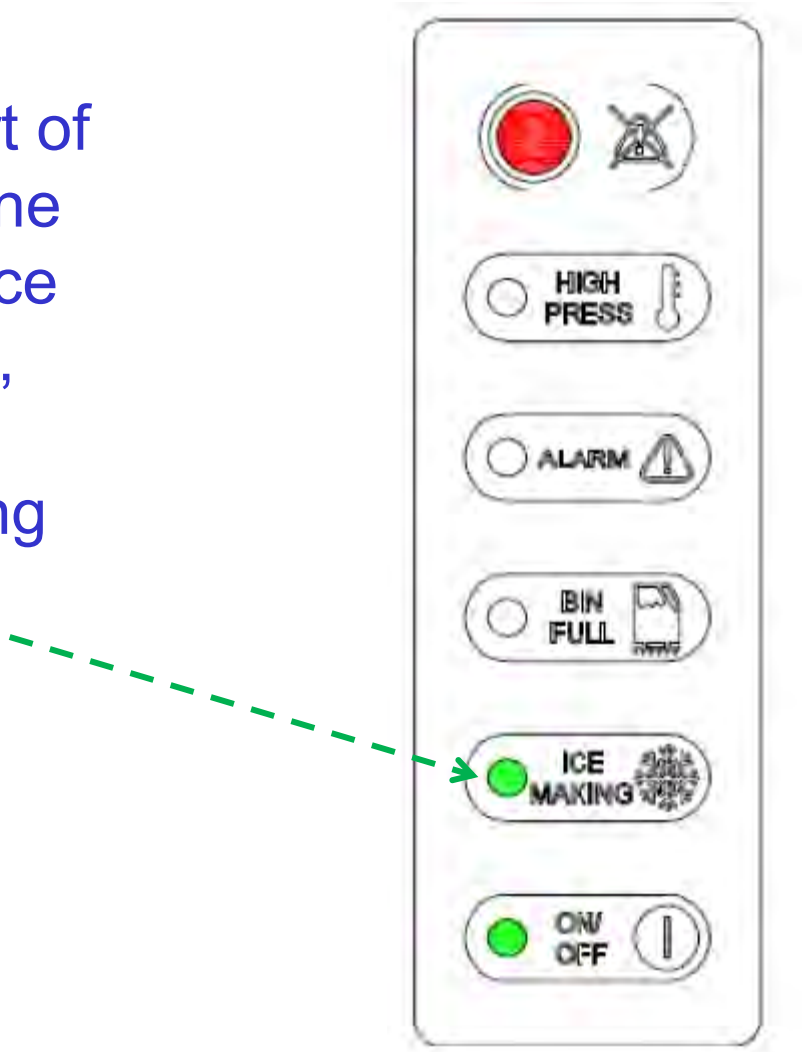
Water pump : 60”

Water pump + water inlet valve + drain valve : 20”

Water pump + water drain valve: 40”

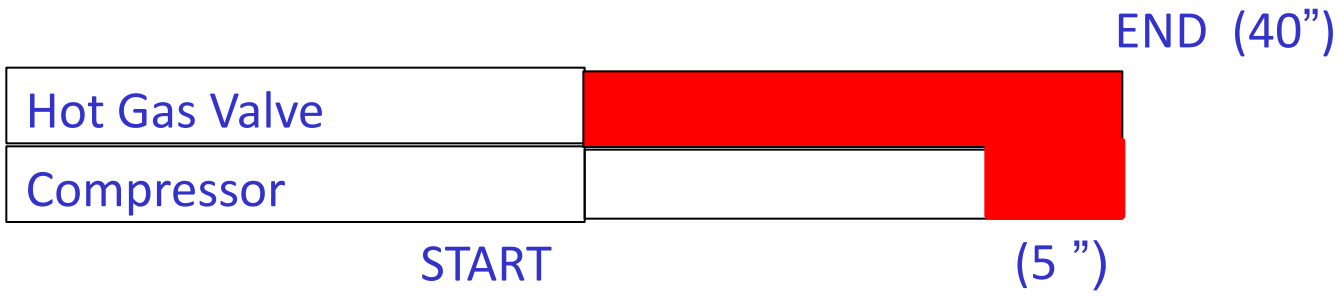


Once completed the first part of the Start-up cycle the machine enters in the pressure balance mode that takes 40 seconds, with the slow blinking of the second **Green LED** of making ICE



During the pressure balance mode the refrigerant pressure is checked with the following components in operation:

Hot gas valve: **35”**
Hot gas valve + compressor: last **5”**



Model **NW 1008 only** has a crankcase heater in the compressor. When the main power to the machine is switched ON, there is a time delay of 90 minutes during which only the compressor heater is energized with Green ICE Making LED Blinking slowly.

However, if the ambient temperature is higher than 25°C , the PC Board will automatically bypass this delay.

This delay can also be by-passed

pressing the switch located on the rear panel of the machine. Once the delay is elapsed the machine enters in Start-up cycle doing water reservoir rinse and pressure balance

After the start up cycle the machine enters directly into the FREEZING CYCLE with the following components energized:

- Water Inlet valve
- Compressor
- Fan motor

The LED energized are:

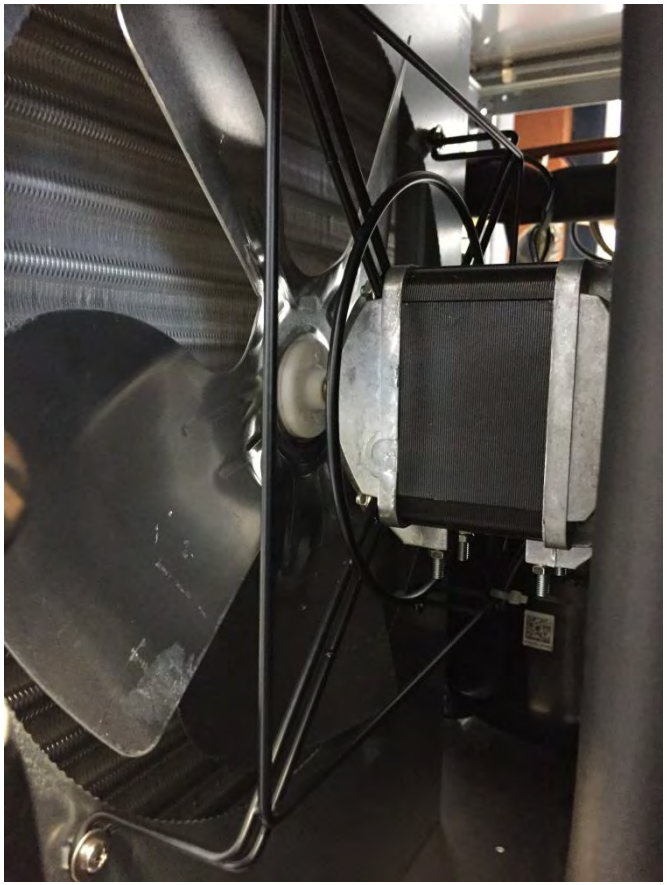
- ICE MAKING (steady)
- ON/OFF (steady)

- Water is coming into the water through the Water Inlet Solenoid Valve till the water reservoir is filled up to the maximum level controlled by a water level sensor.

- The Water Pump starts up 40 seconds later.

- After few minutes (3-5) from the start up of the freezing cycle, the Water Inlet Solenoid Valve is activated again for few seconds to refill the water reservoir up to the maximum level so to reduce any possibility of slush ice formation.

The fan motor works in continuos mode for 3 minutes at the beginning of the freezing cycle
In the meantime the condenser sensor starts
to transmit the current to the PC Board to
keep in operation the Fan Motor in ON-OFF
mode or continuously



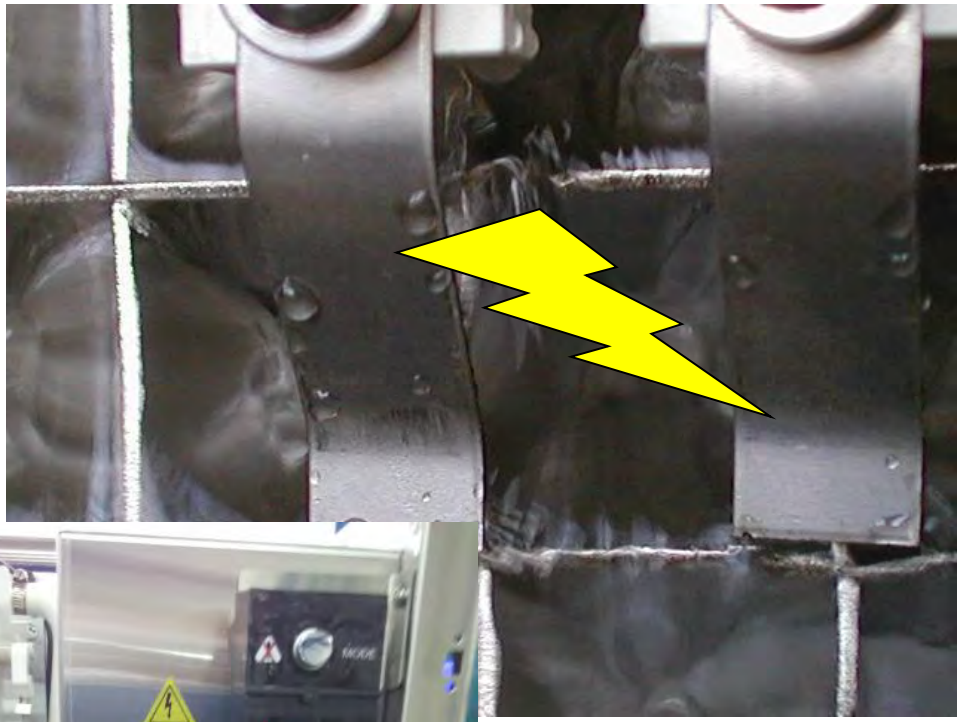
- If the condensing temperature is higher than 35°C, the fan motor works continuously

- If the condensing temperature is lower than 35°c the fan motor works in ON/OFF mode

The machine remains in the freezing cycle with ice become thicker, till the metal plate of the ice thickness sensor are covered by the water cascading down through the front surface of the ice plate.

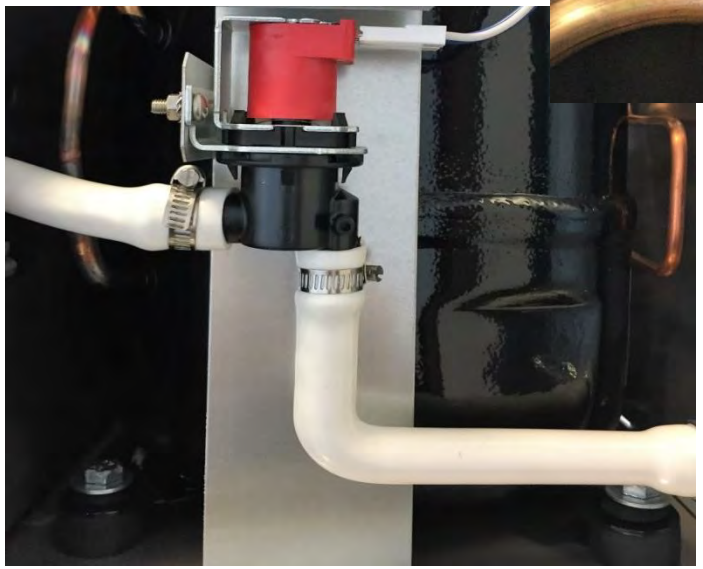
When the power is transmitted back continuously to the PC Board through the metal plate of the ice thickness sensor for more than 6 seconds, machine enters in the harvest cycle .

POWER , OPERATION and HARVEST lights are on steady



During the harvest cycle the components in operation are:

- **Hot Gas Valve**
- **Water Drain valve**

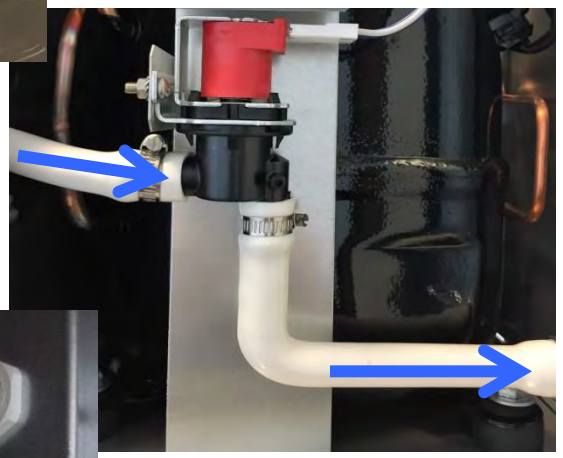


During the harvest cycle the components in operation are:

- **Water pump (according with DIP SWITCH n. 6 – 7)**
- **Compressor**

When the Harvest Cycle starts , Drain Valve and Water Pumps purge out old water for a pre-set time according with Dip-SWITCH n.6-7.

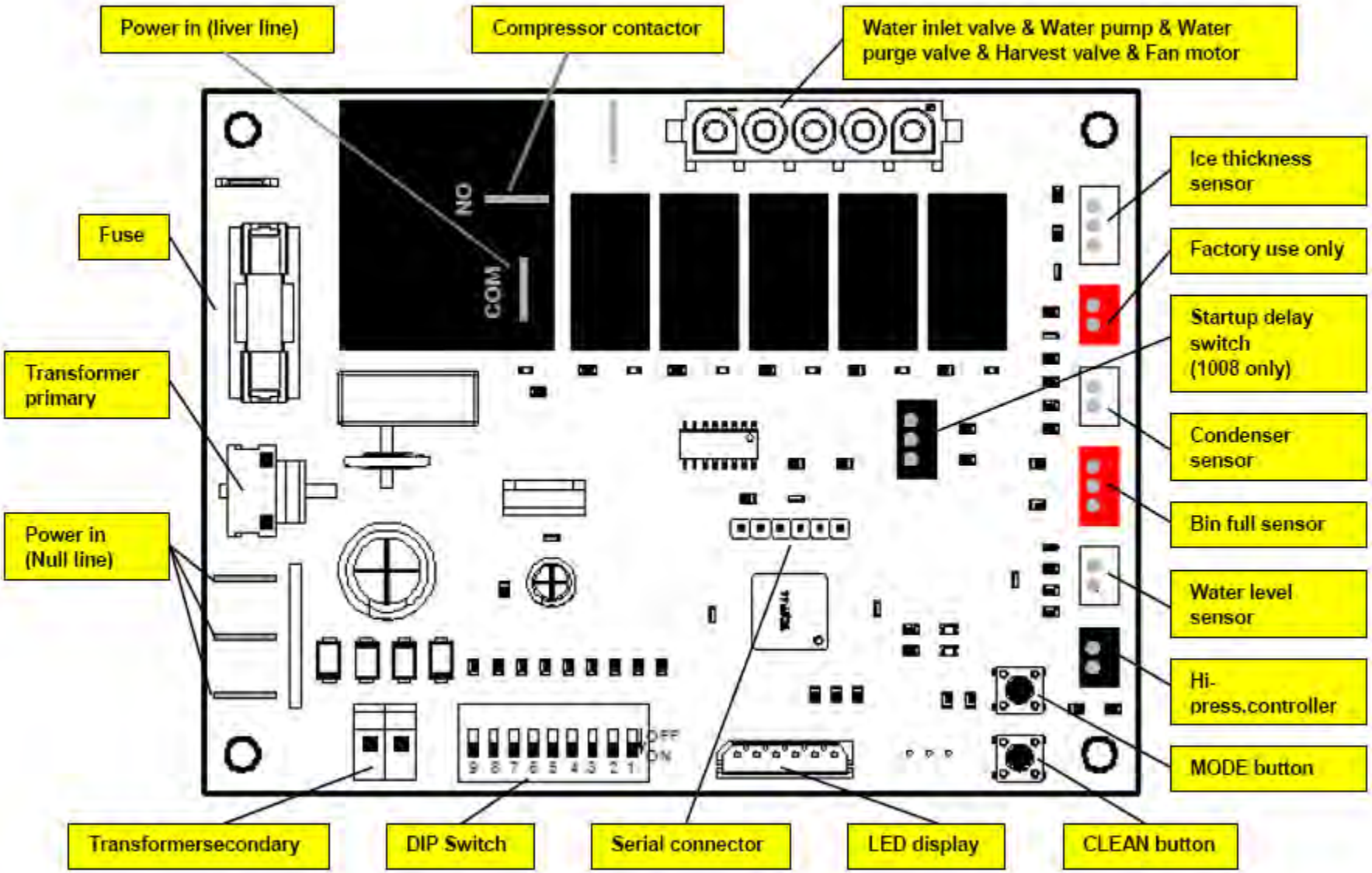
After 20” of operation of Water Drain Valve also the Water inlet Valve will be activated for 10” in order to have a short flush of fresh water into the water sump while the Water Pump and Drain Valve are still in operation.



While the ice plate is falling down, it moves the front plastic cover out from the evaporator causing the activation of the magnetic switch to restart a new freezing cycle.

When the last ice plate discharged from the evaporator, the plastic deflector cover keeps in open position for **30”** . The ice full sensor transmit the signal to the PC Board, all the components stop working, and the **BIN FULL light is on steady**. The next freezing cycle will start three minutes later after the plastic deflector is closed.

PC BOARD

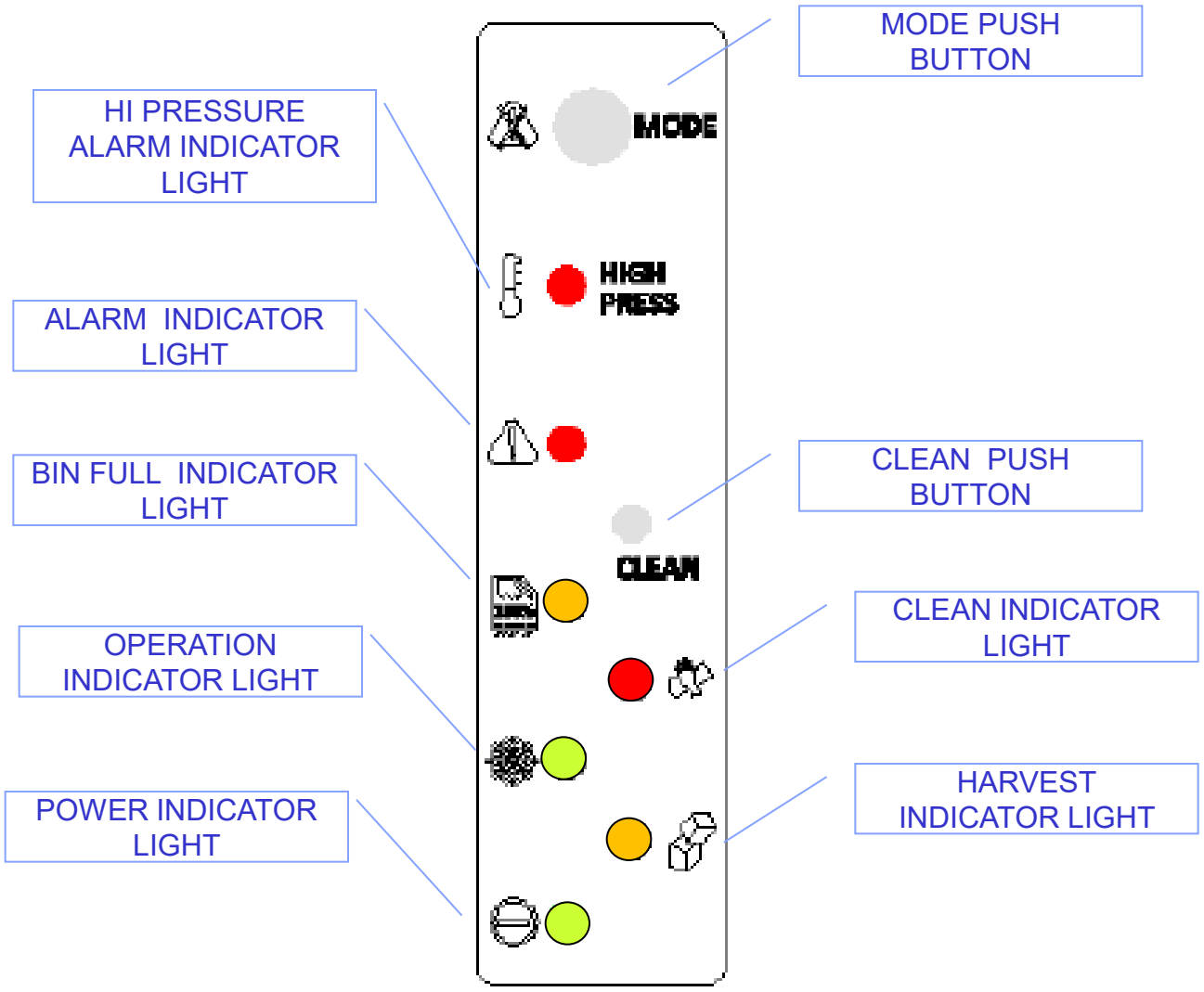

Power in (liver line)
Compressor contactor
Water inlet valve & Water pump & Water purge valve & Harvest valve & Fan motor
Ice thickness sensor
Factory use only
Startup delay switch (1008 only)
Condenser sensor
Bin full sensor
Water level sensor
Hi-press.controller
MODE button
CLEAN button
LED display
Serial connector
DIP Switch
Transformersecondary
Power in (Null line)
Transformer primary
Fuse
NO
COM
OFF
ON
9 8 7 6 5 4 3 2 1

MONITOR PANEL

It is located on the upper right side behind the front panel the monitor panel

It is composed by two push button (MODE and CLEAN) and seven indicator/alarm lights

MONITOR PANEL



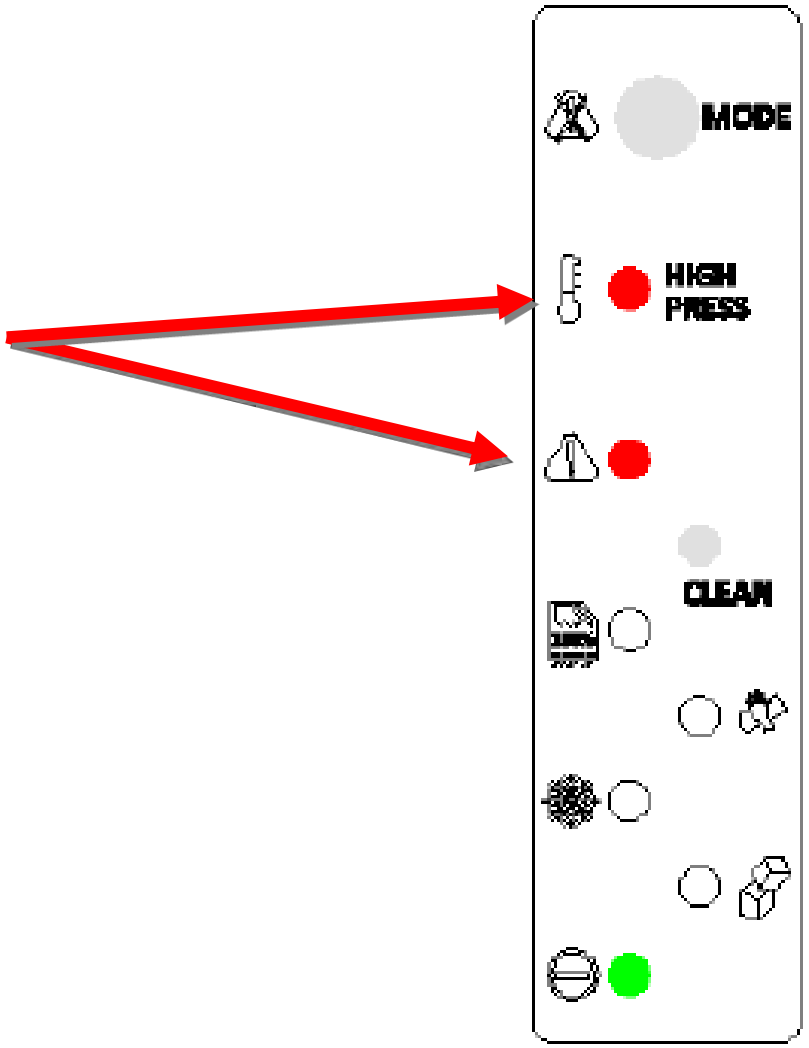
ALARM CONDITIONS

Both the last two **Red LED**

are **ON STEADY** :

