AM SERVICE TRAINING

Featuring the

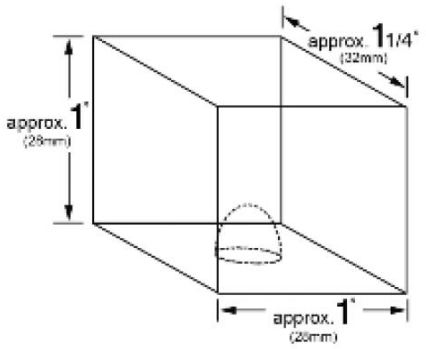
IM-500SAA

80047 9/10/13

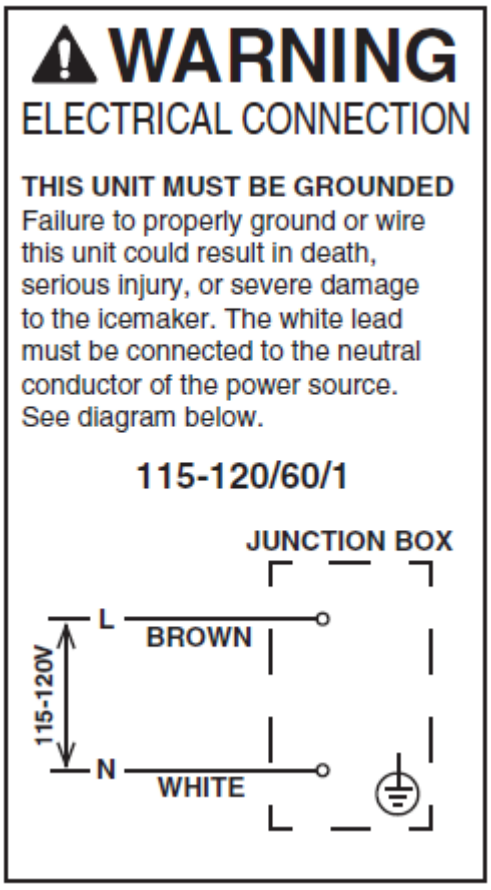
All IM models have similar sequence of operation. This manual is designed as a generic IM Training manual.

The Hoshizaki IM series ice machine uses a horizontal evaporator design which forms a square cube shape with a small dimple.