CONDENSER SENSOR

OUT OF ORDER



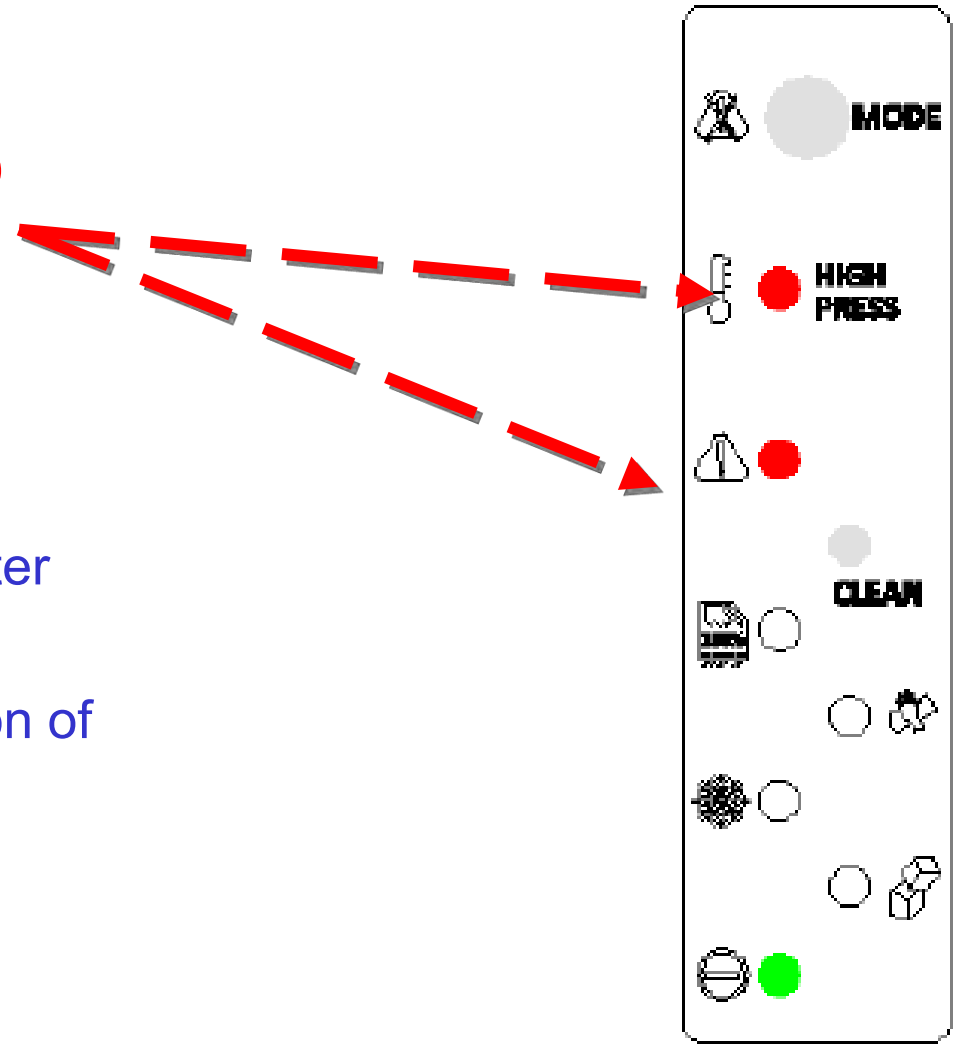
ALARM CONDITIONS

Both the last two **Red LED**

are **BLINKING SLOW**:

WATER ERROR

Water level inside the water sump too low after 3 or 6 minutes from the activation of the Water Inlet Valve according with setting of DIP SWITCH n.4



ALARM CONDITIONS

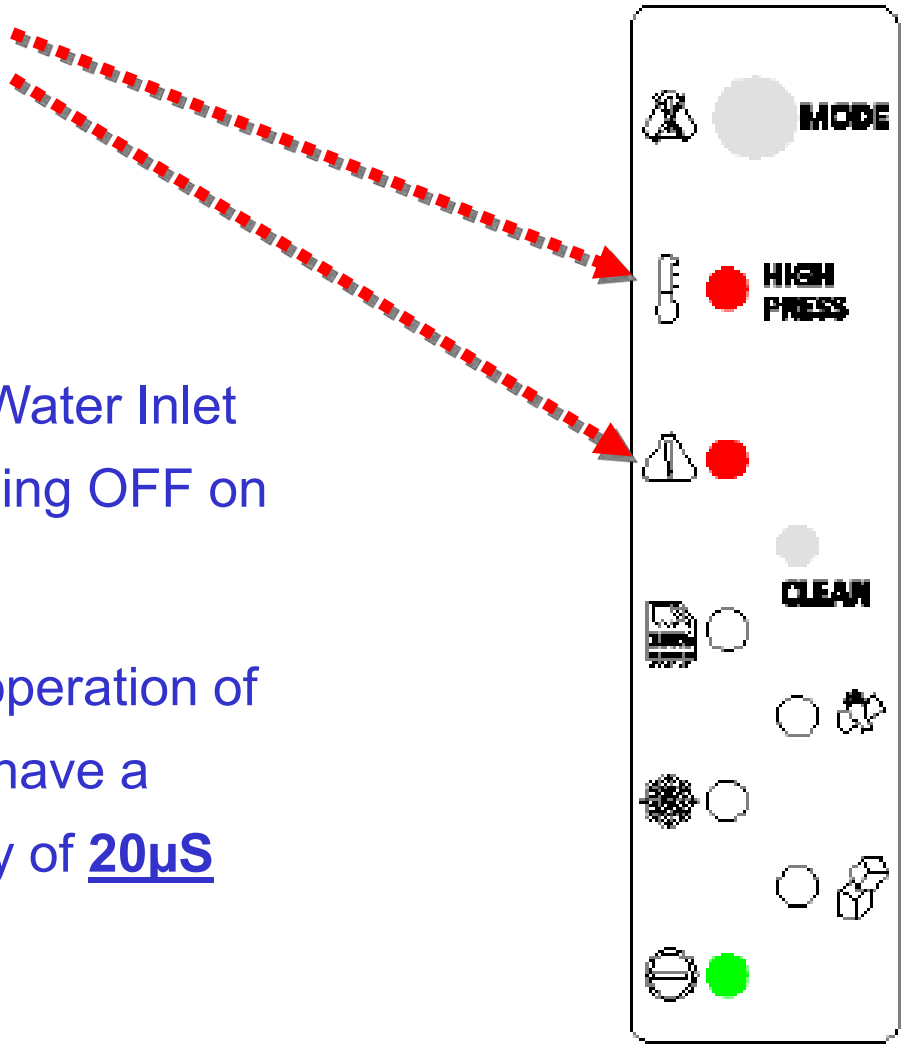
Both the last two **Red LED**

are **BLINKING FAST**:

RESET MODE

Charging water through the Water Inlet Solenoid Valve after the tripping OFF on WATER ERROR

NOTE = to assure a proper operation of the machine the water must have a minimum electric conductivity of **20µS**



ALARM CONDITIONS

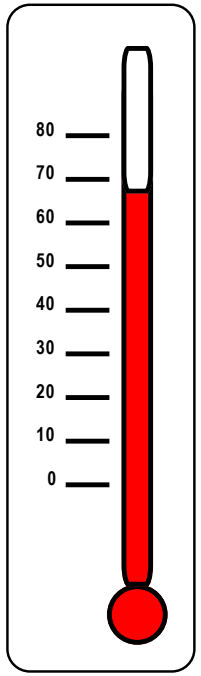
The Fourth **Red Led** is **BLINKING**

SLOW:

TOO HI CONDENSING TEMPERATURE

The condenser sensor detected a temperature **> 70°C**

Reset Mode: For the first two times, machine will automatic reset , it will stops when the alarm occours the third time. Press MODE button to reset and go to start up cycle



ALARM CONDITIONS

The Fourth **Red LED**

is **ON steady:**

3 TIMES TOO LONG HARVEST

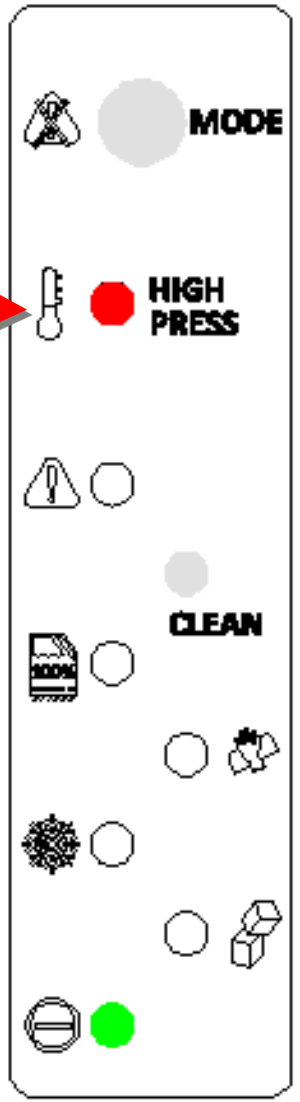
CYCLE TIME (according with setting of DIP SWITCH n.3)

Reset Mode: Press MODE button to reset and go to start up cycle

ALARM CONDITIONS

The Fifth **Red LED**

is **ON STEADY**:



TOO HI DISCHARGE PRESSURE

(MORE THAN 33 BAR / 460 PSI)

Reset Mode: Press MODE button to reset and go to start up cycle

ALARM CONDITIONS

Both the third YELLOW LED and

fourth **Red LED** are blinking fast :

ICE THICKNESS SENSOR FAULT

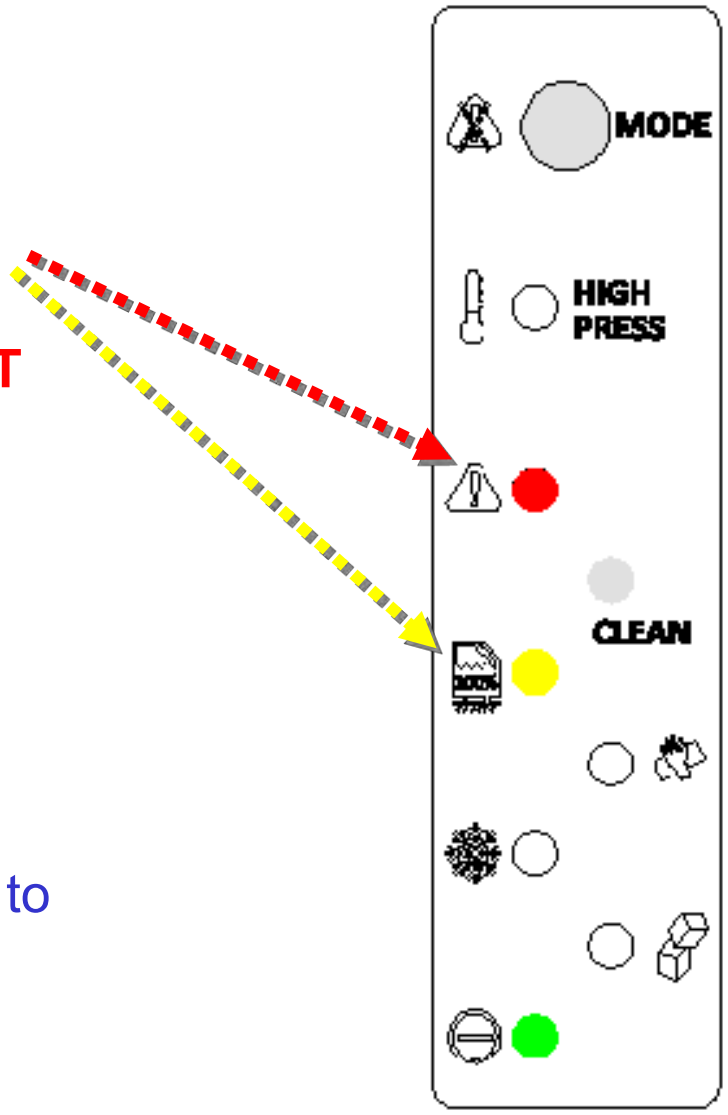
When machine starts, if PC Board

detects the Ice Thickness ON

machine will stop

Reset Mode: Press MODE button to

reset and go to start up cycle



ALARM CONDITIONS

Whenever the machine remains in the Freezing Cycle for the Maximum time (30 or 40 minutes), the PC Board moves the unit directly into the Harvest Cycle.

ALARM CONDITIONS

The PC Board is also checking the maximum time of the freezing cycle that changes according to the operation of the fan motor during the freezing cycle (room temperature):

- **Fan motor in ON-OFF mode: Max. freezing cycle length equal to 30’**
- **Fan motor ON all the time: Max. freezing cycle length equal to 40’**

PC BOARD SETTING

MODE BUTTON FUNCTION

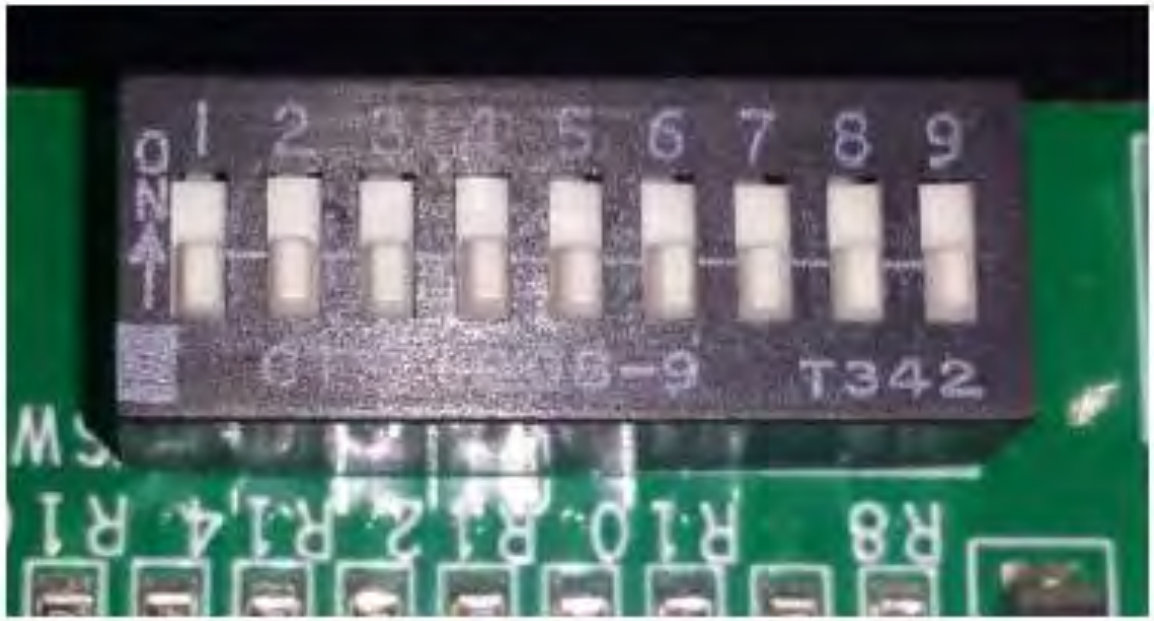
- To restart the machine is necessary press the MODE button.
- When machine is working, press MODE button to go to next process as follow:

Start →Automatic Clean → Pressure Balance → Freezing → Harvest → Bin Full

PC BOARD SETTING

Default Factory setting :

All Dip-Switches OFF

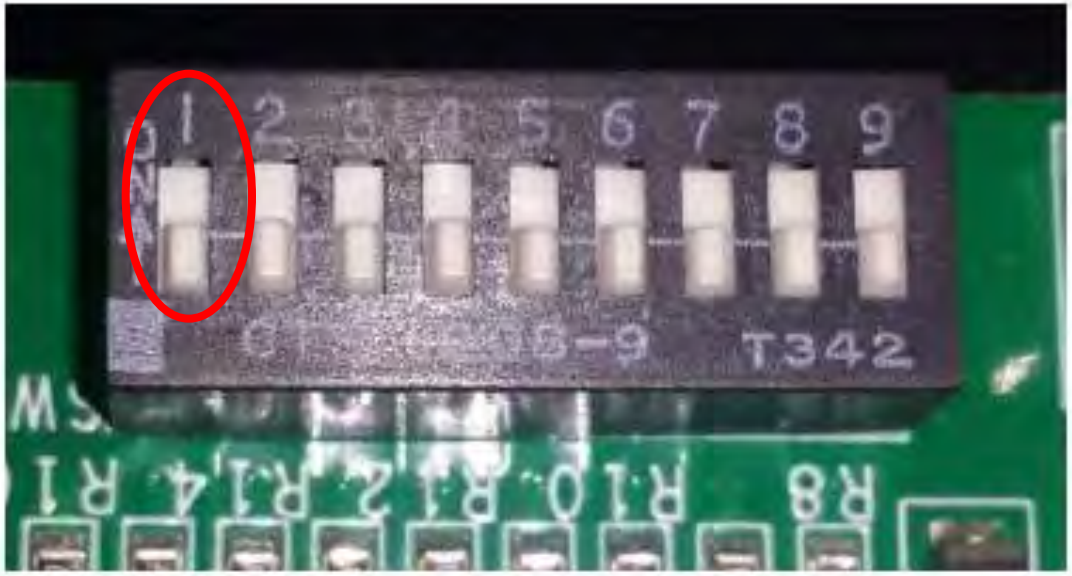


PC BOARD SETTING

DIP-SWITCH n. 1

OFF = Used on NW Series

ON = Factory use only



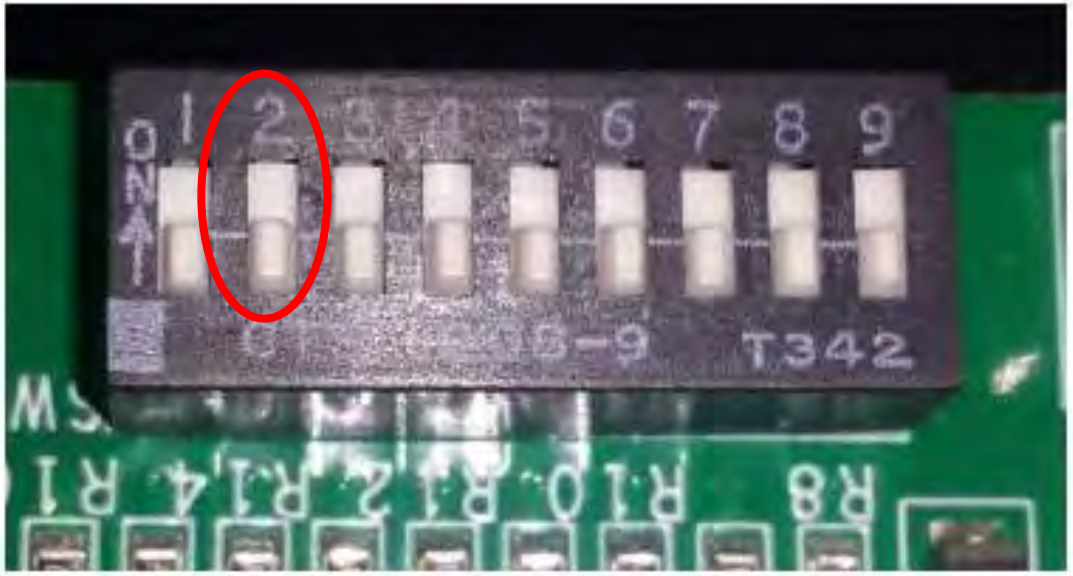
PC BOARD SETTING

DIP-SWITCH n. 2

OFF = No start-up time delay

ON = 90’ start-up time delay

(Used on NW 1008 only)



PC BOARD SETTING

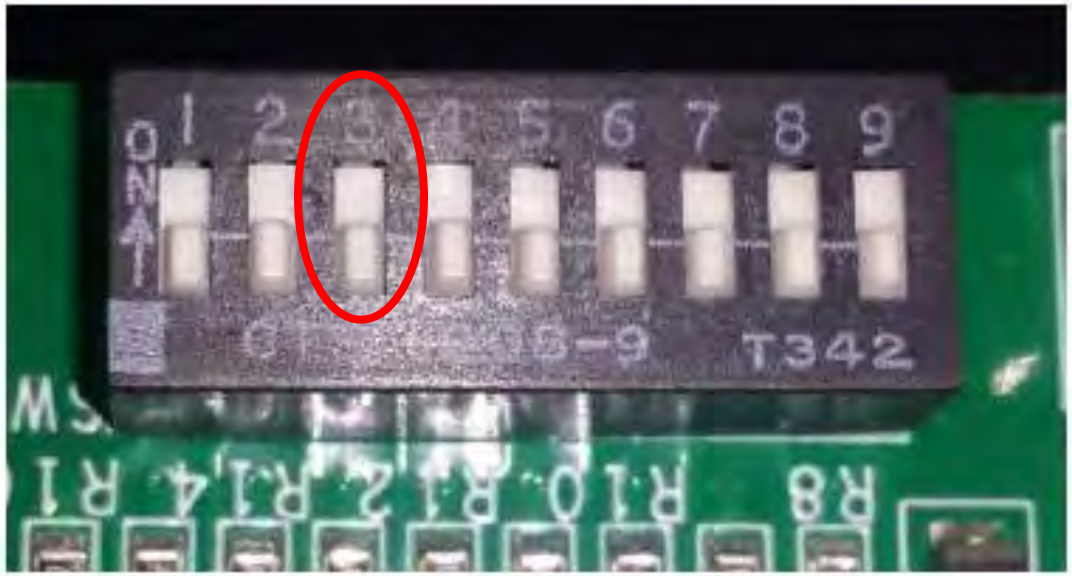
DIP-SWITCH n. 3

OFF = 3’ and 30” Max.

Harvest Time

ON = 6’ max. Max.

Harvest Time

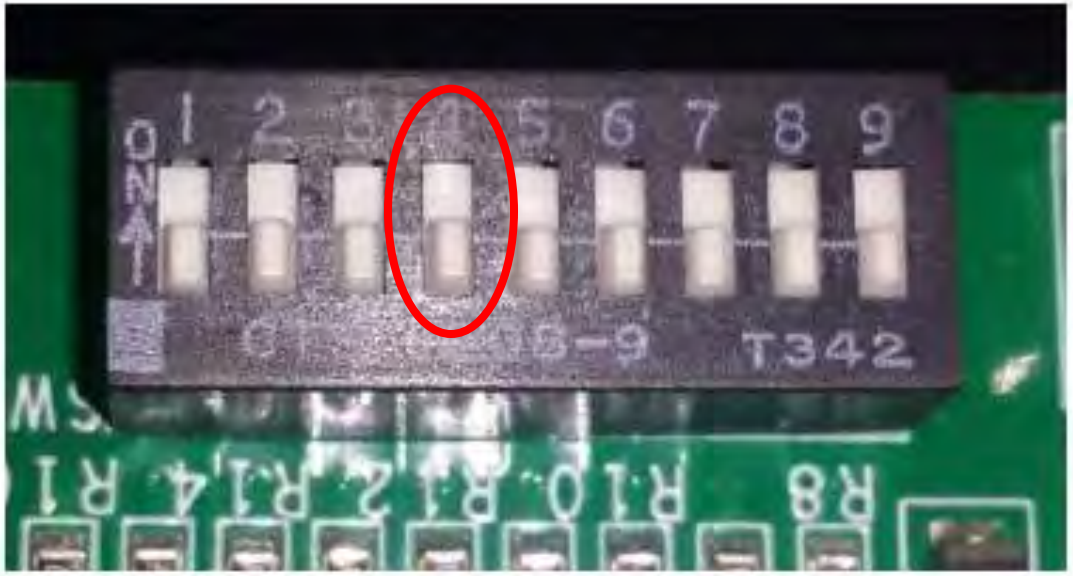


PC BOARD SETTING

DIP-SWITCH n. 4

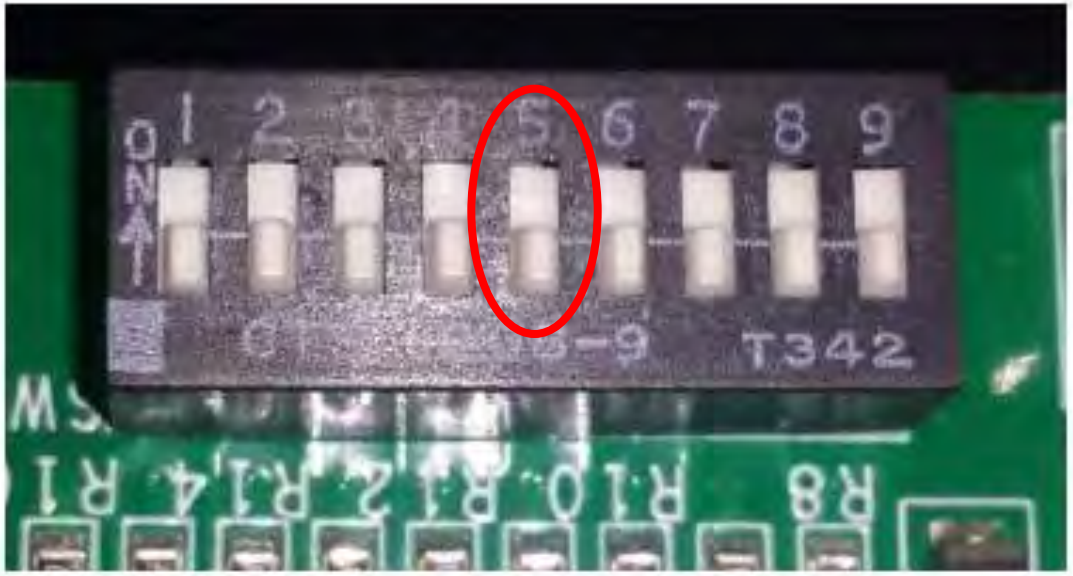
OFF = 3’ and 30” Water fill time

ON = 6’ water fill time



PC BOARD SETTING

DIP-SWITCH n. 5



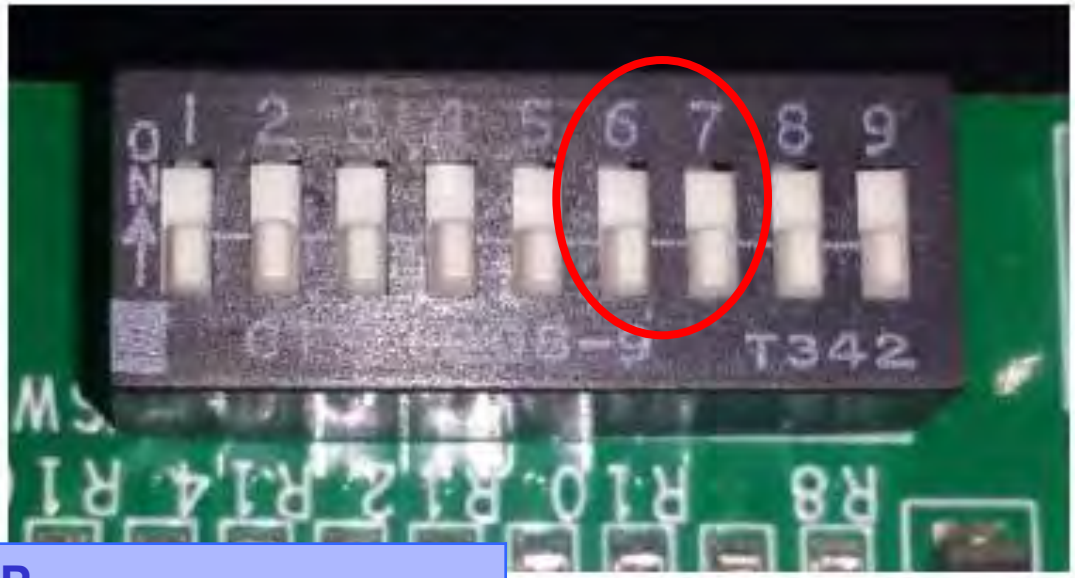
OFF = Fill water in first 4’ in freezing cycle

ON = Fill water in first 10’ in freezing cycle

PC BOARD SETTING

DIP-SWITCH n. 6 - 7

Purge water control



DIP n. 6	DIP n. 7	WATER PUMP
OFF	OFF	Works for 30 seconds
ON	OFF	Works for 6 seconds and 30 seconds every six harvest cycles
OFF	ON	Works for 30 seconds every three harvest cycles
ON	ON	Works for 30 seconds every six cycles

PC BOARD SETTING

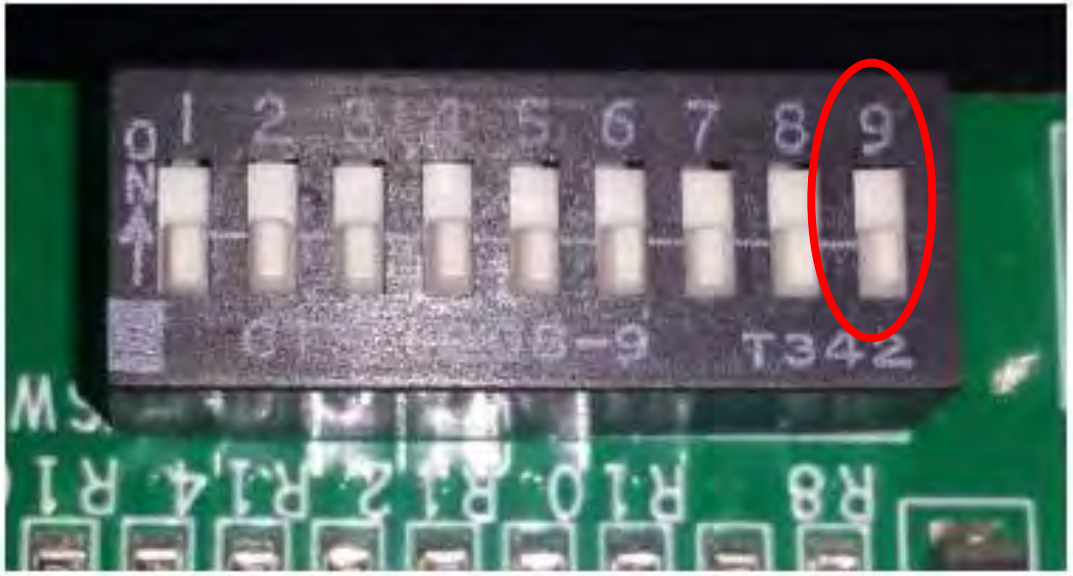
DIP-SWITCH n. 8

FACTORY USE ONLY

DIP-SWITCH n. 9

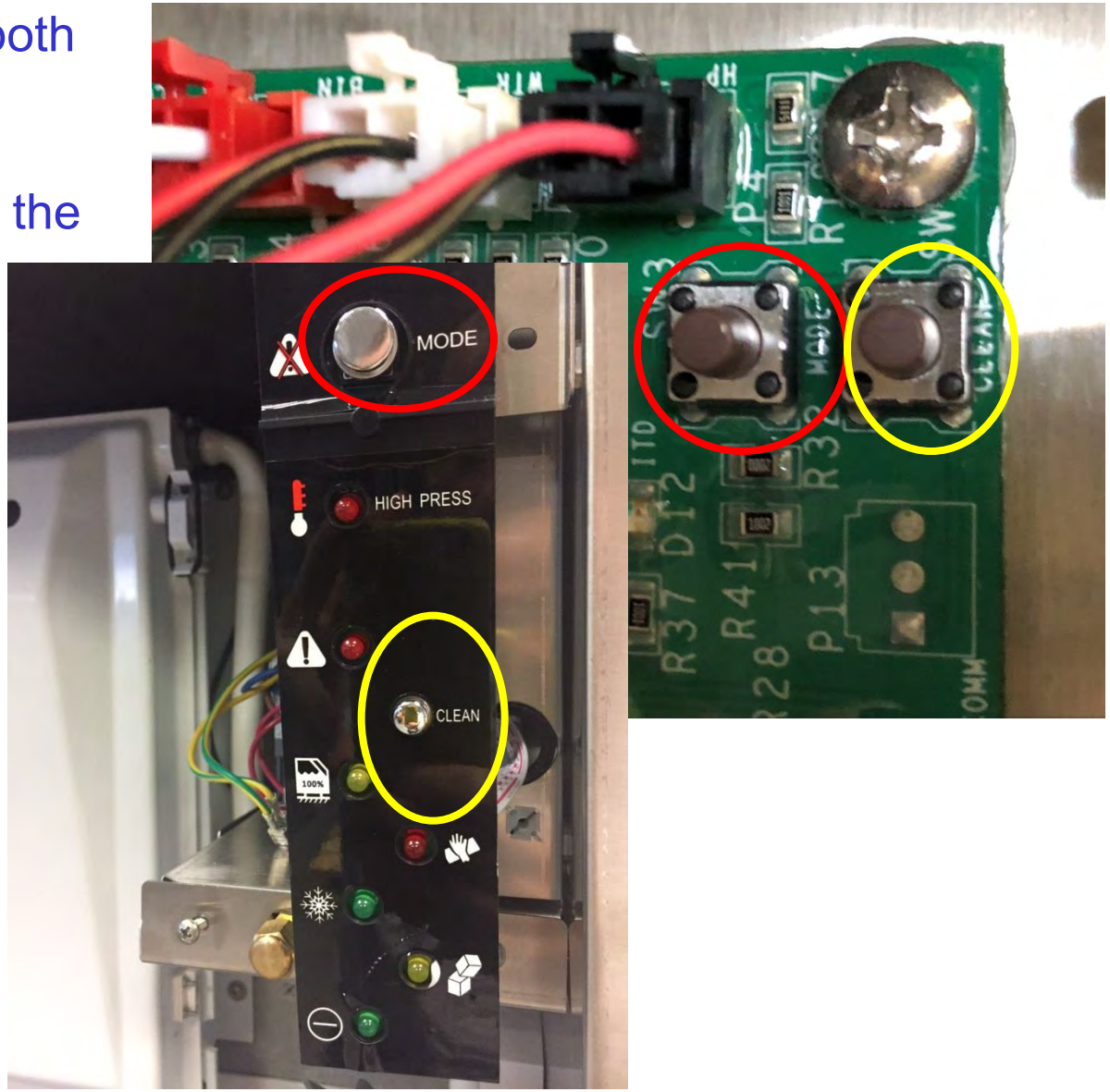
OFF = Machine will stop after clean procedure, need to press clean button to restart

ON = Machine will restart automatically after clean procedure



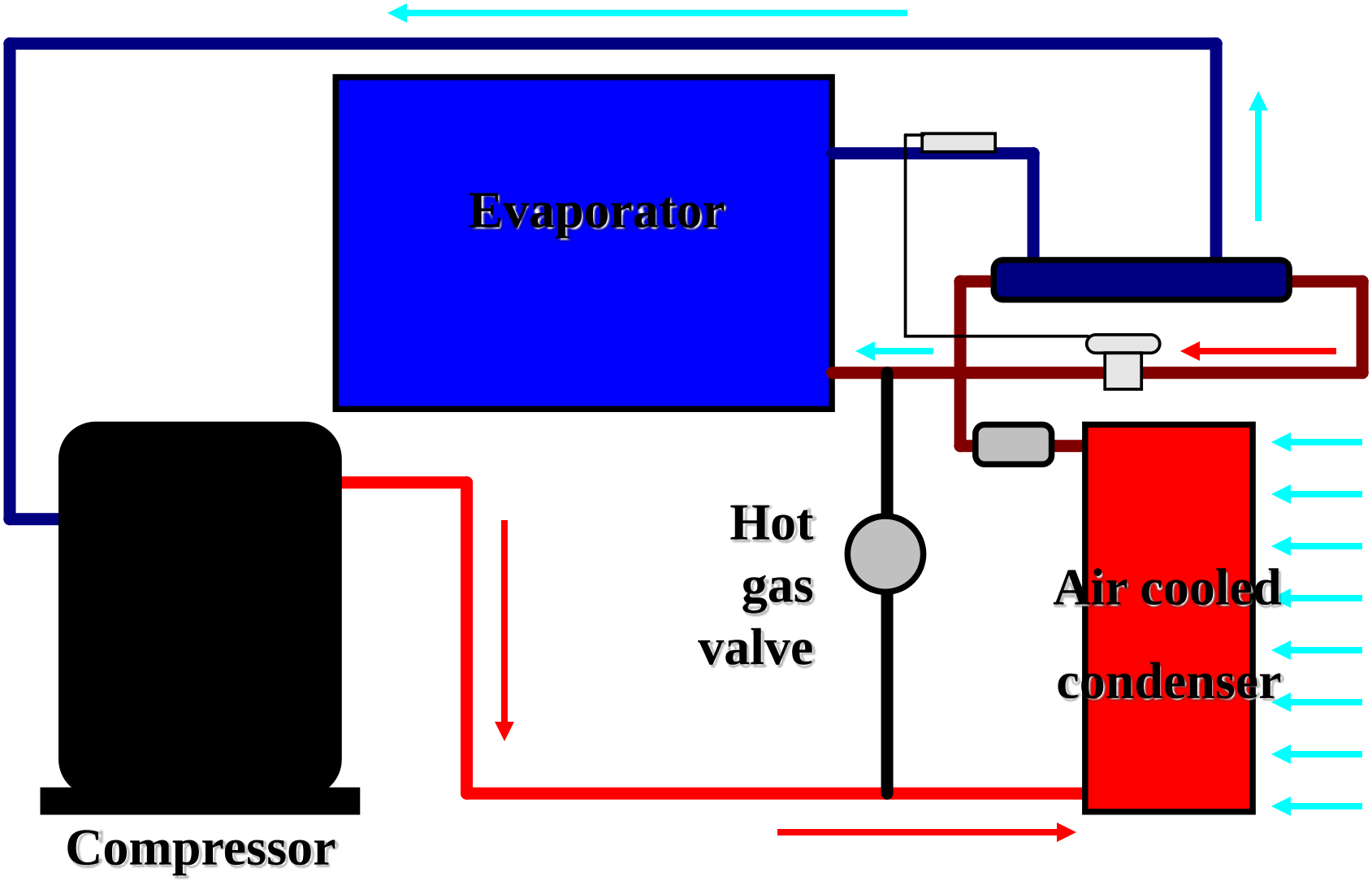
PC BOARD PUSH BUTTON

PC Board and display are both equipped with MODE and CLEAN push button having the same function

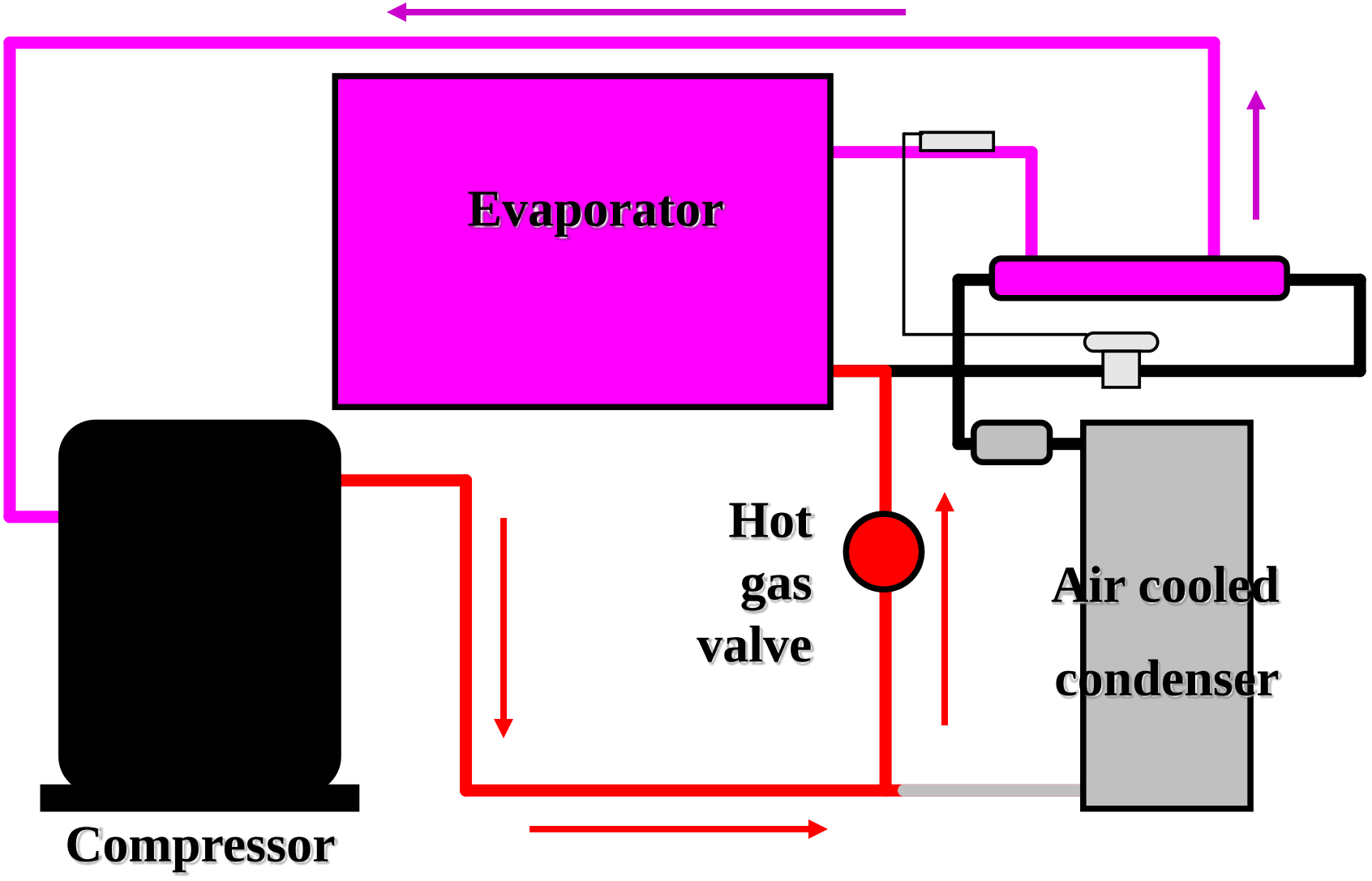


OPERATING PRINCIPLES and COMPONENTS

OPERATING PRINCIPLES - FREEZE

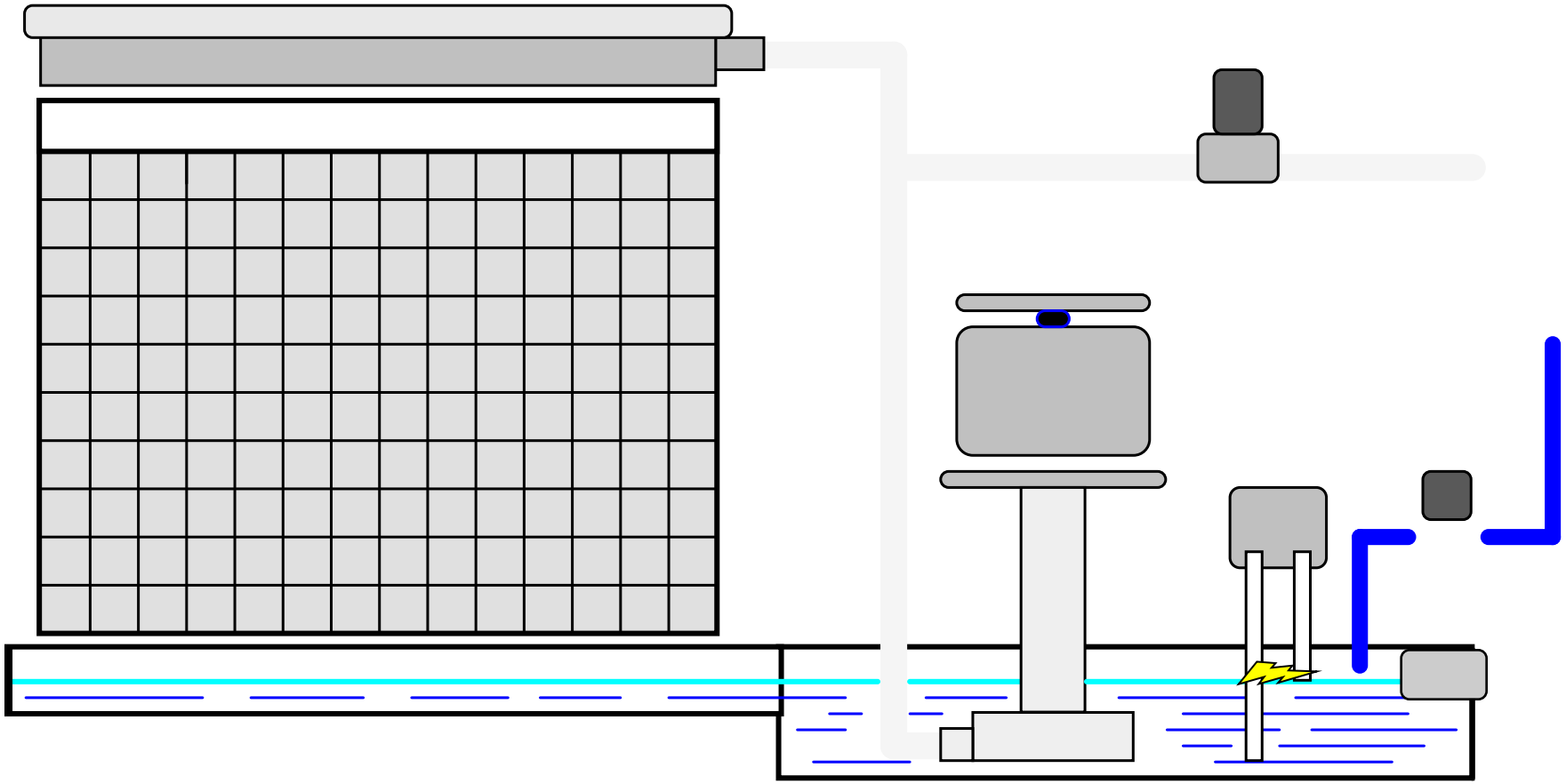


OPERATING PRINCIPLES - HARVEST



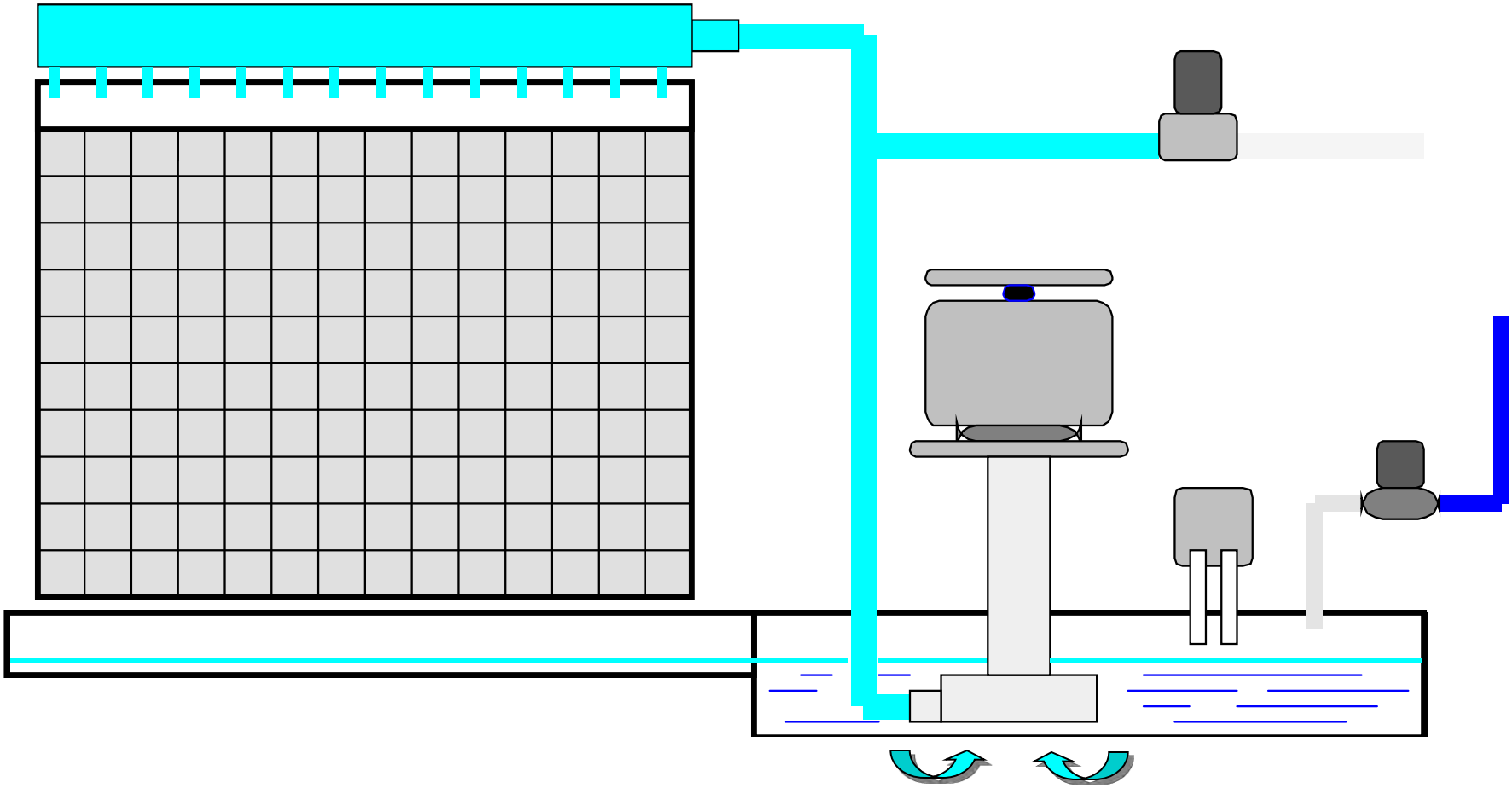
WATER SYSTEM – FREEZING CYCLE

1° PART – 40”