***IM CUBE DIMENSIONS**



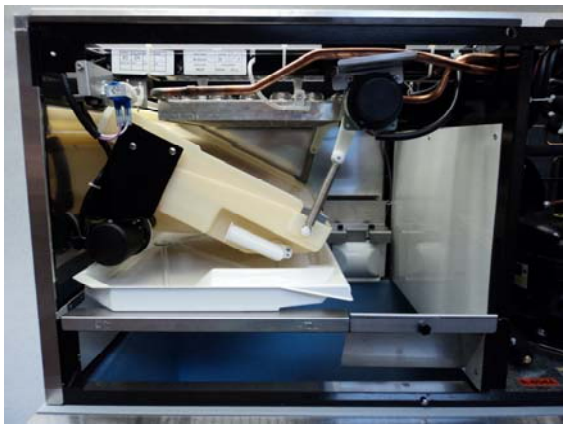
*approximate size, image not to scale

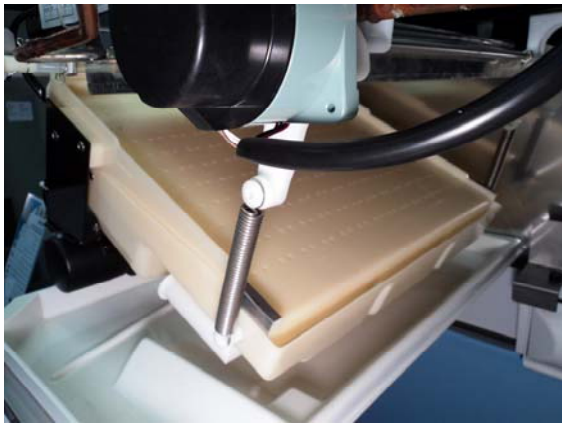


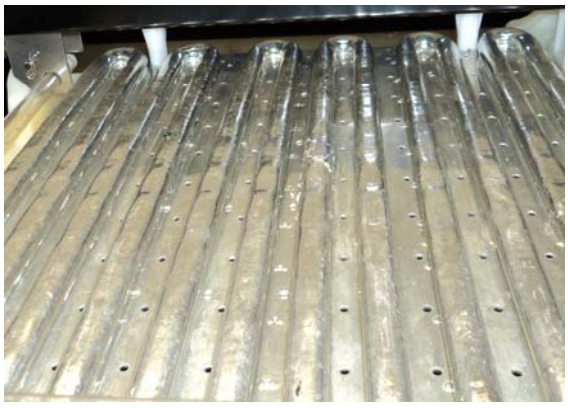
A standard 120-volt power cord (field supplied) provides the electrical connection. The unit is designed to operate on a separate 20-amp circuit.

The water supply connection is 1/2" FPT fitting and is located at the top right side of the unit. A minimum 1/4" water line is required for proper operation.

The drain connection is 3/4" FPT fitting located on the right rear of the unit. A standard 3/4" MPT fitting can be used to connect this drain.

	The ABS water plate sprays water up into the evaporator cells to form the square IM cube.
	The moveable water pan assembly includes the water plate, reservoir pan, and pump motor assembly. Tension springs connect two cam arms to the water plate assembly. An actuator motor rotates the cam arms to raise and lower the water pan during the ice making cycle.

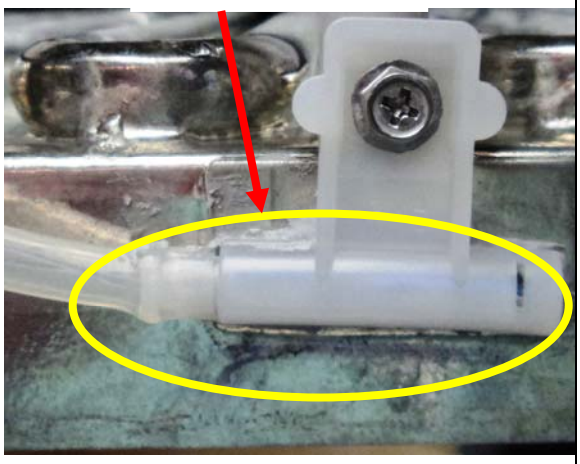


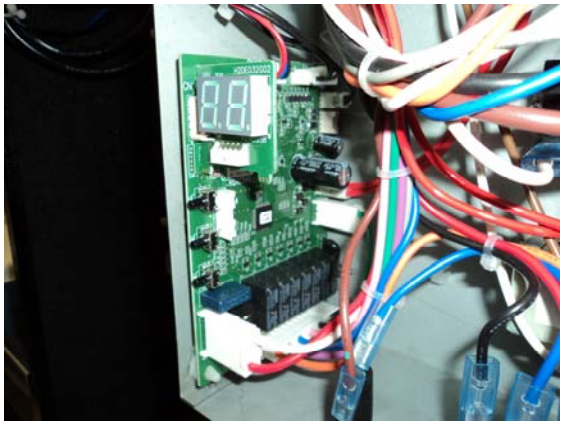


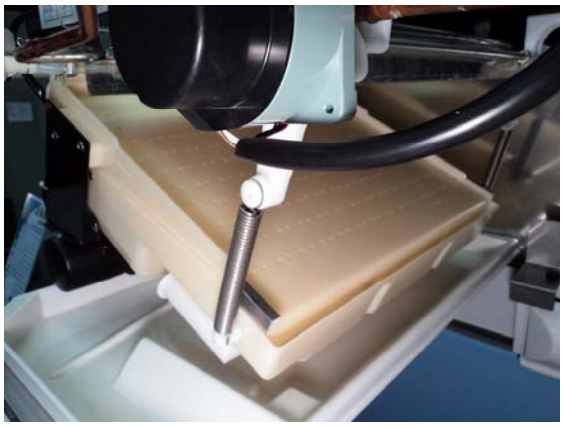
The horizontal evaporator and water distribution system are unique to the Hoshizaki IM series. The IM-500 makes ice on a horizontal evaporator and uses R-404a refrigerant.

The IM-500SSA sequence of operation will be explained in the following pages.

Thermistor







The IM-500SAA unit uses a combination thermistor and control board to control the sequence of operation.

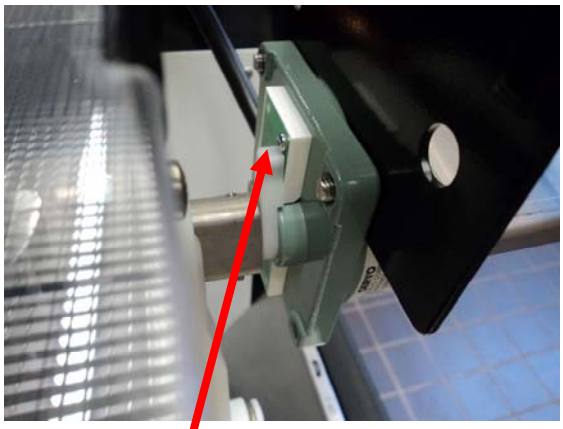
SOFT START:

When the toggle switch is placed in the "ON" position and the bin control calls for ice, the unit will begin in the soft start the display will say "on" and the hot gas valve will open after 30 seconds the initial harvest cycle begins,(if the reset switch is pressed during the 30 sec. standby time the unit will skip soft start and immediately starts operation). Starting the unit in harvest allows the compressor to start up in basically an unloaded condition, greatly extending the life of the compressor. This operation is common among all Hoshizaki cube icemakers.

WATER PAN OPENS/HARVEST:

During the initial harvest, the compressor, hot gas valve and the actuator motor starts to open, after 20 seconds the water valve will energize to supply defrosting water for a specified time. (The time varies depending on the incoming water temperature above or below 48ºF(9ºC) also in initial cycle the water temp. is not detected and assumed to be below 48ºF (9ºC) resulting in a longer defrosting water supply time.

The opening backup timer starts counting when the water pan starts to open if the hall IC (magnetic switch) does not turn on within 3 min. the display will show "EE" and the unit stops for 60 minutes, if it reoccurs after the unit resumes display will show "EE" and the unit shuts down and (records as "E3" in the error history.



Hall IC Switch is located on the motor backside. (Magnetic Switch)

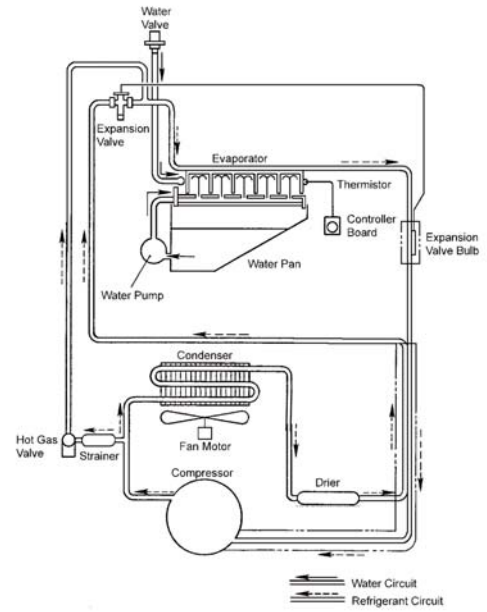
As soon as the pan starts to open the defrost backup timer starts, if the thermistor mounted on the evaporator does not reach the defrost completion temperature before the timer times out at 30 min. the display will show “E2” and the unit stops. (if the HGV does not open this could also give you an “E2” error)

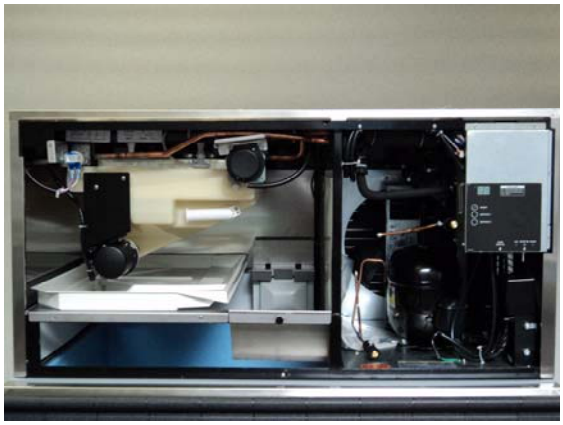
The harvest cycle is controlled by thermistor when the defrost completion temperature of 18.5º C or more is reached the HGV closes, the fan motor starts, and the water pan starts closing.
As before there is a timer that starts as soon as the water pan starts to close. If the hall IC (magnetic Switch) does not turn on within 3 min. the machine will stop and give a “EE” error and the machine shuts down for 60 minutes if the error reoccurs after restart the unit will shut down again and again shows “EE” (recorded as ‘E4” in the error history).