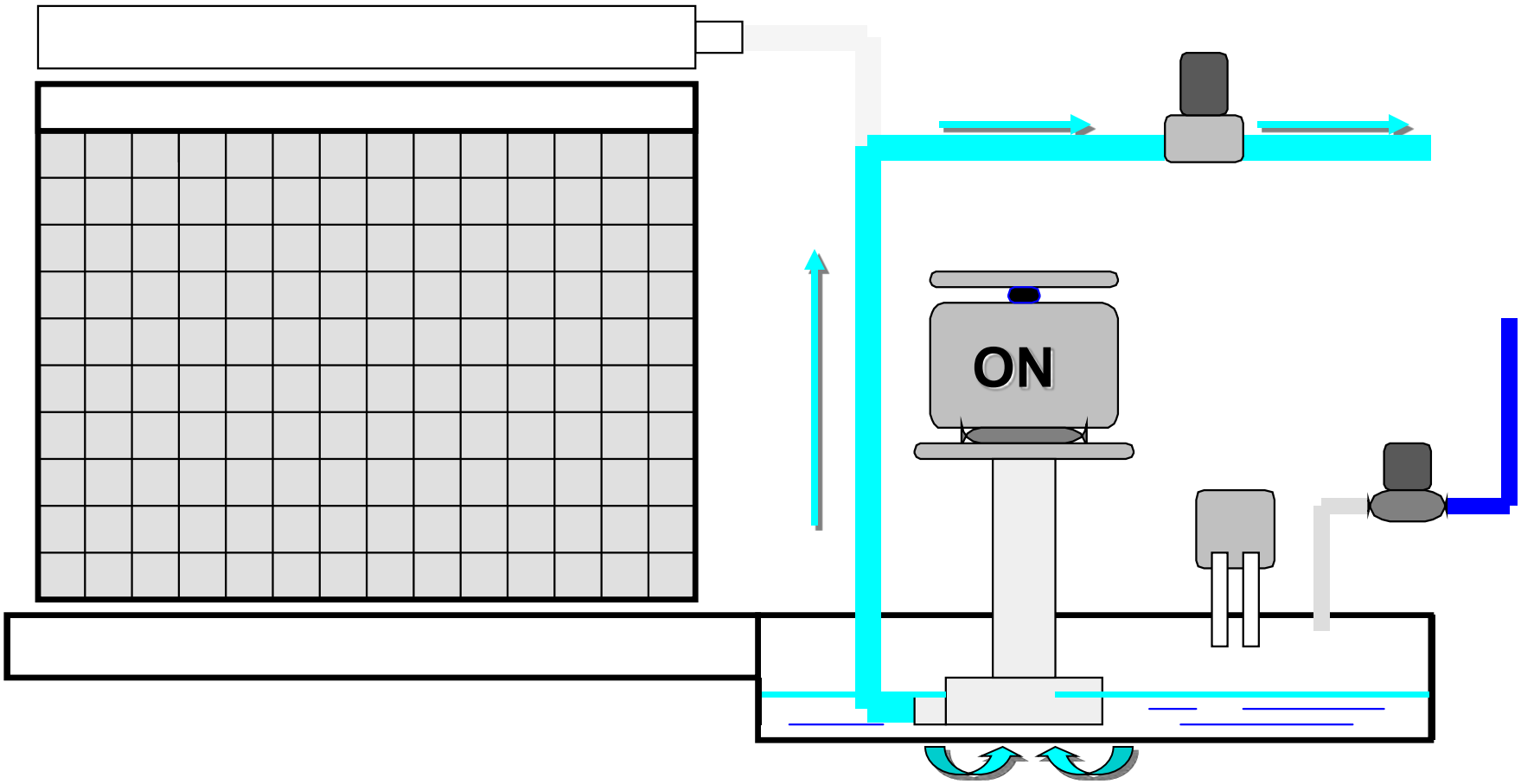
WATER SYSTEM – FREEZING CYCLE

2° PART



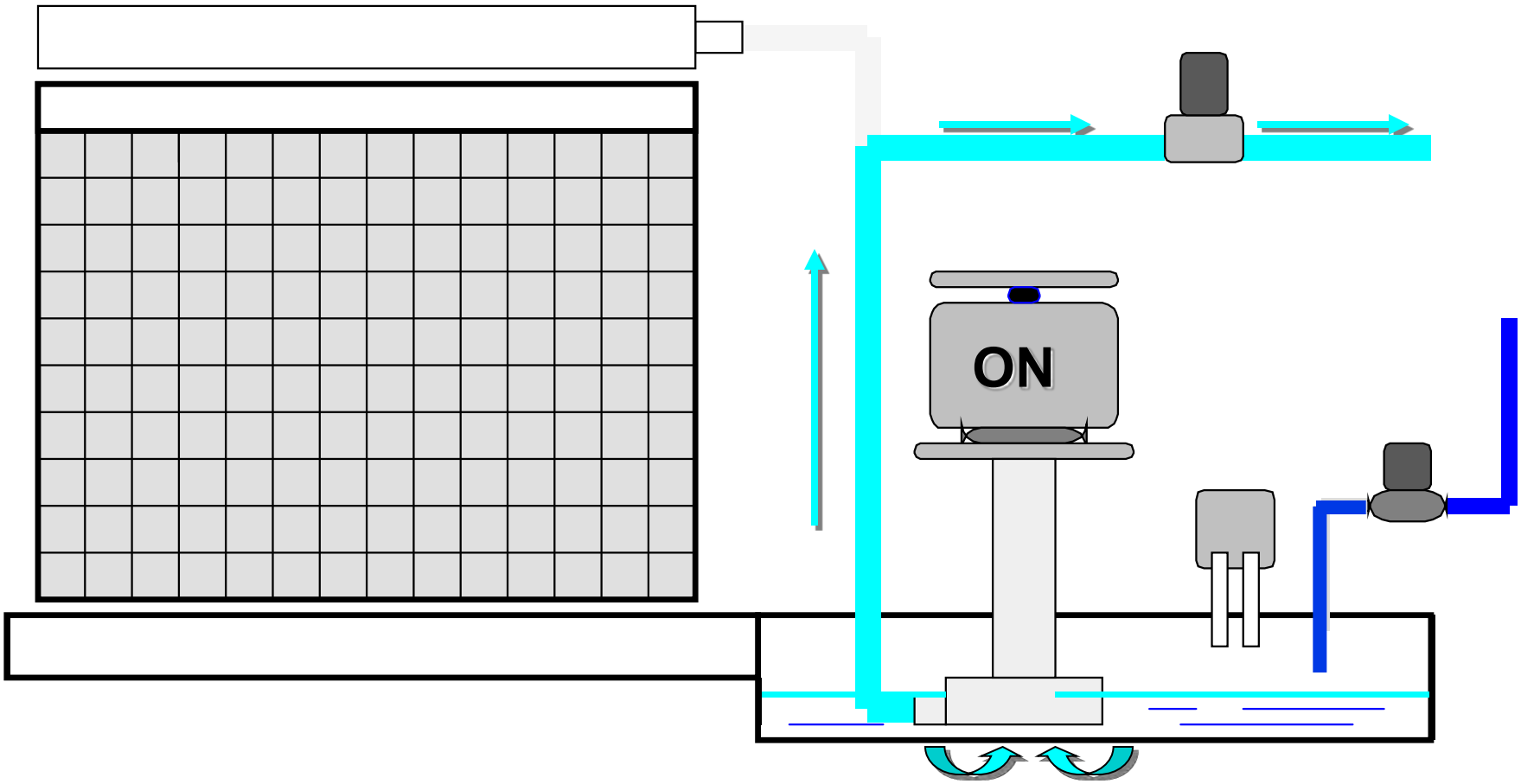
WATER SYSTEM – HARVEST CYCLE

First 20”



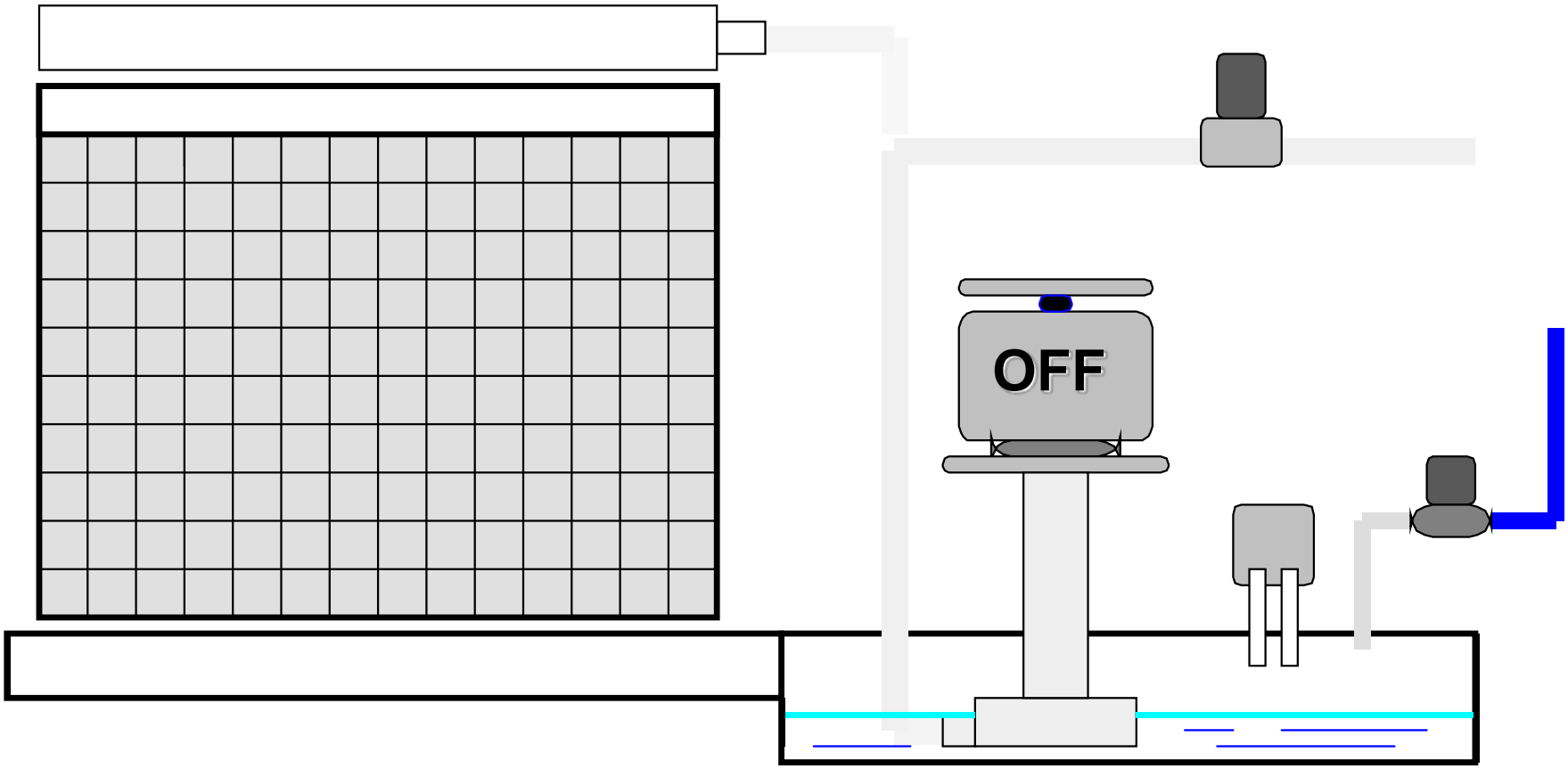
WATER SYSTEM – HARVEST CYCLE

From 20” up to 30”



WATER SYSTEM – HARVEST

From 30” up to the end of harvest cycle



COMPONENTS - REFRIGERANT SYSTEM

The components of the refrigerant system of the NW series are:

- **COMPRESSOR**

COMPONENTS - REFRIGERANT SYSTEM

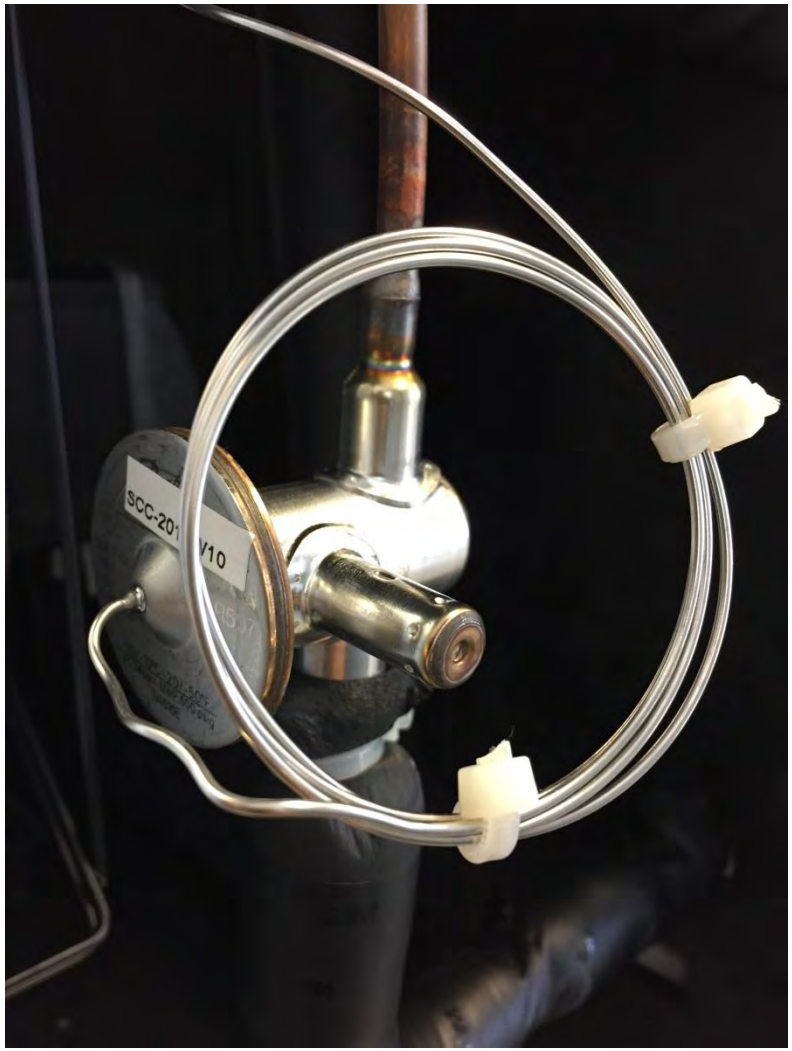
- CONDENSER

COMPONENTS - REFRIGERANT SYSTEM

- **EVAPORATOR**

COMPONENTS - REFRIGERANT SYSTEM

- TXV VALVE



COMPONENTS - REFRIGERANT SYSTEM

- **DRIER**

COMPONENTS - REFRIGERANT SYSTEM

- **HOT GAS VALVE**

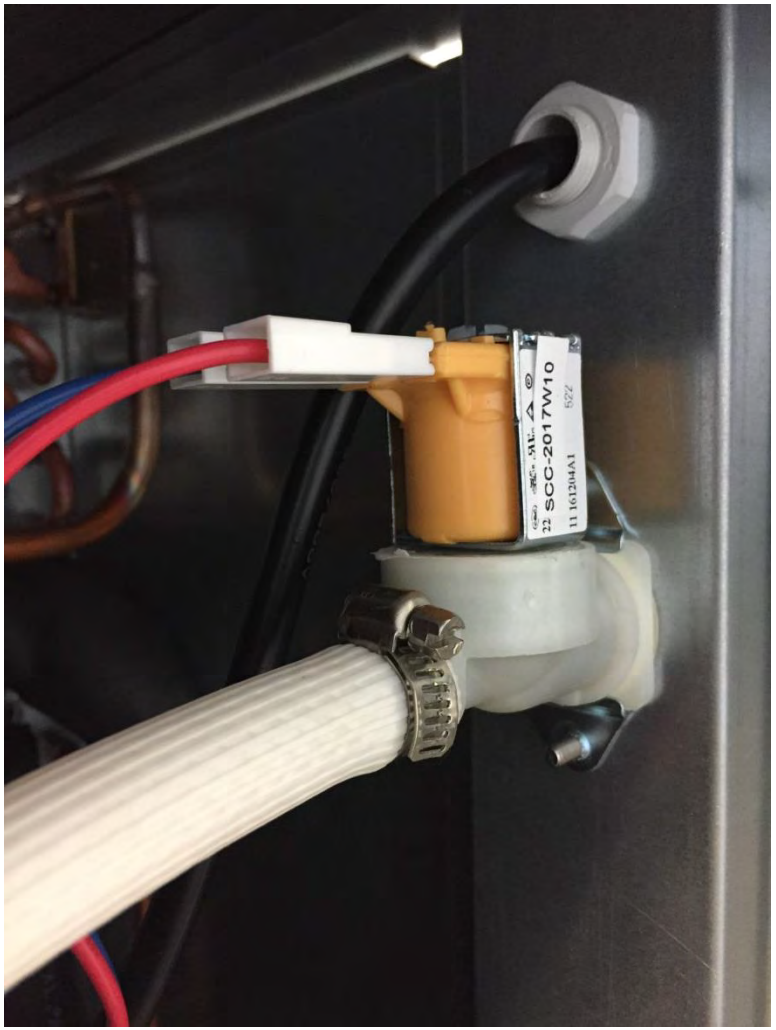
COMPONENTS - REFRIGERANT SYSTEM

- HIGH PRESSURE CTRL

COMPONENTS – WATER SYSTEM

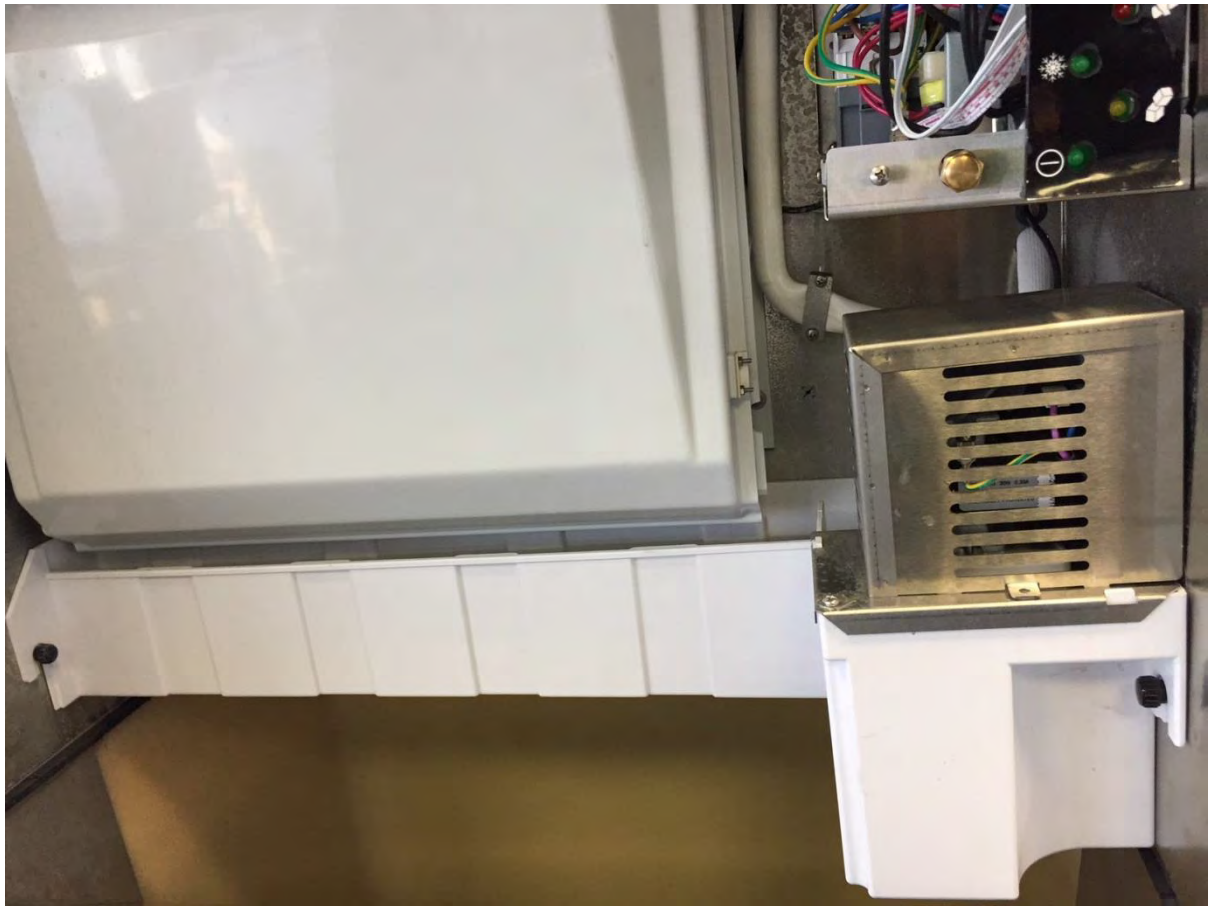
The components of the water system of the NW series are:

- **WATER INLET VALVE**



COMPONENTS – WATER SYSTEM

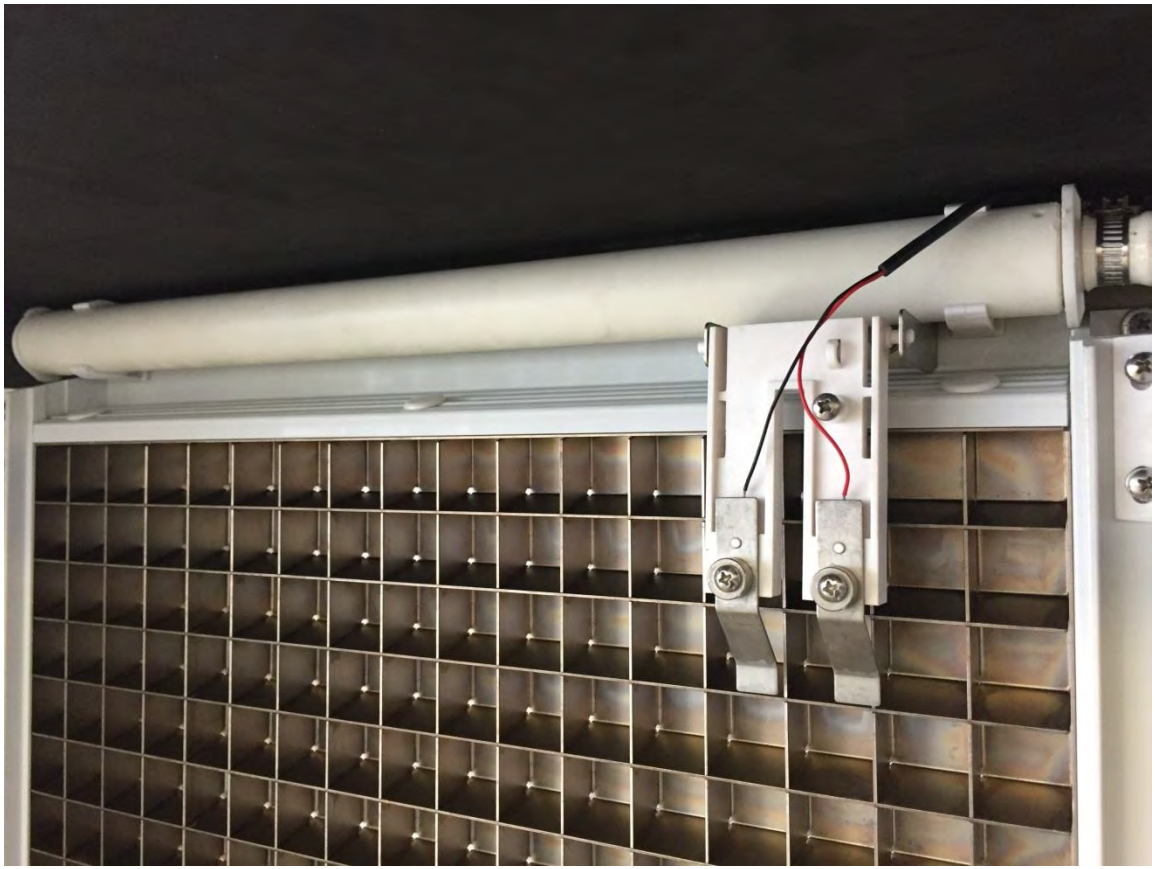
- **WATER SUMP**



- **WATER PUMP**

COMPONENTS – WATER SYSTEM

- WATER DISTRIBUTOR TUBE

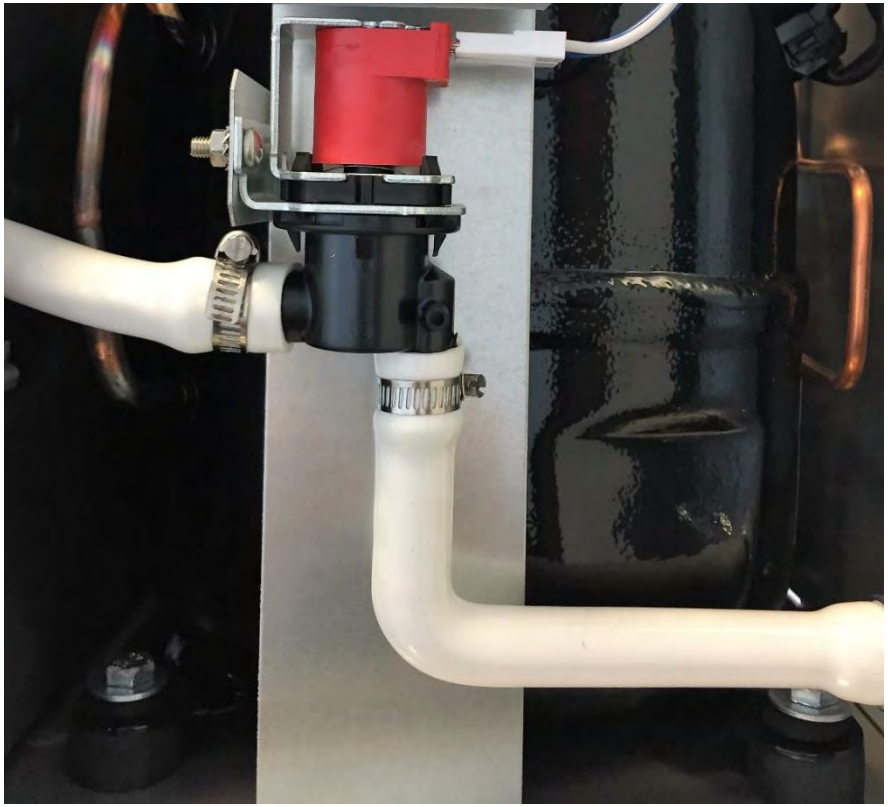


COMPONENTS – WATER SYSTEM

- WATER FLOW ADJUSTERS

COMPONENTS – WATER SYSTEM

- **WATER DRAIN VALVE**



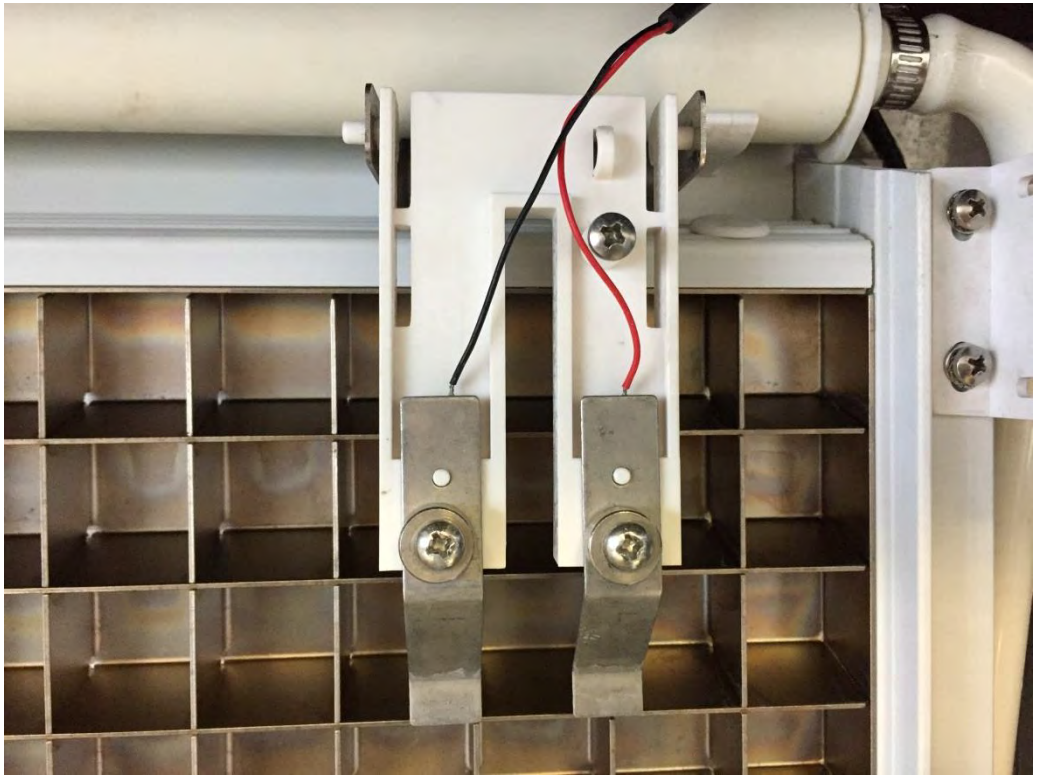
COMPONENTS - ELECTRONIC CONTROLS

The components of the Electronic System of the NW Series Models are :

- **PC BOARD**

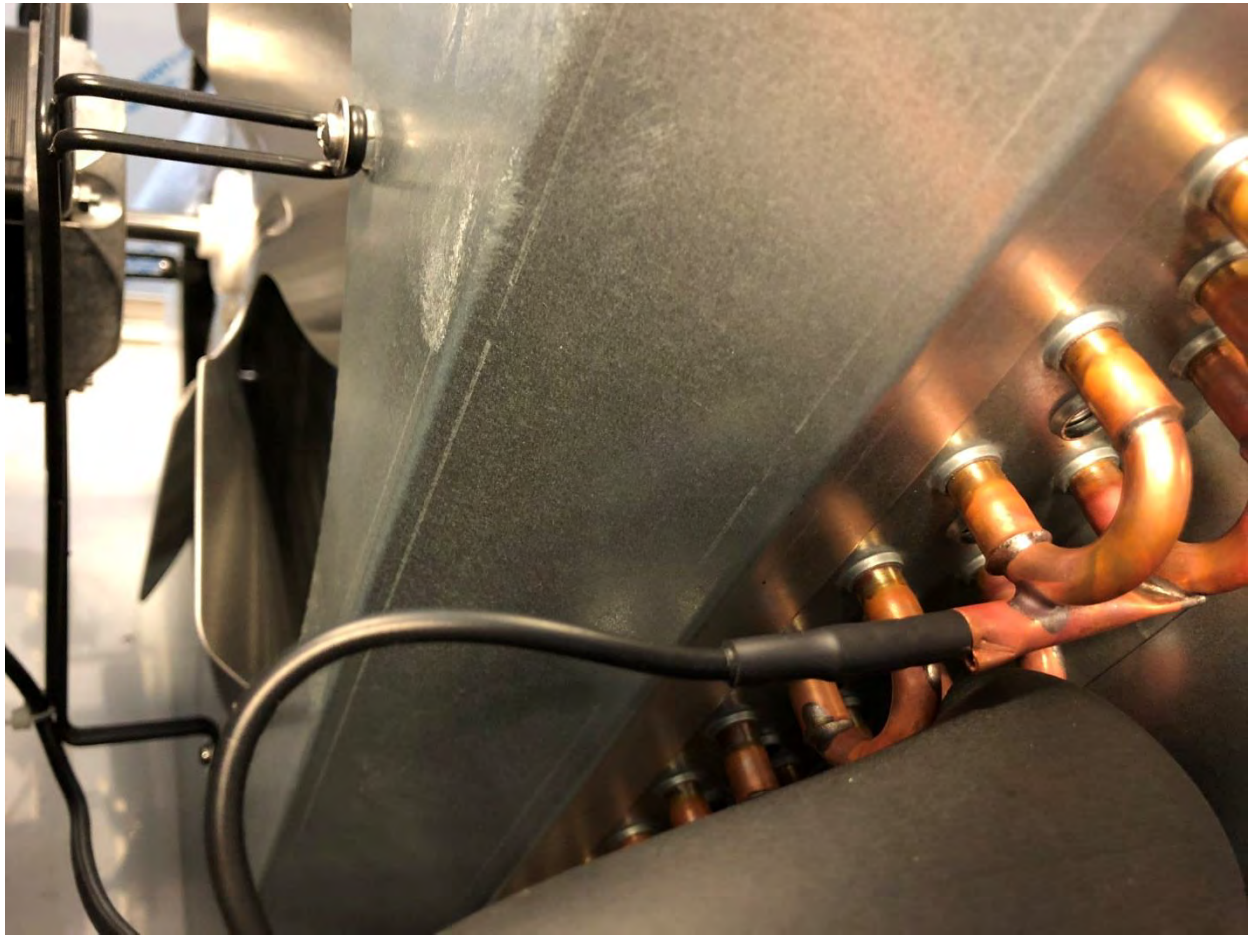
COMPONENTS - ELECTRONIC CONTROLS

- ICE THICKNESS SENSOR



COMPONENTS - ELECTRONIC CONTROLS

- CONDENSER SENSOR



COMPONENTS - ELECTRONIC CONTROLS

- MAGNET

- MAGNETIC SWITCH

COMPONENTS - ELECTRONIC CONTROLS

- WATER LEVEL SENSOR

COMPONENTS - ELECTRONIC CONTROLS

- WATER LEVEL SENSOR

NW 308-508

MAINTENANCE

The most important program on the maintenance of the cubers machines is the cleaning/sanitizing to be done on regular base as detailed here below

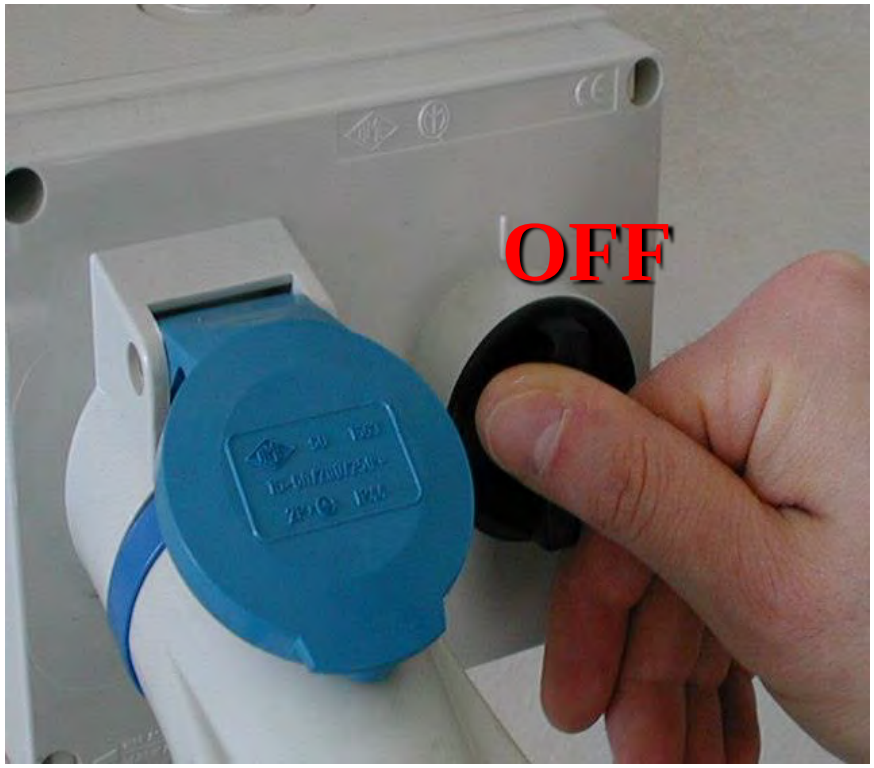
- Sanitizing: Every month
- Cleaning: Every six

On next slides will be shown the procedure for sanitizing and

TOOLS REQUIRED

- Medium Phillips Screwdriver
- Medium Flat Screwdriver
- Pair of safety gloves
- Bucket
- Different types of brush
- Approved Cleaner/Sanitiser

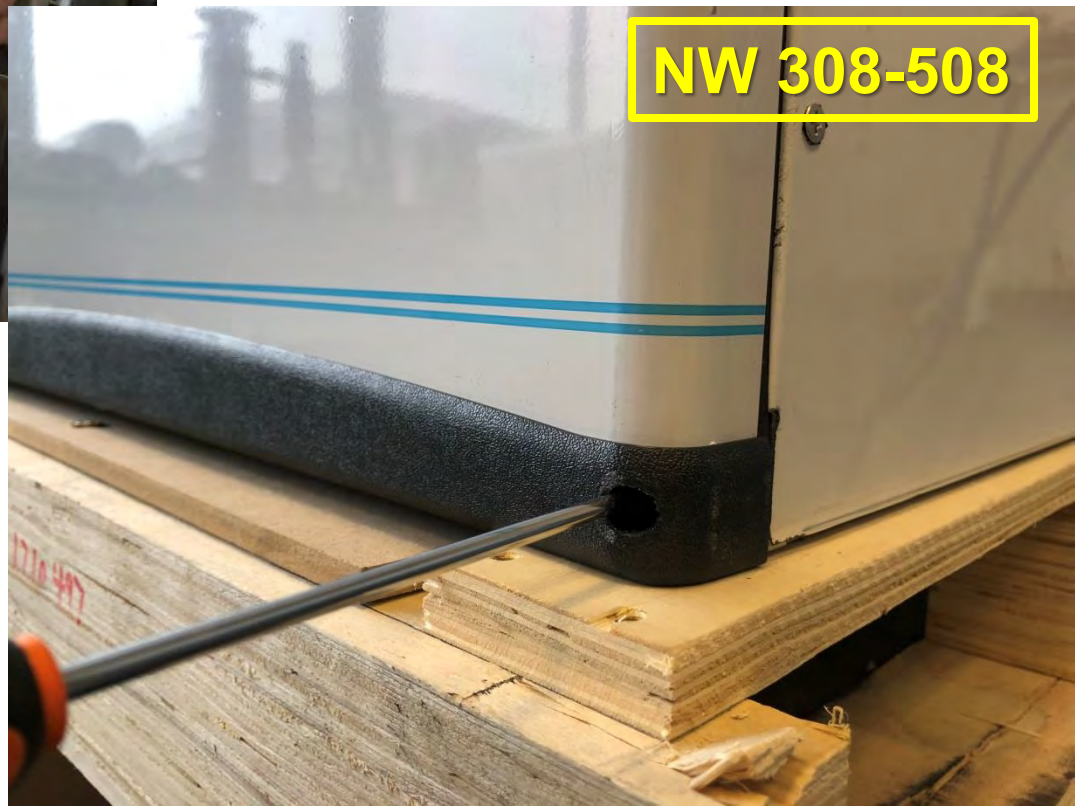
Wait till the end of the defrost/harvest cycle; then switch off the machine from the main switch and close the water tap



MAINTENANCE

Scoop out all ice cubes stored into the bin so to prevent its contamination then...


NW 458-608-1008


NW 308-508

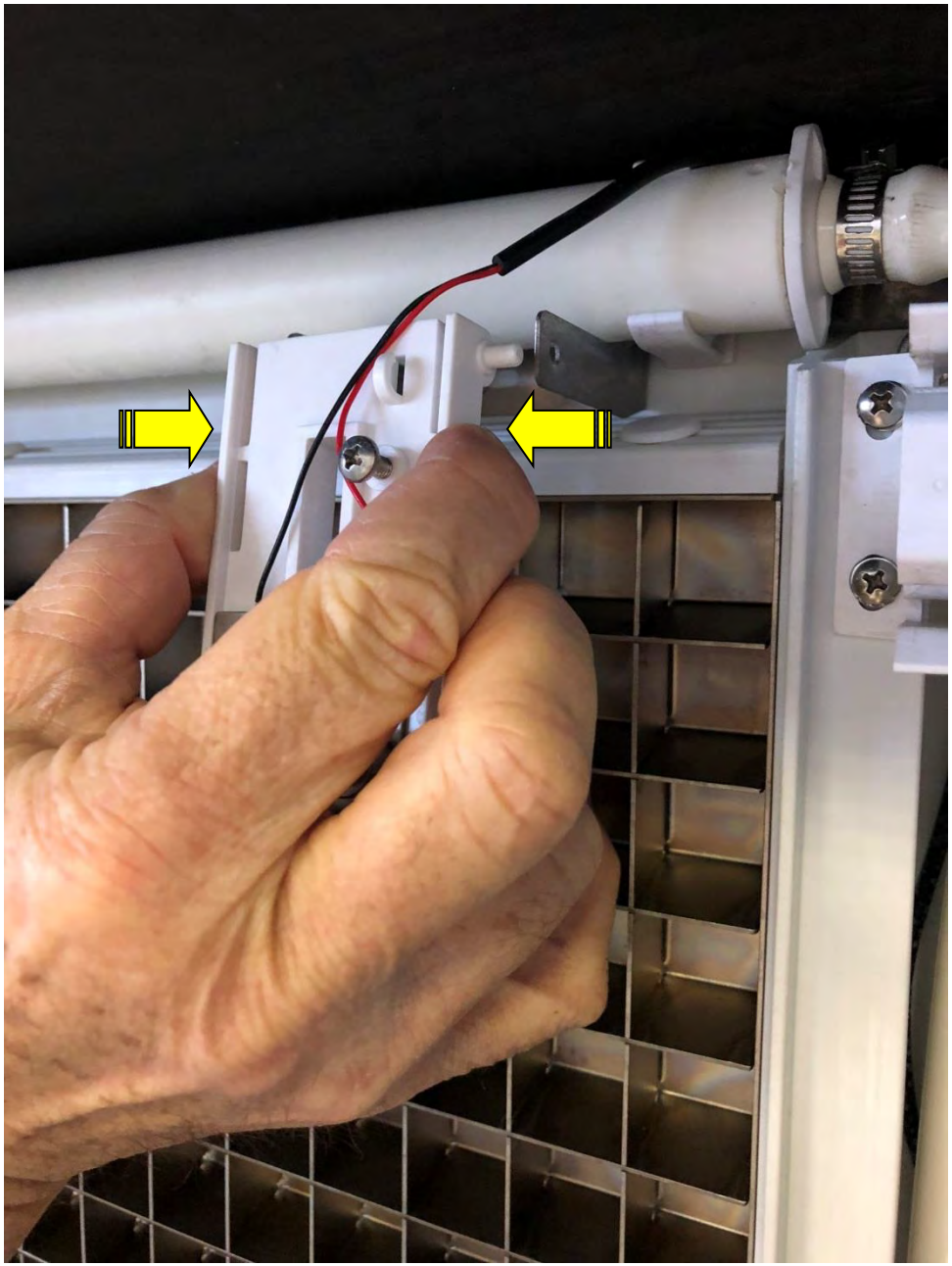
Be assured water sump is empty by water.

In case dump the same by removing drain plastic plug

... And the

plastic deflector

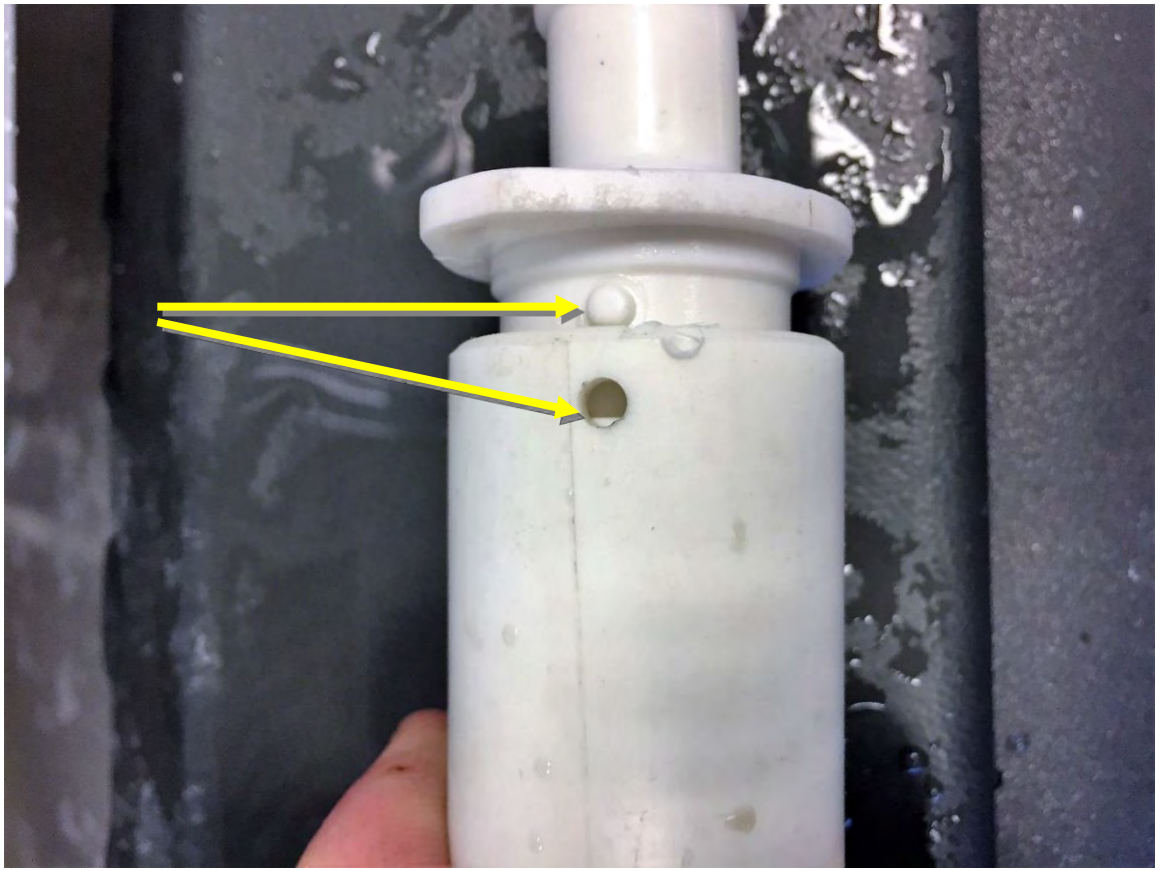
Push the ice thickness sensor external plastic arms and take it off from its housing



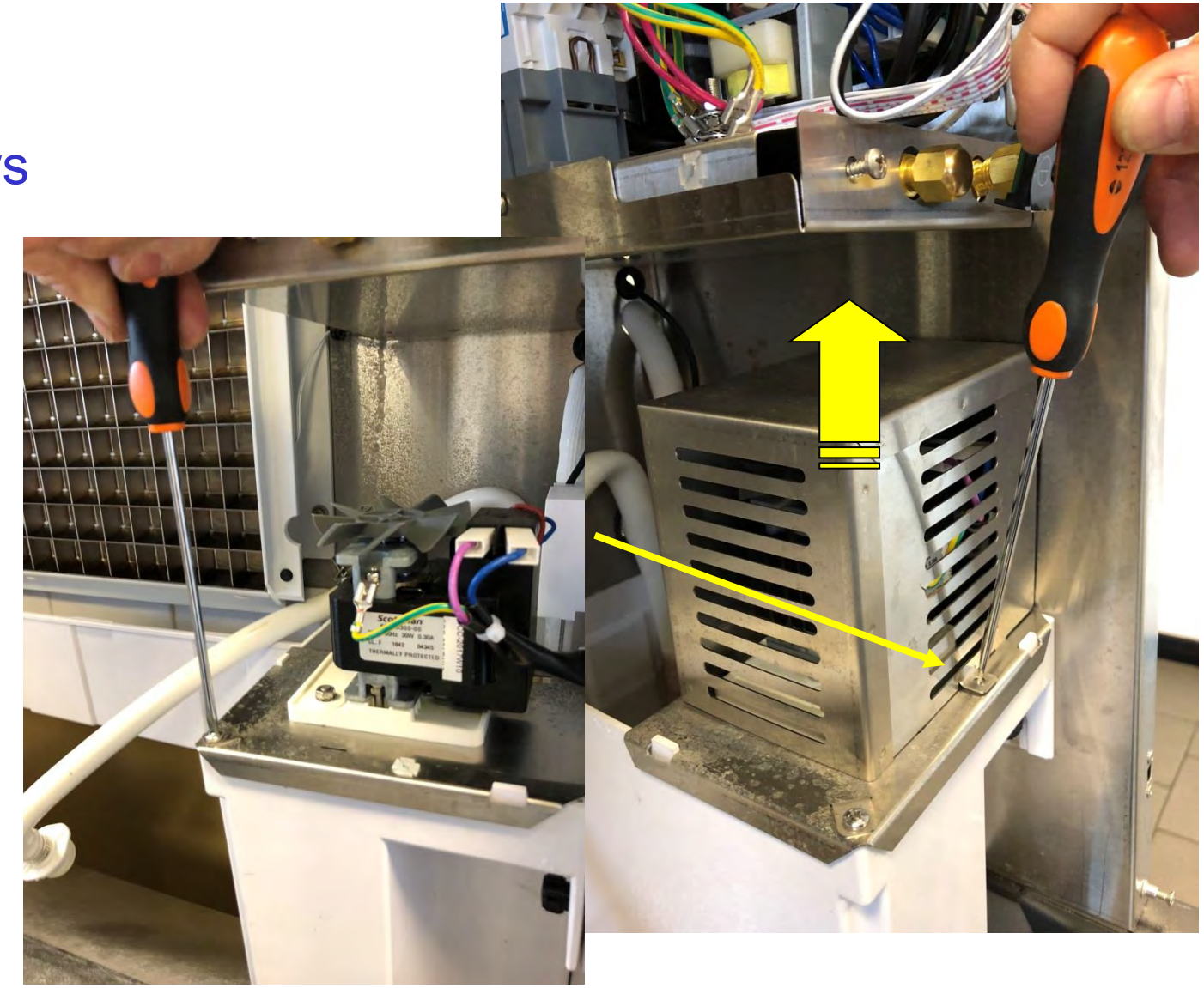
Disconnect the water inlet hose from distributor tube

Open up the water distribution tube for cleaning

Once properly cleaned re-assembly the Water Distributor Tubes then re-fit it again on the upper side of the evaporator paying attention to match the plastic pin with the hole.