NOTE: in the initial cycle or when the water is below 48º F (9ºC), the water valve will open to supply defrosting water for 10 second after the water pan starts to close.

To check the resistance between thermistor leads, follow the steps below.
1) Disconnect the connector CN13 on the board.
2) Remove the screw and the thermistor holder on the evaporator.
3) Immerse the sensor part in a glass containing ice and water for 2 or 3 minutes.
4) Check the resistance between thermistor leads. Normal reading is within 5 to 7 kΩ Replace the thermistor if it is outside the normal reading.

A. Water Circuit and Refrigerant Circuit





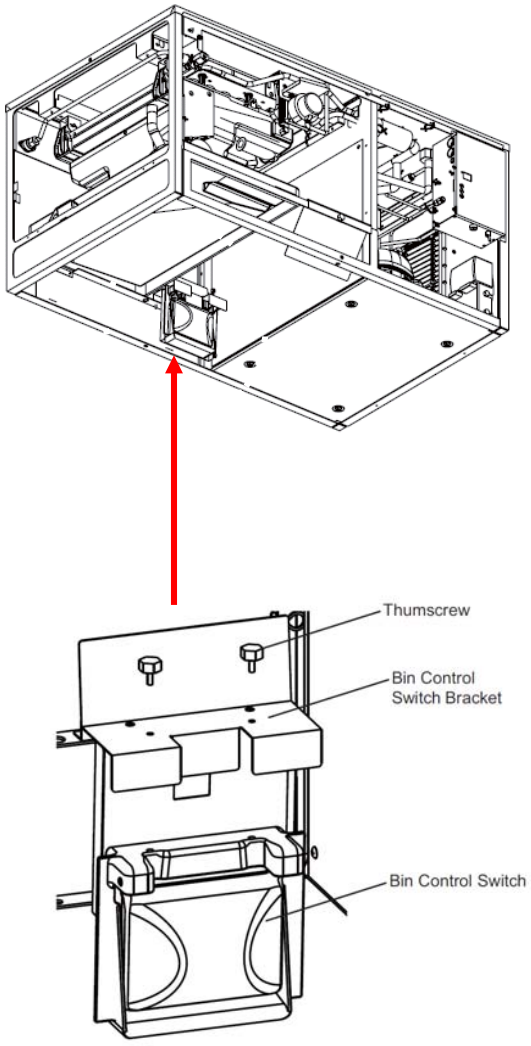
WATER PAN CLOSES/FREEZE:

When the water pan closes and the hall IC turns on the water valve opens to supply ice making water for a specific time. The supply time varies between startup, reset, and end of bin control cycle between partial flush and full drain.

NOTE Full drain flush: After a freeze cycle ends the unit drains all remaining water out of the tank and refills for the next freeze cycle.

Partial drain flush: (default setting) After a freeze cycle ends, the unit leaves remaining water in tank and adds water for the next cycle.

After water has been supplied the pump motor starts, after 30 seconds the thermistor senses the temperature that will be added with a predetermined offset value and used as the water temperature for the freeze cycle, pan opening, defrost, and pan closing cycle. The freeze cycle is considered to be 100% complete when the predetermined target and the integrated values are reached. To reduce ice forming on the water pan when the freeze completion rate reaches 100% with an ambient temperature below 86º F (30ºC), the hot gas valve opens and closes two times to raise the water pan temperature and the actuator motor starts to open the water pan. The freeze cycle is not considered complete and the pump motor and fan motor continue. The unit will continue to cycle between freeze and harvest until the bin control opens, signaling a full bin or until power is interrupted



The IM-500SAA uses a mechanical bin control located on the right rear side of the ice drop zone. This control will open when ice pushes against the switch, if the switch stays open for more than 10 seconds the machine will start the bin control cycle, starts and the machine will shut down after the next defrost cycle.