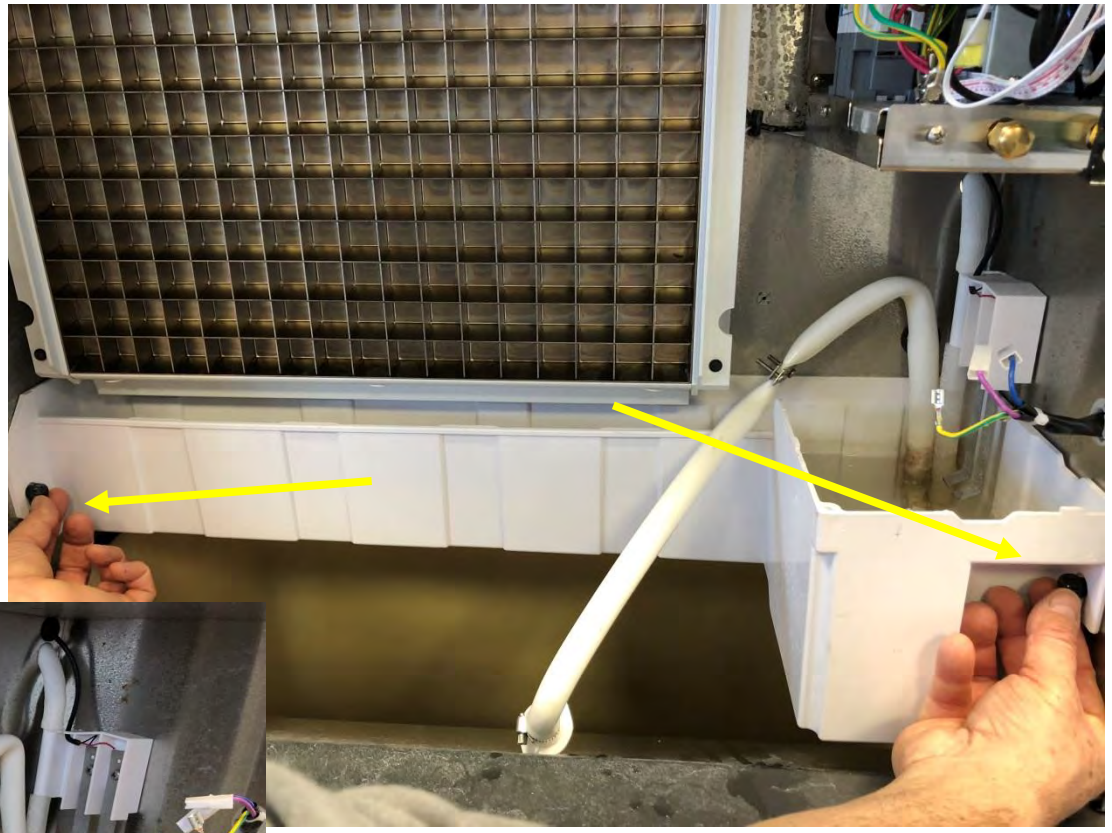
Unscrew water pump bracket screws and remove it from the reservoir



Disconnect the water pump from its power spade connectors

Remove water pumps from the reservoir and disconnect the water discharge hose

Unscrew the two thumb screws then withdraw reservoir from its seat

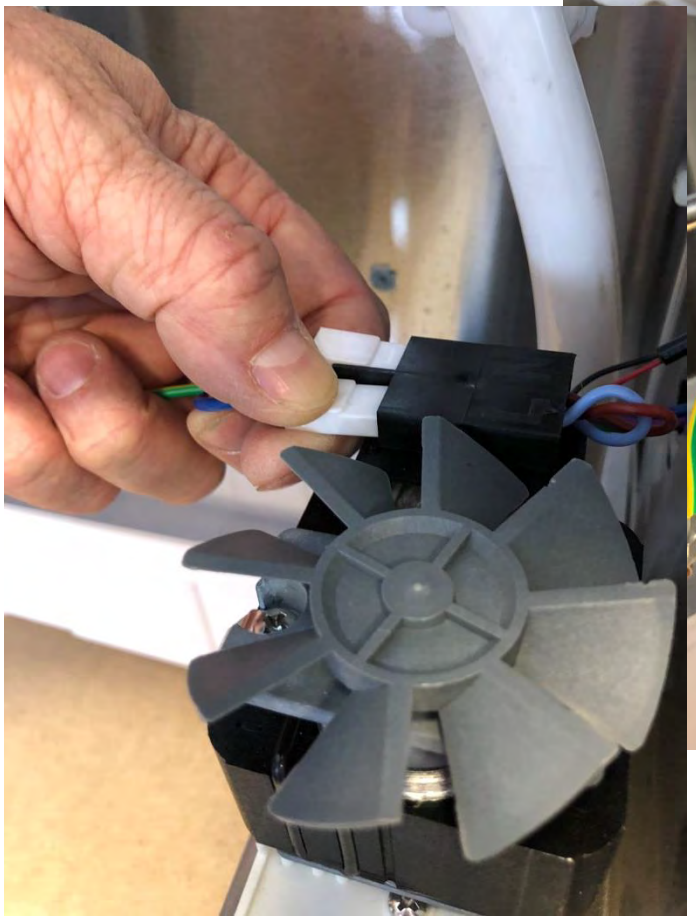


NW 308-508

Unscrew water pump bracket screws and remove it from the reservoir

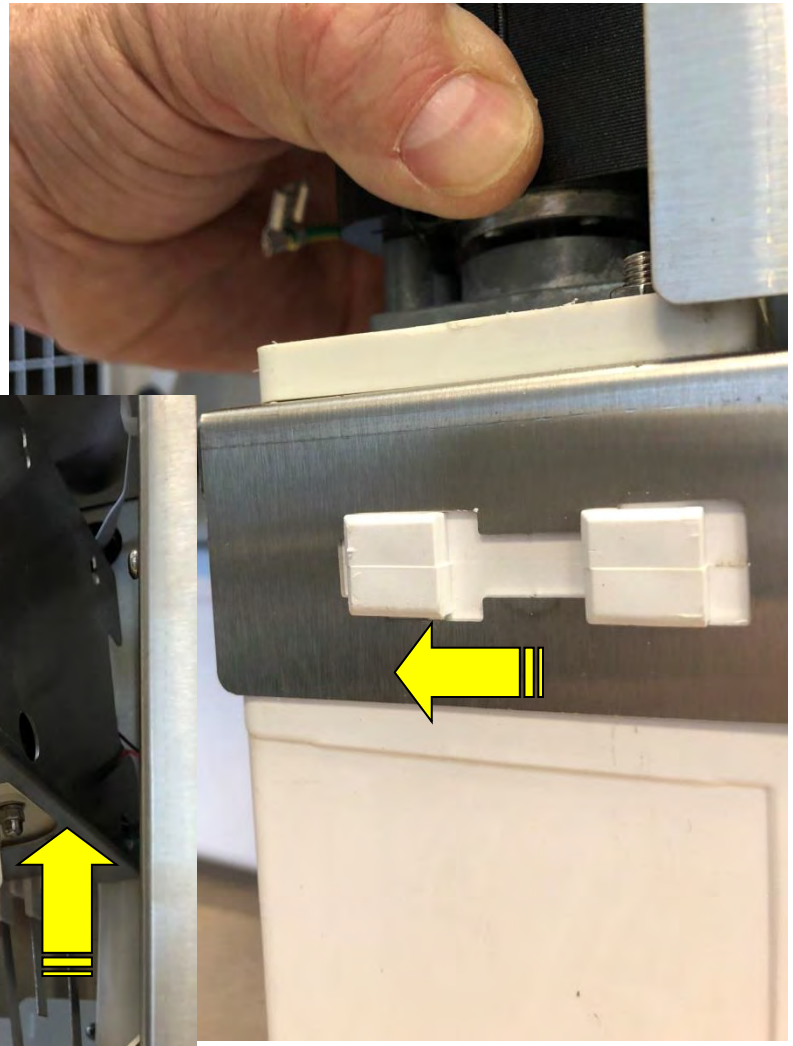
NW 308-508

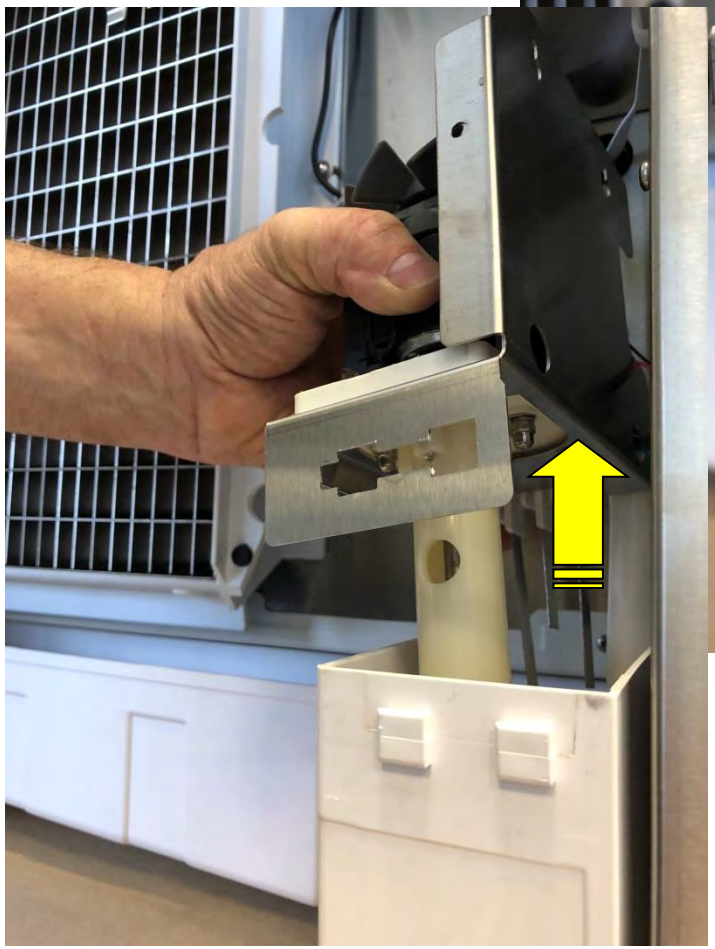
Unloose water pump bracket screws and remove spade connectors



NW 308-508

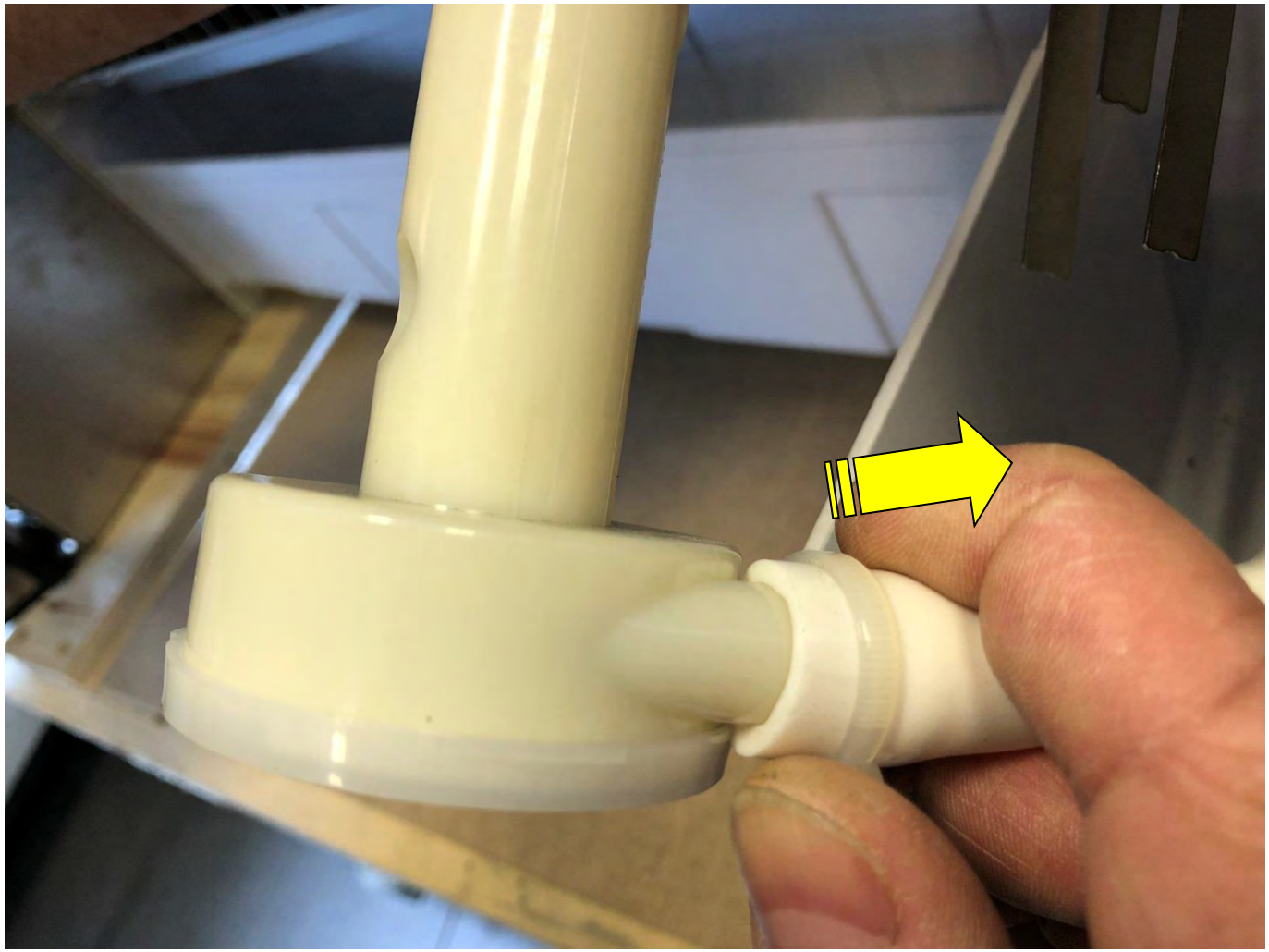
Slip to the left side the water pump bracket thus to release the same from the water reservoir and lift up the water pump





NW 308-508

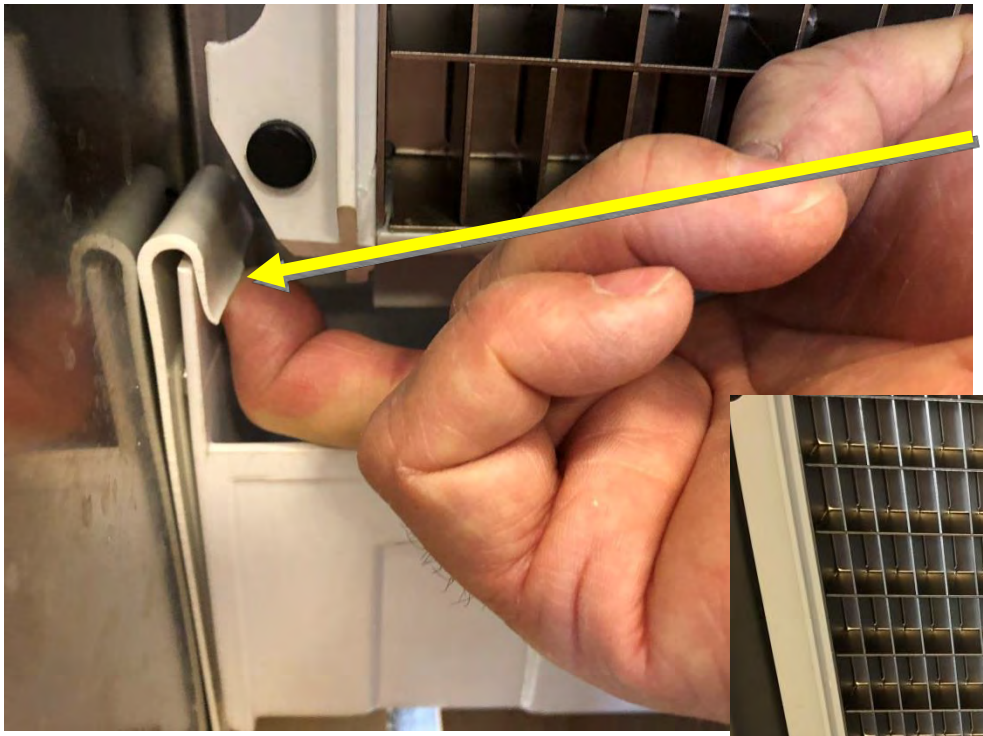
disconnect the water water discharge hose



NW 308-508

Push the water level sensor arms IN and remove the same from its seat

NW 308-508



Hang on water reservoir left holding bracket and withdraw reservoir from its seat

Prepare the cleaning solution by diluting in a plastic bucket two liters of lukewarm water (max 40ºC) with 200 ml of **SCOTSMAN Ice Machine Cleaner**.

Clean evaporator plastic cover by cleaning solution then rinse it by fresh water

Clean water distribution tubes and water reservoir by cleaning solution then rinse it by fresh water

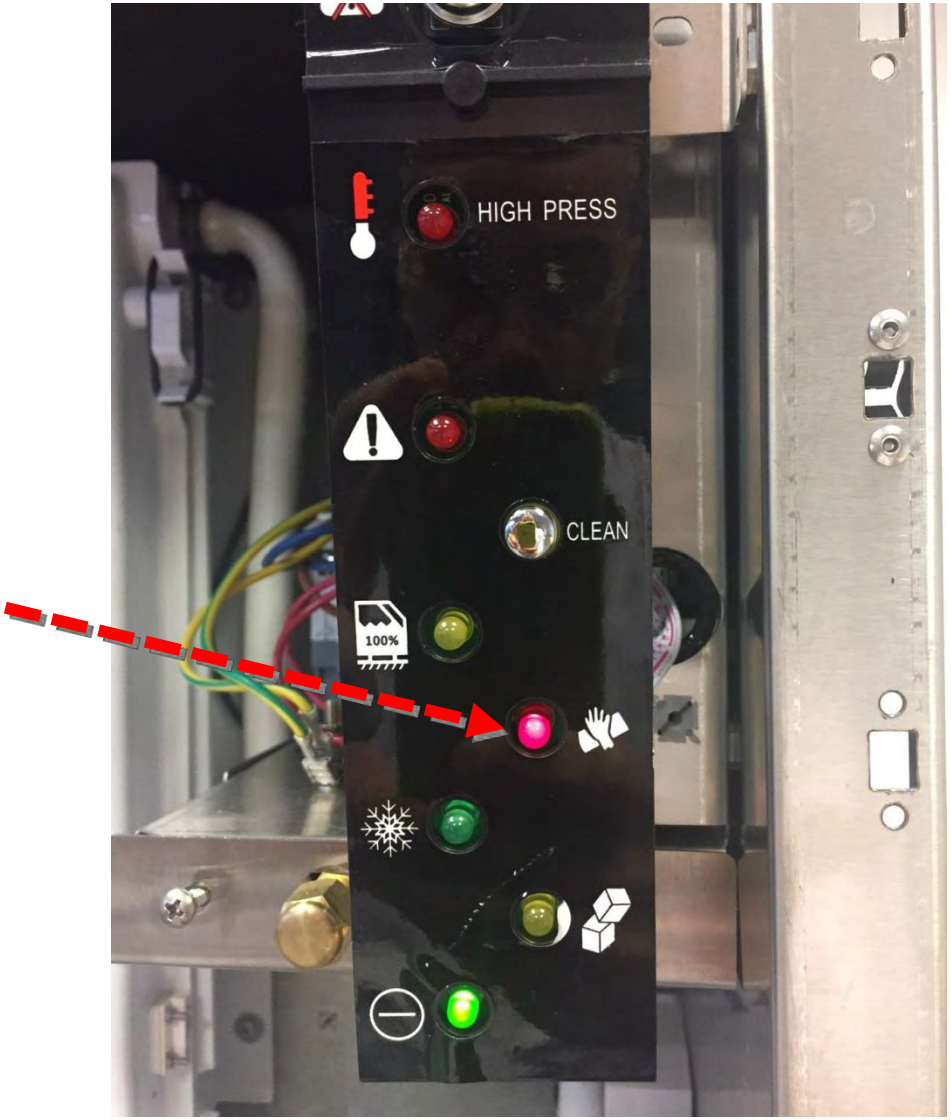
All above step (cleaning) shall also be made by antibacterial solution (finally rinsed by fresh water) then, carefully reinstall all cleaned removed parts

Once completed cleaning procedure on removed parts reinstall the same accordingly

Switch ON the machine from the main switch and OPEN the water tap

Push the **CLEAN BUTTON** for 2-3 seconds

The machine enters in the Cleaning/Sanitize cycle with the red CLEAN LED light on MONITOR PANEL blinking fast in whole procedure



In the first 30 seconds of clean procedure the machine purge water from the sump, then pour:

NW 308: 180 ml

NW 506: 200 ml

NW 458-608: 350 ml

NW 1008: 350 ml

of SCOTSMAN cleaner inside water sump while…

……the water inlet

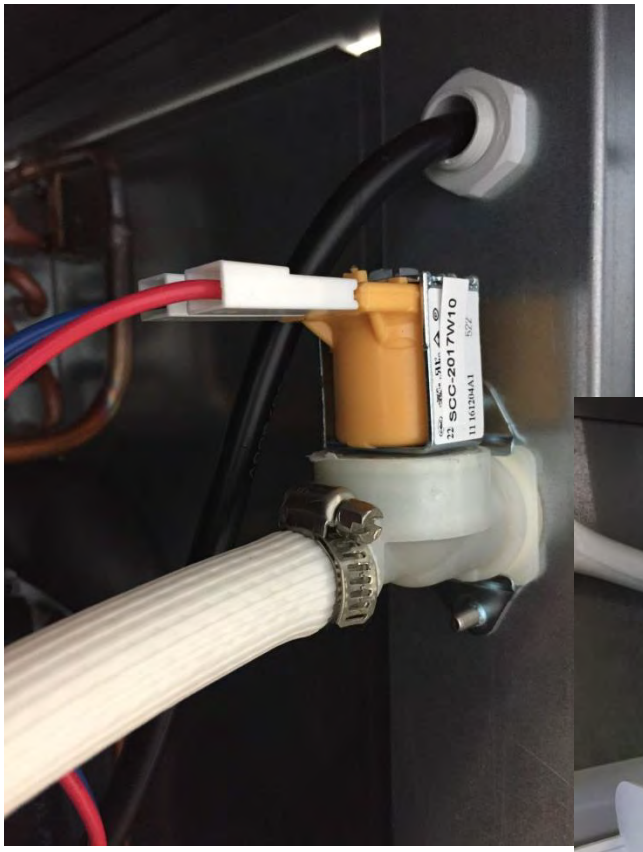
valve will be energized

till the fill up of the

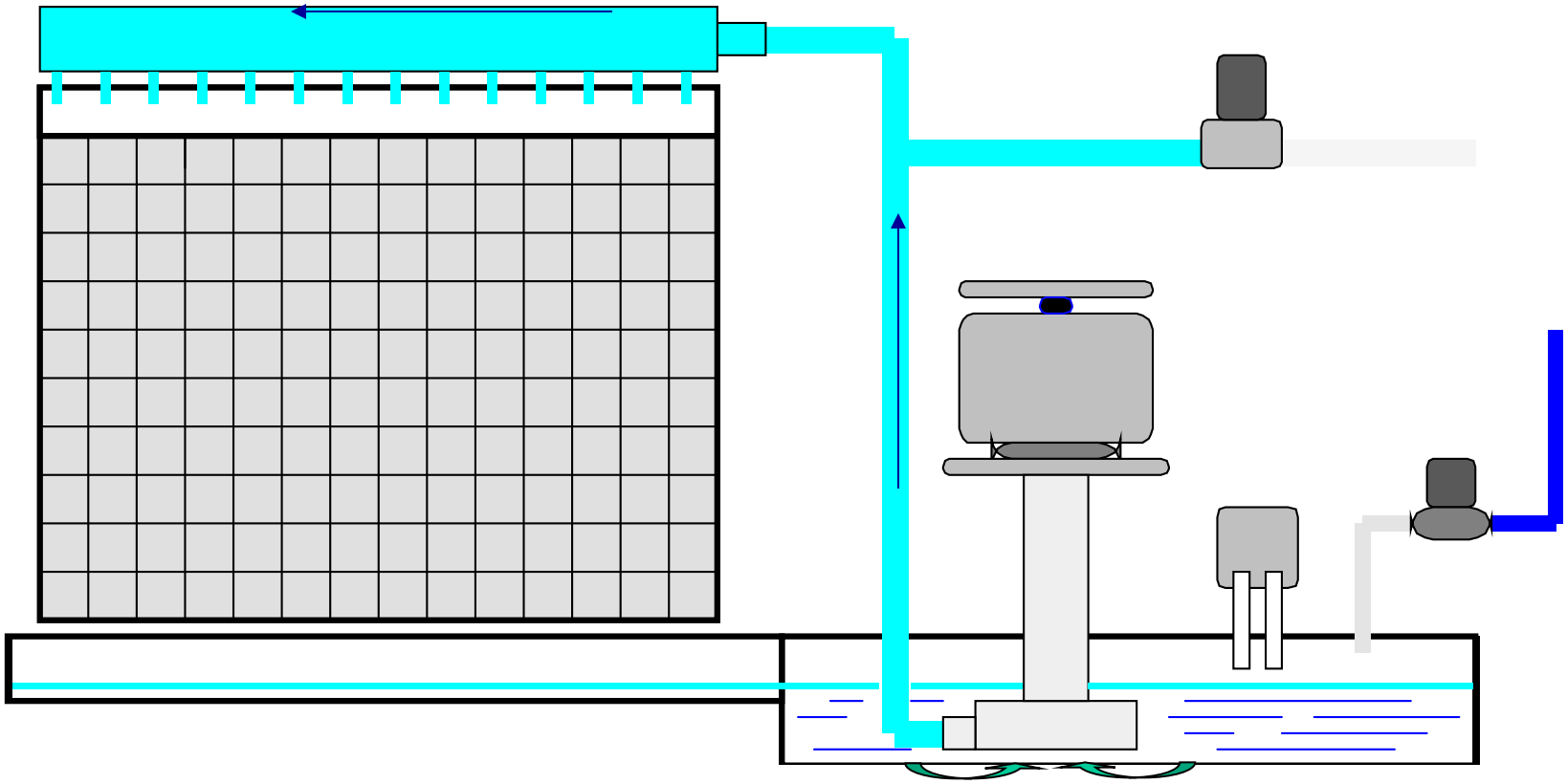
water sump . The

water pump starts to

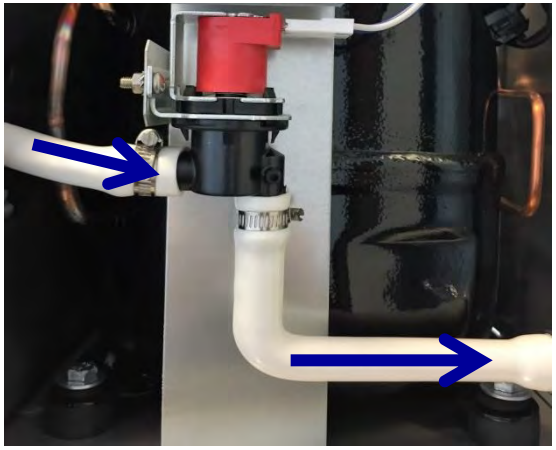
operate



With the system in Cleaning mode the water pump is the only component in operation to circulate the cleaning solution in the entire water system.



After 10 minutes from the start of the cleaning cycle machine will purge automatically the Cleaner solution and refill up the water sump, then goes into automatic rinsing mode.

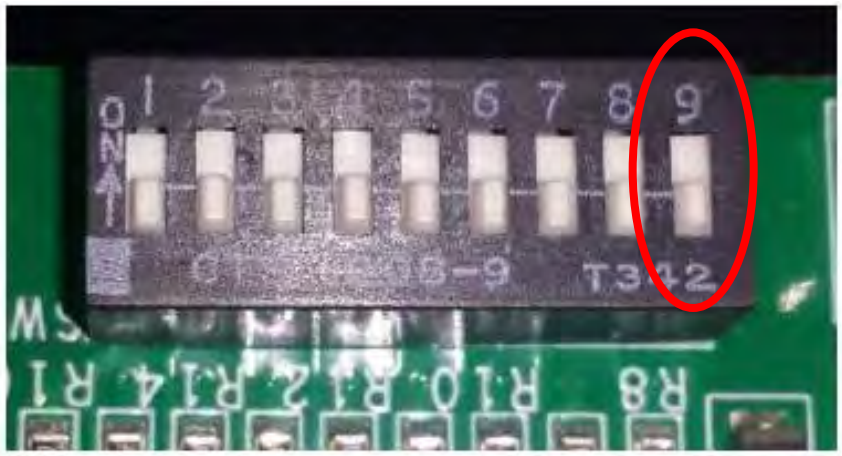


RINSING MODE consists of:

- Energize water pump for 30”
- Energize water drain valve and water pump for 30”
- Energize water inlet valve till the fill up of the water sump
- The above sequence is repeated 10 times to be sure to have removed any possible trace of Ice Machine Cleaner

At the end of 10th rinsing cycle, the machine restart according with the setting of DIP-SWITCH n.9

OFF = Machine will stop clean procedure with slow blinking of Red CLEAN light



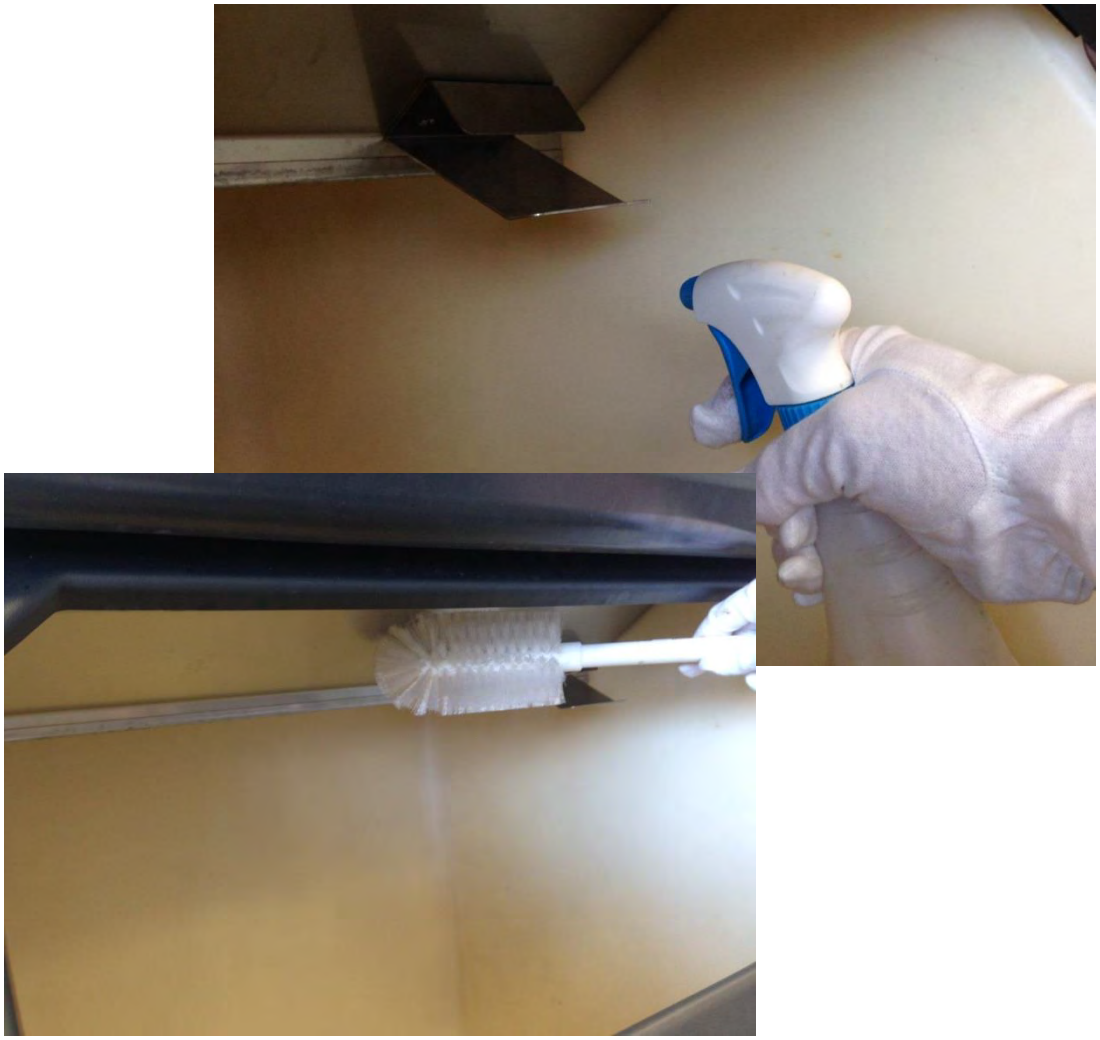
Push CLEAN button to restart in freezing cycle

ON = Machine will restart automatically with a new freezing cycle

Repeat same procedure pouring approx. 5 ml of Sanitizer (Amuchina) directly into the water reservoir

Meanwhile the unit is running the rinsing cycle , mix in a clean bucket some fresh water with 1% of sanitizer product (Amuchina)

Fill up with the mixed solution a spray bottle, then spray the same to all bin internal wall/area and wipe with a proper brush the SS deflector as well as the internal surface of the plastic door and the internal area of the bin



REMEMBER: The interior liner of the bin is in contact with a food product, ice, and needs to be cleaned and sanitized regularly **(one a week)** to prevent accumulation of bacteria. Once a week sanitize it with a commercial food grade sanitizers complying with the manufacturer dilution instruction

Install back the front panel and switch

ON the machine.

Check next batch, if it s cloudy, white

and have an acid taste, melt them

immediately by pouring on them some

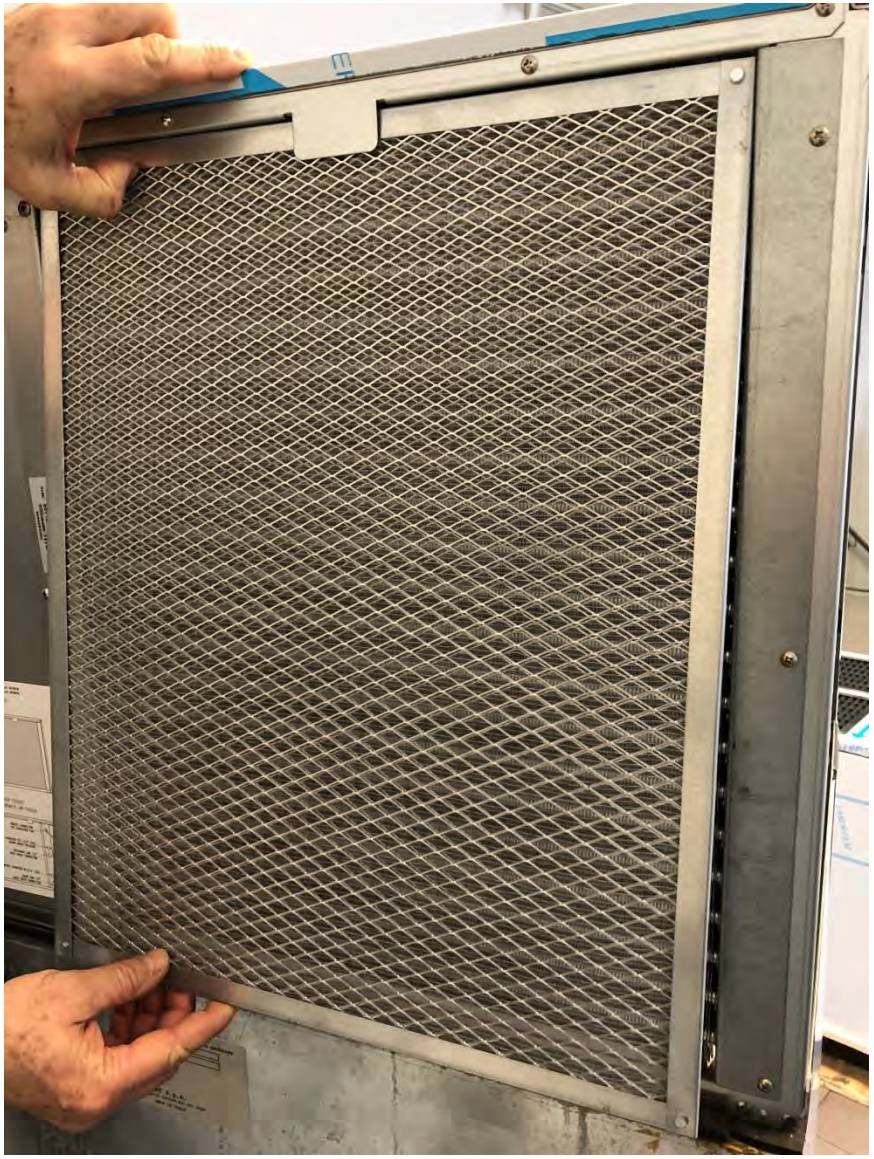
warm water. This to prevent that

somebody can use it

Monthly check

and clean rear air

filter



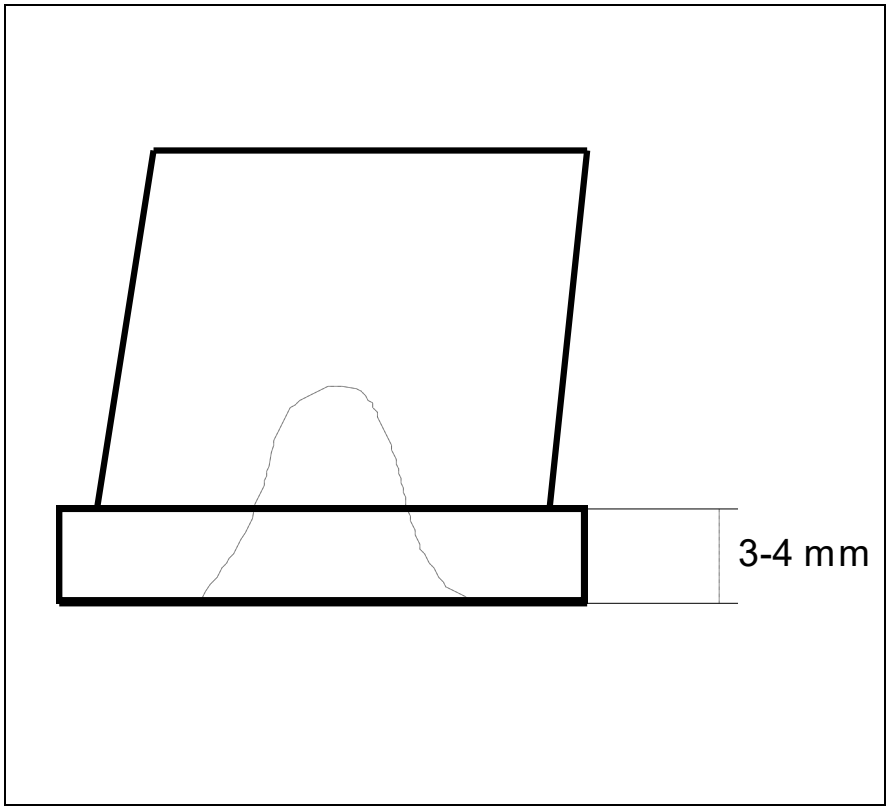
SERVICE ANALYSIS

SERVICE ANALYSIS

This is a **Scotsman Dice**

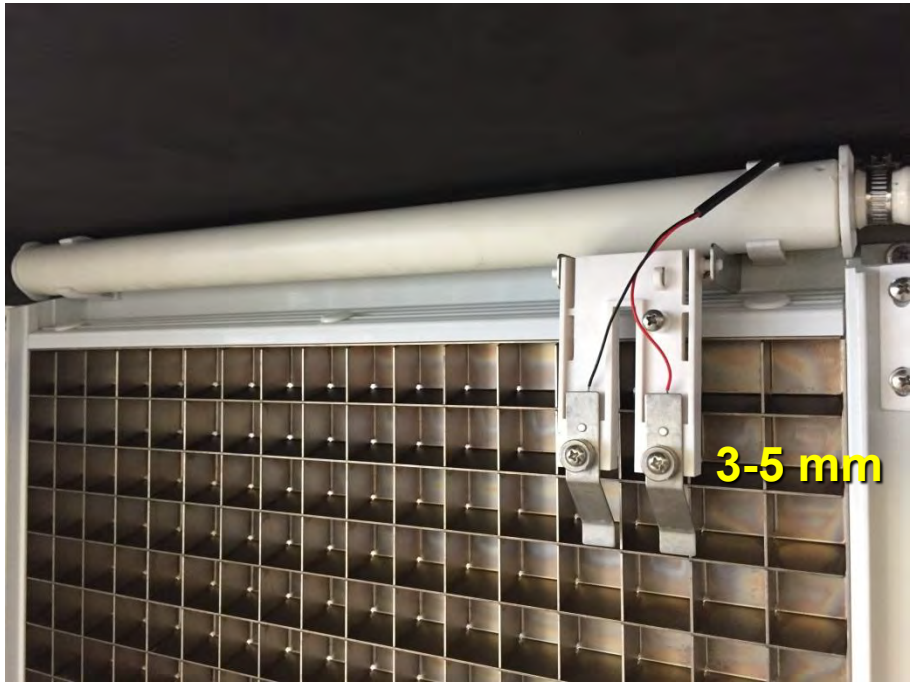
Cube.

It must be clear, solid with a bottom rim of about 3-4 mm and a small depression of 9-10 mm.



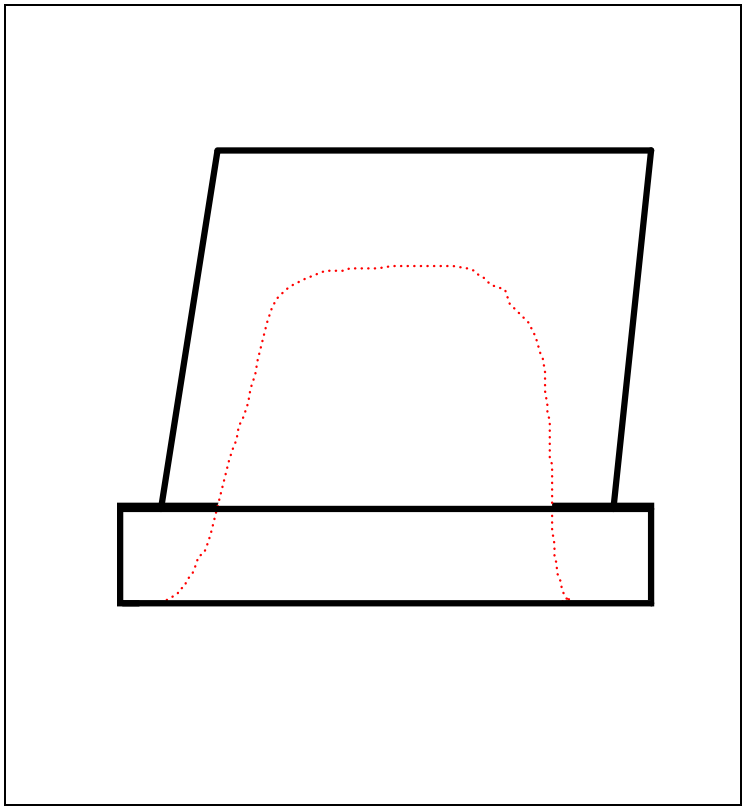
SERVICE ANALYSIS

The Ice Thickness Sensor must be adjusted so to have a clearance of approximately 3-5 mm between the bottom of the two metal plates and the front of the evaporator cells.



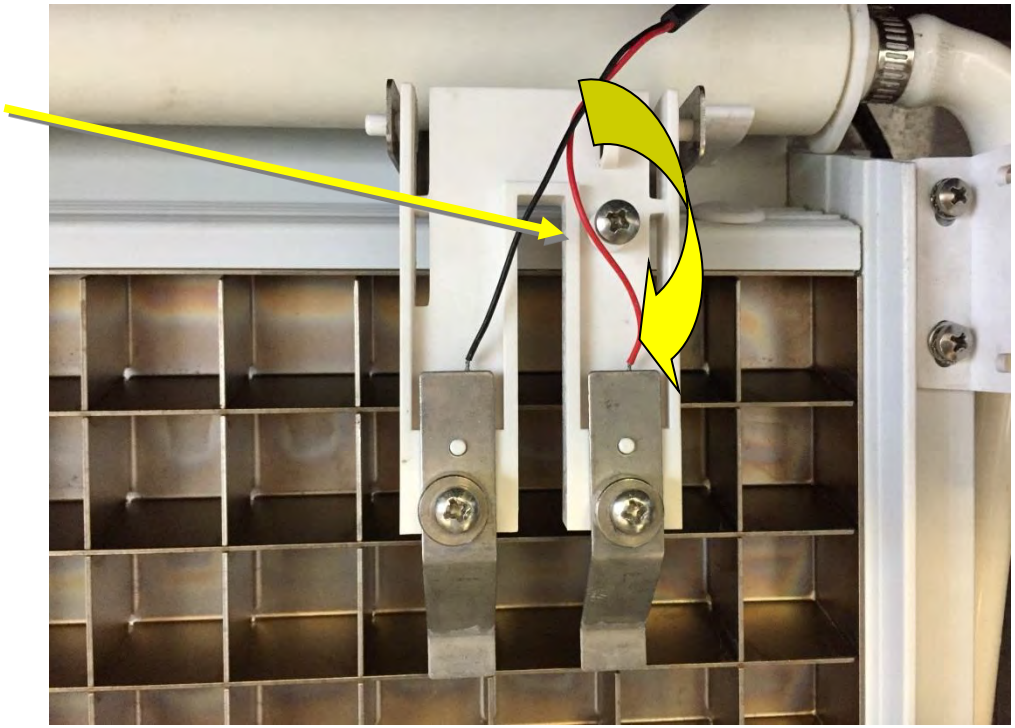
SERVICE ANALYSIS

This ice cube is clear, solid but it has a deep depression on its bottom rim due to a too short freezing cycle.



SERVICE ANALYSIS

It is necessary to extend the length of the freezing cycle by adjusting the clearance between the ice thickness sensor and the front of the evaporator turning the adjusting screw clockwise.