After the bin control stays closed for more than 80 seconds the bin control cycle will end and the machine will restart.(the hot gas valve opens 30 seconds before the icemaker restarts)

After the bin control cycle ends (or when the power supply is turned on), the water pan starts to open.

When the water pan opens and the hall IC turns on, the bin control cycle starts after 10 seconds and the ice maker stops.

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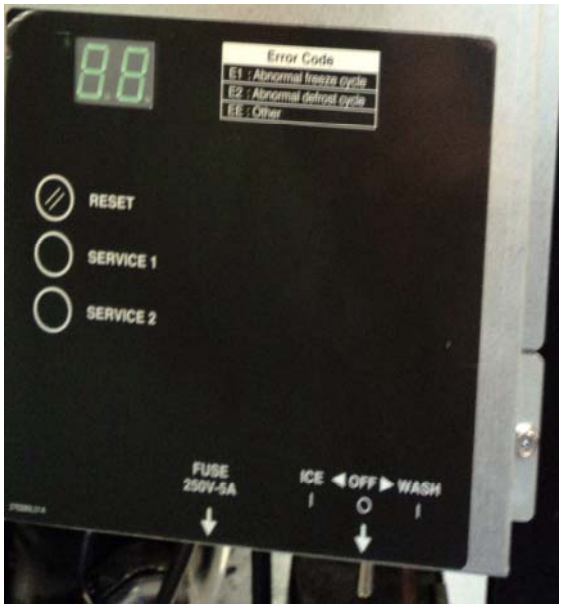


The control switch is marked "ICE-OFF-WASH" and is located on the upper right front of the unit.

"OFF" – No power supplied to unit

"ICE" – Starts the automatic Ice making process

"WASH" – Power is supplied to water pump (this allows for cleaning and/or sanitizing

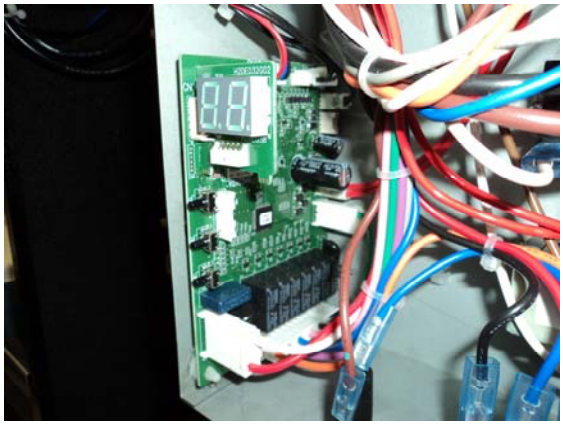
"RESET"- If the reset is pushed after the unit is turned to ICE the soft start is skipped after 3 seconds the water pan starts to open in the initial cycle.

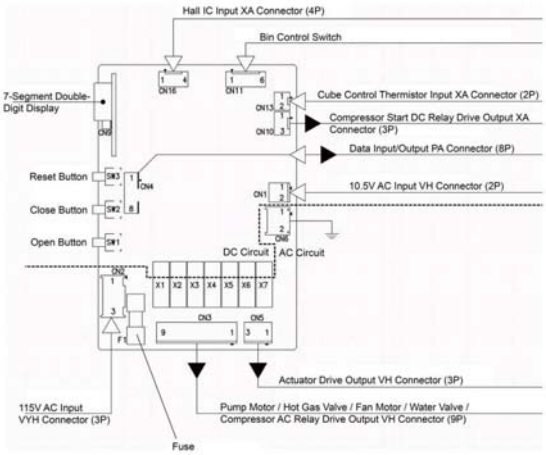
If pressed and released during operation (water pan opening or closing, defrost or freeze cycle), the machine will return to the initial cycle within 3 seconds and the water pan starts opening.

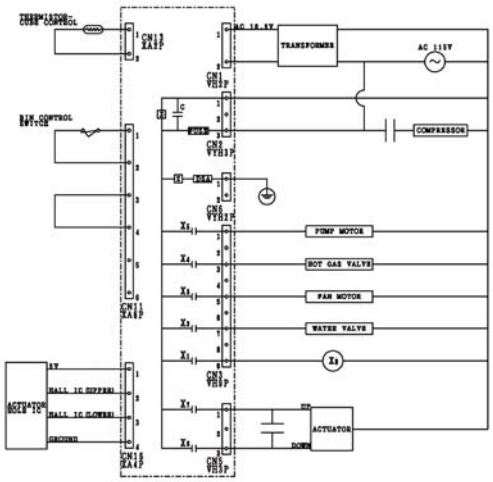
If pressed and released while the machine is in the off or bin control cycle the machine will return to initial cycle within 3 seconds the bin control cycle ends and the water pan starts to open.

If pressed and released while machine is in the off on an error the machine will return to the initial cycle within 3 seconds, the error is reset and the water pan starts to open.

NOTE: When the machine returns to the initial cycle by the reset switch the water temperature is assumed to be 32º F (0ºC) [below 48º F (9º C), the freeze backup timer is extended.







CONTROL BOARD:

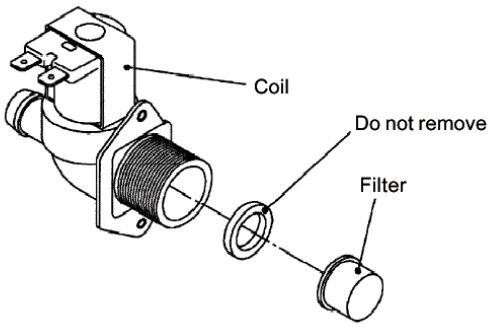
A solid state board controls the IM operation. The control board is factory adjusted to produce consistent ice in all ambient conditions.

"NO SEASONAL ADJUSTMENTS ARE REQUIRED"

If it becomes necessary to install a new IM-500SAA control board, part number P01873-01, the model code must be programmed into the board before the unit will operate properly

Follow the steps below for programing:

1. Once the board has been installed, apply power to the unit and turn the switch on.
2. "00" will appear on the display of the new board
3. For the IM-500SAA, set the model code to "08"
4. Press service button "1" to increase the first digit and service button "2" to increase the second. Note: It should only be necessary to adjust service button "2" in order to get the IM-500SAA model code of "08" displayed.
5. Digits will appear in the following order: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.
6. When a valid model code is displayed, the dot in the bottom right of the display turns on.
7. When the desired model code "08" is displayed, press the reset button to save the setting. "ON" will appear in the display.



<u>Preventative maintenance</u>:

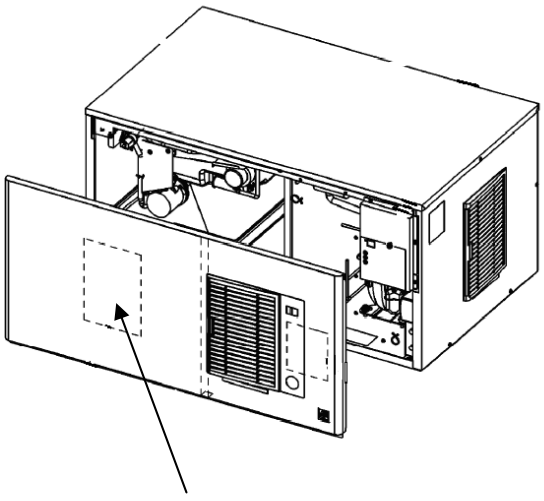
Follow these steps to allow the unit to operate efficiently.

1. Clean the condenser once a year using a brush or vacuum.

2. Check and clean the inlet water valve screen as needed to assure proper water flow.

3. Clean and sanitize the water distribution system annually using the recommended cleaner. (See below for detailed information on cleaning the water system)

4. Wipe down the exterior using a soft cloth and neutral cleaner.



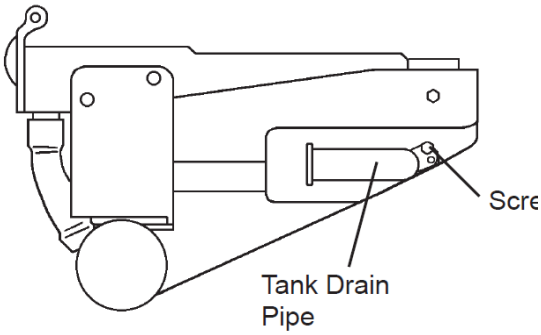
Cleaning Label inside front panel.