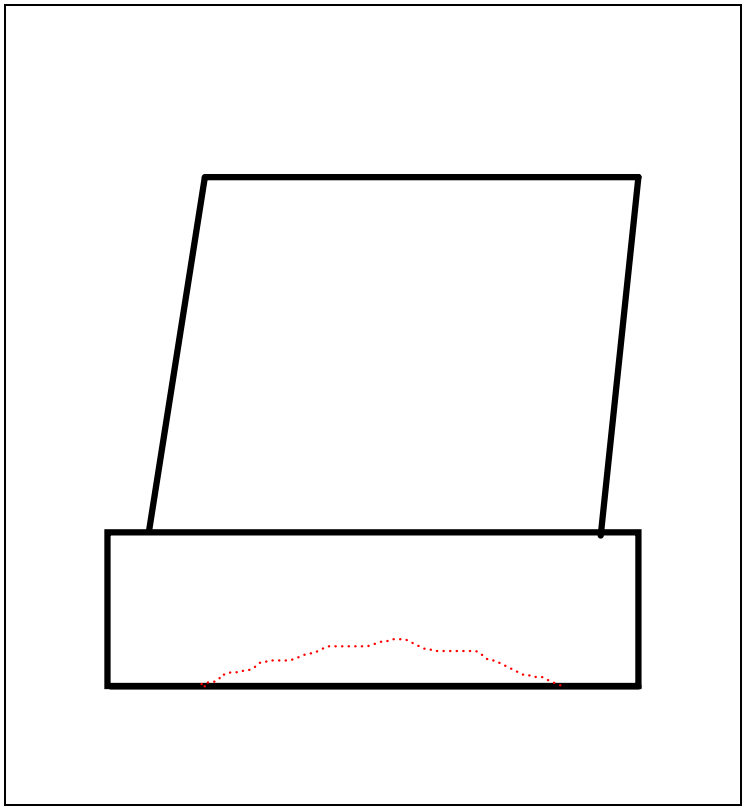


SERVICE ANALYSIS

This ice cube is clear, solid but

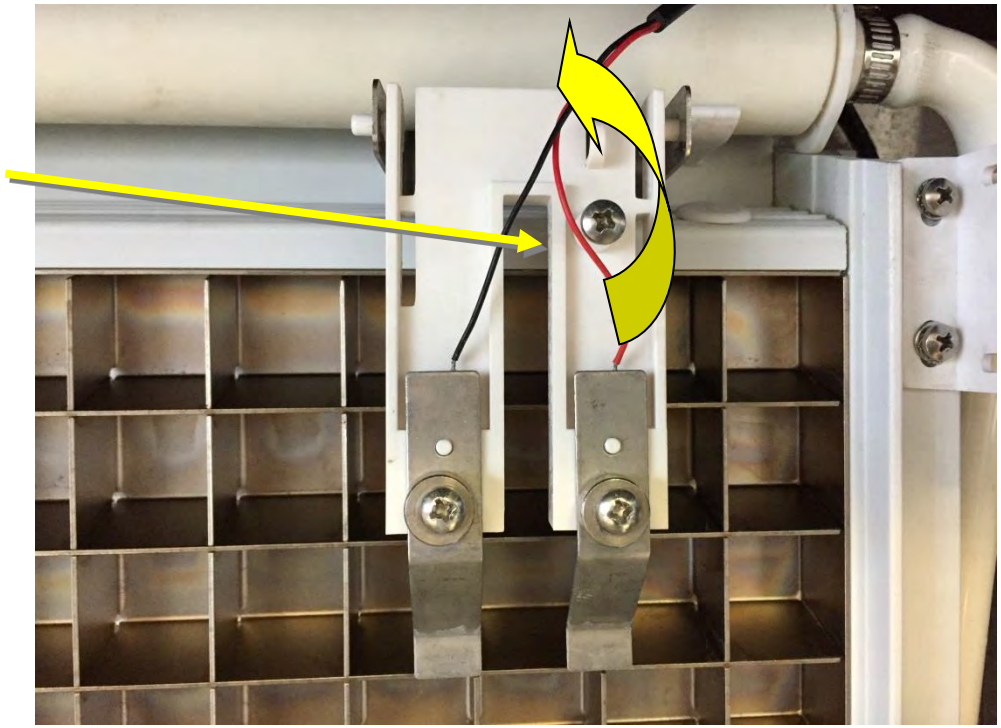
it is oversized due to a too

long freezing cycle.



SERVICE ANALYSIS

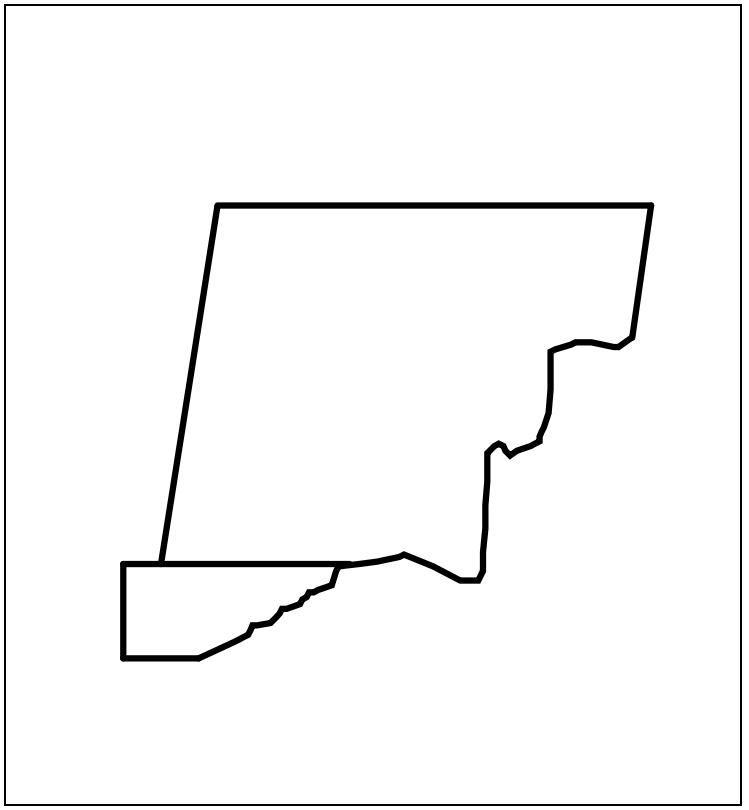
It is necessary to reduce the length of the freezing cycle by adjusting the clearance between the ice thickness sensor and the front of the evaporator turning the adjusting screw counterclockwise.



SERVICE ANALYSIS

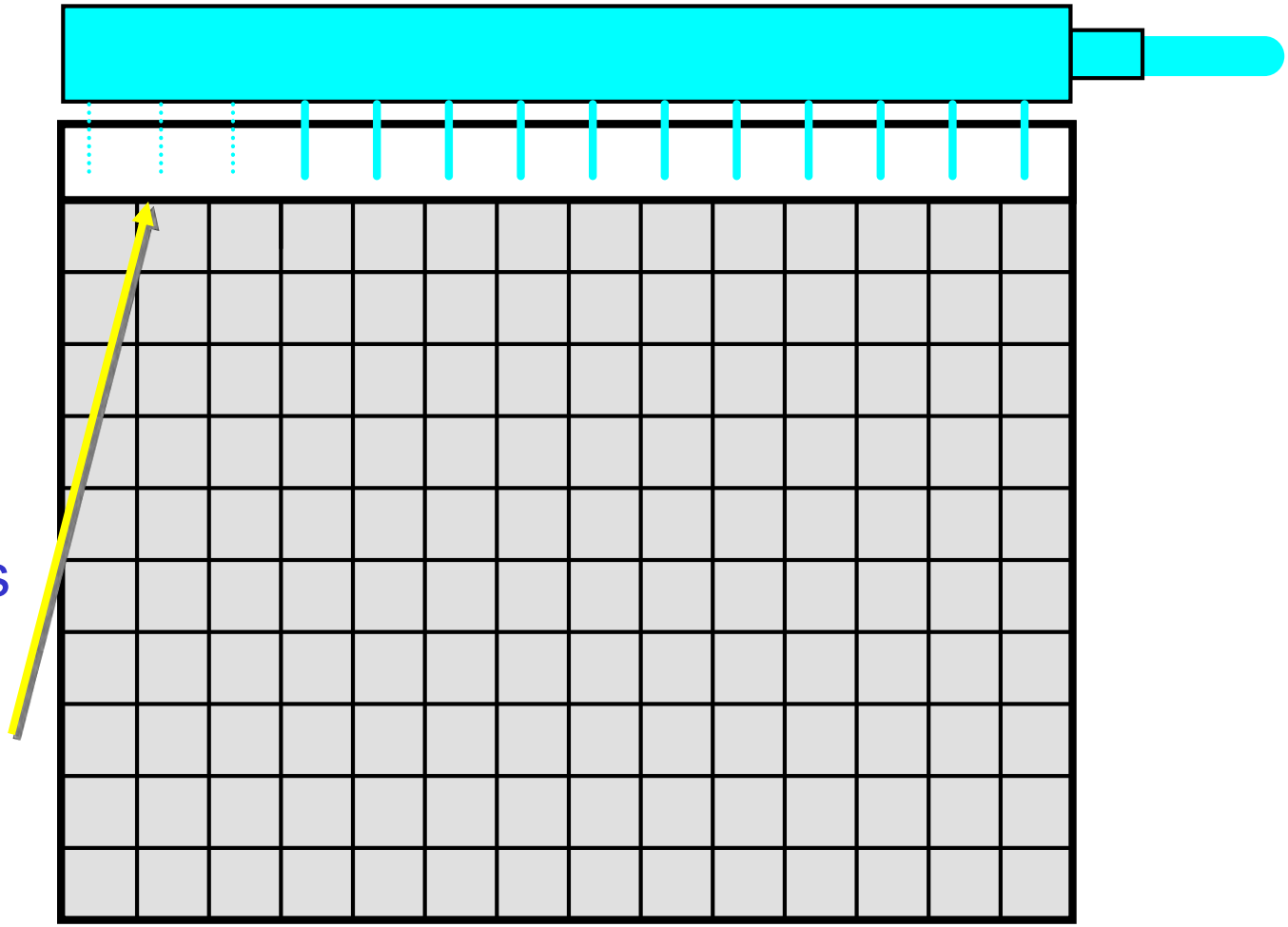
This is a typical ice cube clear on its upper left side and white and corroded on its bottom right side.

The reason is that the water doesn't reach in correctly the inside of some of the evaporator molds.



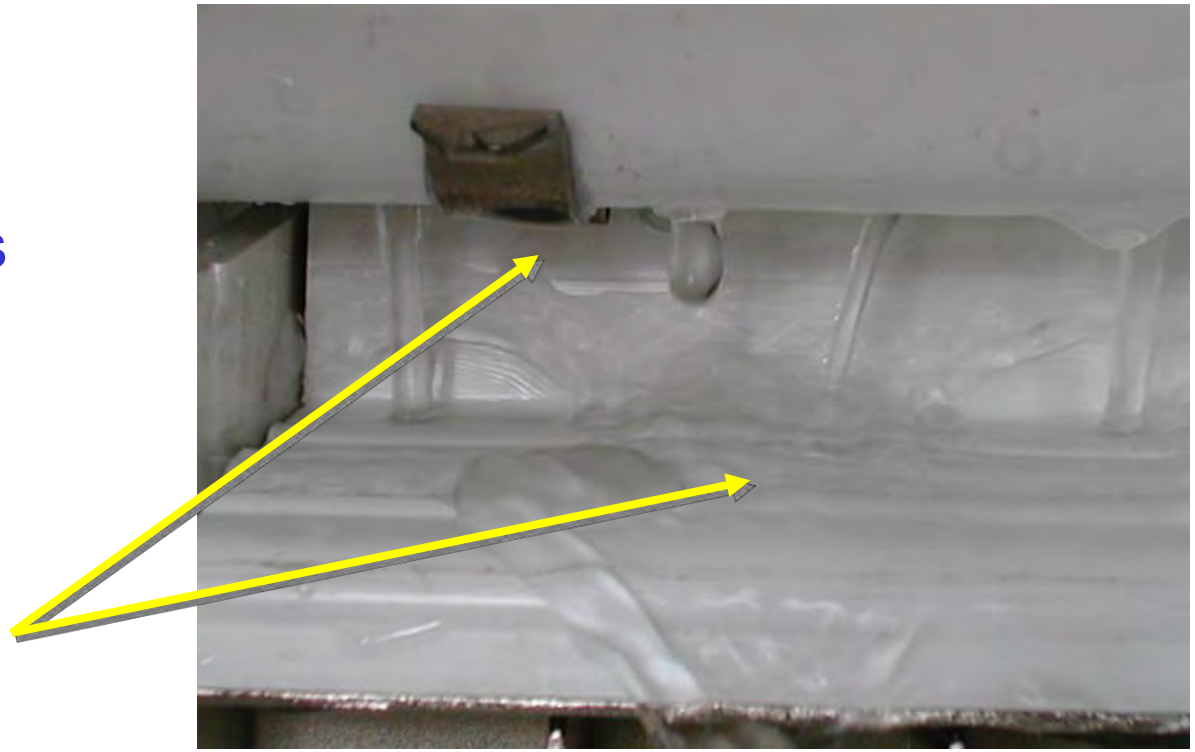
SERVICE ANALYSIS

Should be due to clogged spray jets



SERVICE ANALYSIS

To solve this trouble check and clean spray bar as shown on the previous Cleaning Procedures

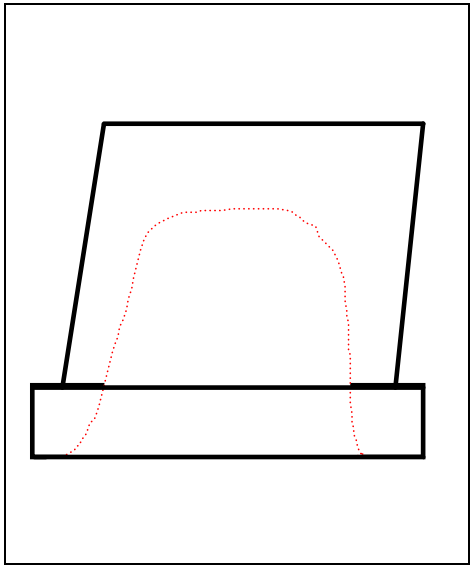


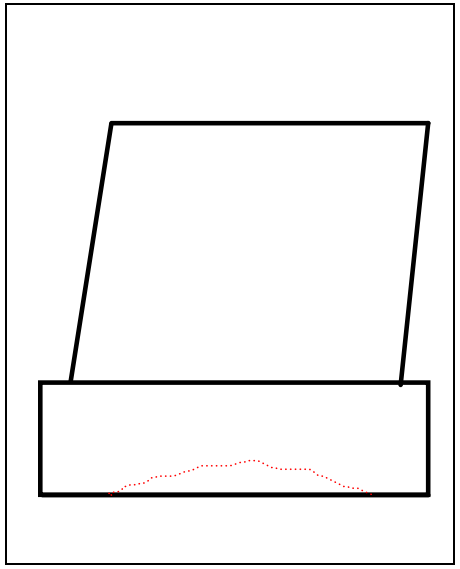
SERVICE ANALYSIS

These ice cubes are both clear, solid but some are oversized and some other are undersized.

If so the possible reasons could be:

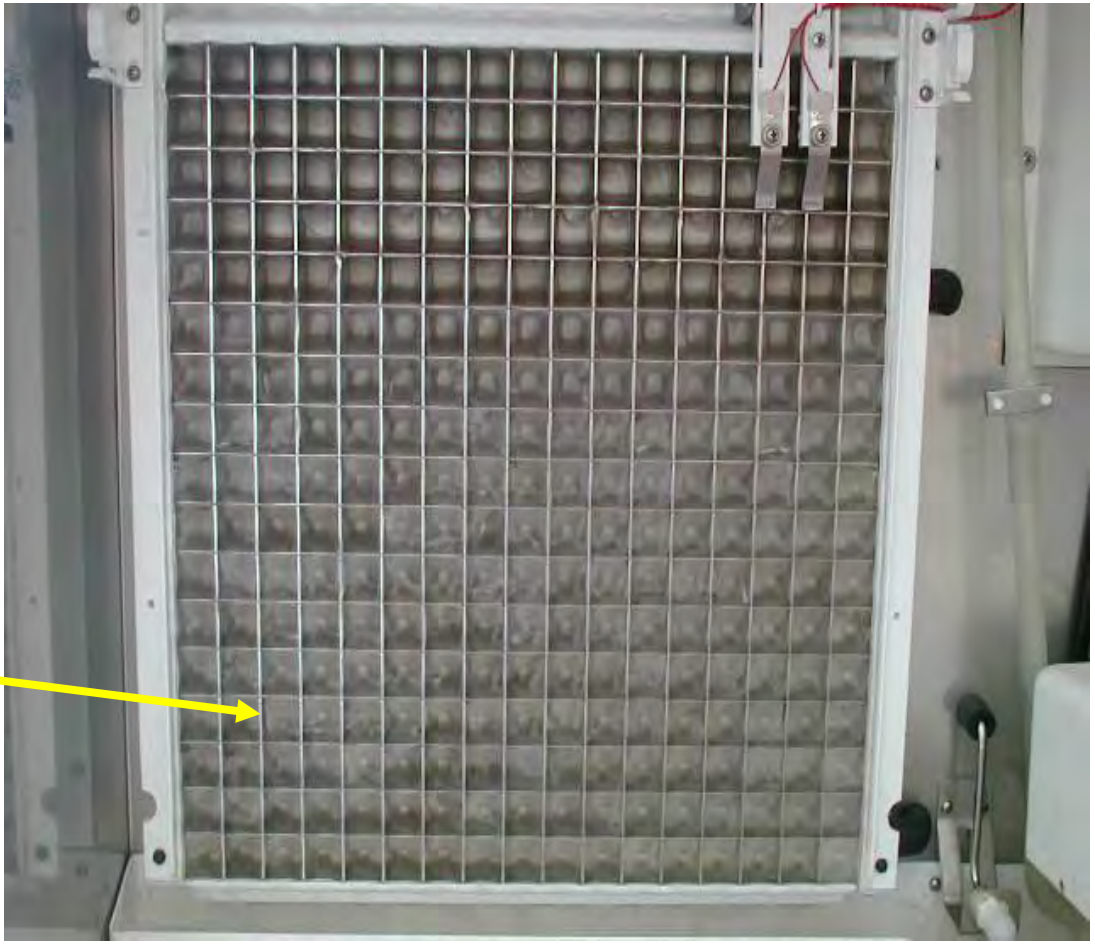
- **TXV not working properly**
- **Low refrigerant charge**





SERVICE ANALYSIS

Looking the evaporator, after 15-20 minutes in the freeze, the ice is probably…..



SERVICE ANALYSIS

thick on the bottom portion (inlet of refrigerant) and thin on the upper one (outlet) due to the lack of exchange of heat between refrigerant - already in vapor state - and cascading water.

SERVICE ANALYSIS

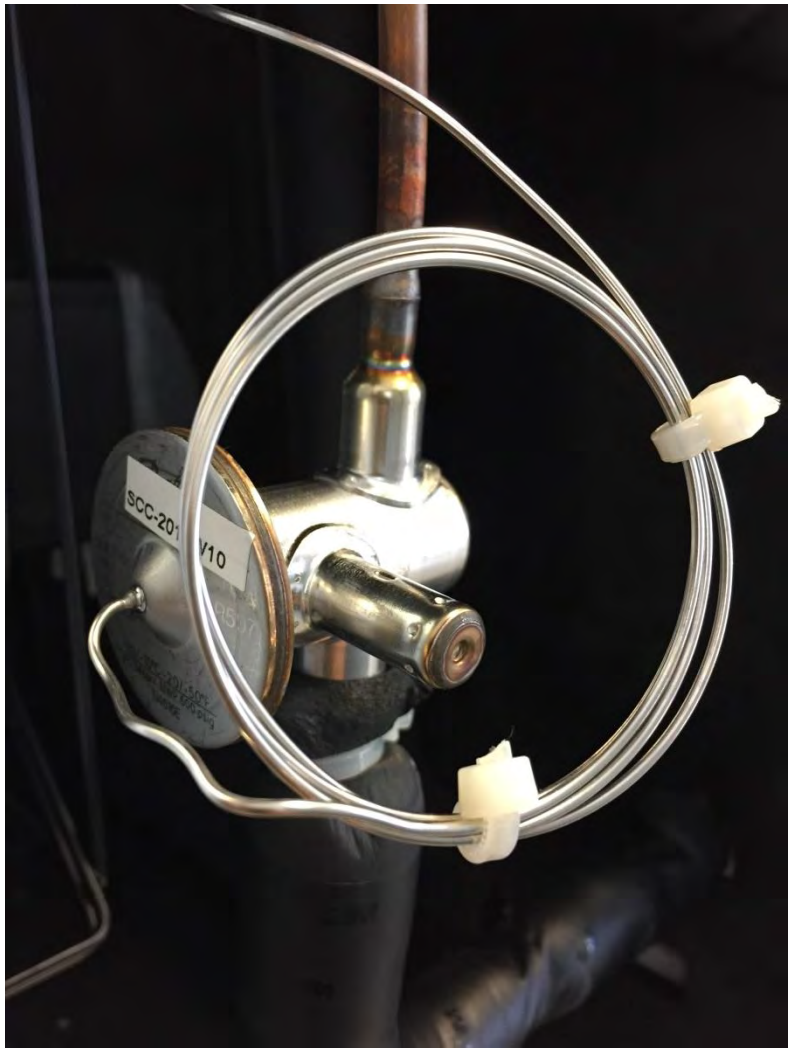
Check the operating pressures of the refrigerant system connecting the gauges on hi and low service valve.

The operating pressures at the end of the freezing cycle with unit at 21ºC ambient and 10°c water inlet should be:

MODEL	Disch.Pressure Freeze max bar	Disch. Pressure Freeze min bar	Hi pressure CUT OUT bar	Suction Pressure Beginning Freeze bar	Suction Pressure end Freeze bar	Cycle time minutes
NW308AS	18	13	32,5	4,2	2,4	17
NW508AS	15,4	14	32,5	3,4	2	13
NW458AS	17	11	32,5	3	1,8	16
NW608AS	17	14	32,5	2,6	1,4	14
NW1008AS	17,5	14,5	32,5	3,2	1,7	12
NW1008AS	18	15	32,5	3	1,4	14
NW308WS	17,5	15,8	32,5	3,6	2	18
NW508WS	16	15,5	32,5	3,2	1,6	14
NW458WS	18	17,5	32,5	3	1,4	15
NW608WS	17	16	32,5	3	1,4	15
NW1008WS	18	17	32,5	3	1,7	13
NW1008WS	18	17	32,5	3	1,7	13

SERVICE ANALYSIS

If the pressures are not the right ones, it will be necessary to replace the TXV valve

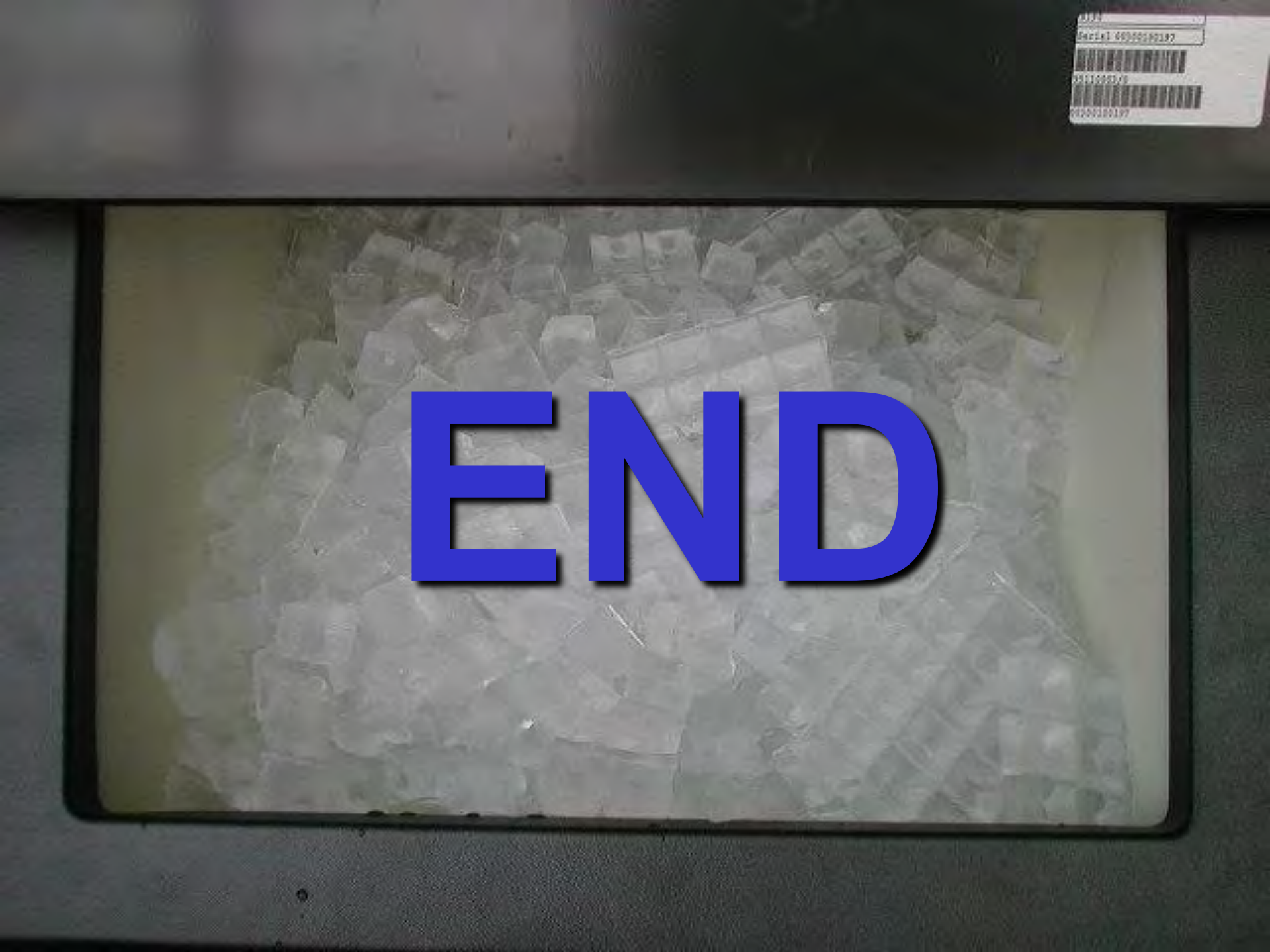


SERVICE ANALYSIS

One more possible reason could be the serpentine no longer proper welded on the back side of the evaporator.

SERVICE ANALYSIS

If so, ice is produced in spots, according to the different transmission of heat between the refrigerant in circulation on the serpentine and evaporator surface.


END