Cleaning tips:

- A detailed cleaning label is located on the back of the ice maker front panel. More detailed instructions are included in the customers Instruction Manual or in the product Service Manual.

- Always follow the cleaning instructions and use the recommended ice machine cleaner.

[Normal Position]



[Drain Position]

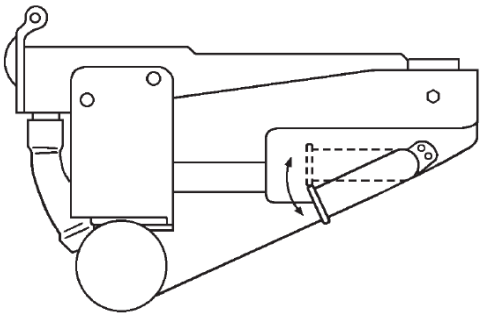


Fig. 5

1) Dilute approximately 7.2 fl. oz. (214 ml) of recommended cleaner Hoshizaki "Scale Away" with 0.8 gal. (3.0 lit.) of water.

2) Turn off the power supply.

3) Remove all ice from the storage bin.

4) Remove the front panel.

5) Remove the screw, and then move the water tank drain pipe to the drain position. See Fig. 5. Use the screw to secure the water tank drain pipe in the drain position.

6) Make sure the control switch is in the "ICE" position, and then replace the front panel.

7) Close the icemaker water supply line shutoff valve.

8) Turn on the power supply for 3 minutes. The water tank drains and cubes are removed from the evaporator.

9) Turn off the power supply.

10) Remove the front panel and top panel.

11) Move the control switch to the "WASH" position.

12) Slowly pour the cleaning solution over the top of the evaporator and into the water tank. Do not splash or spill the solution onto other parts.

13) Replace the front panel and top panel in their correct positions.

14) Turn on the power supply to start the washing process.

15) Turn off the power supply after 30 minutes.

16) Open the icemaker water supply line shut-off valve. See Fig. 4.

17) Remove the front panel.

18) Move the control switch to the "ICE" position.

19) Replace the front panel.

20) Turn on the power supply for 3 minutes. The water tank drains.

21) Turn off the power supply.

22) Repeat steps 20 and 21 three more times to rinse thoroughly.

SANITIZING:

1) Dilute a 5.25% sodium hypochlorite solution (chlorine bleach) with water (add approximately 0.4 fl . oz. (12 ml) to 0.8 gal. (3.0 lit.) of water).

2) Close the icemaker water supply line shut-off valve.

3) Turn on the power supply for 3 minutes. The water tank drains.

4) Turn off the power supply.

5) Remove the front panel and top panel.

6) Move the control switch to the “WASH“ position.

7) Slowly pour the sanitizing solution over the top of the evaporator and into the water tank. Do not splash or spill the solution onto other parts.

8) Replace the front panel and top panel in their correct positions.

9) Turn on the power supply to start the sanitizing process.

10) Turn off the power supply after 15 minutes.

11) Open the icemaker water supply line shut-off valve.

12) Remove the front panel.

13) Move the control switch to the “ICE“ position.

14) Replace the front panel.

15) Turn on the power supply for 3 minutes. The water tank drains.

16) Turn off the power supply.

17) Repeat steps 15 and 16 three more times to rinse thoroughly.

18) Repeat steps 1 through 17 one more time.

19) Remove the front panel.

20) Remove the screw, then move the water tank drain pipe to the normal position. See Fig. 5. Use the screw to secure the water tank drain pipe in the normal position.

	21) Replace the front panel. 22) Clean the storage bin liner using a neutral cleaner. Rinse thoroughly after cleaning. 23) Turn on the power supply to start the automatic ice making process.

D. Performance Data

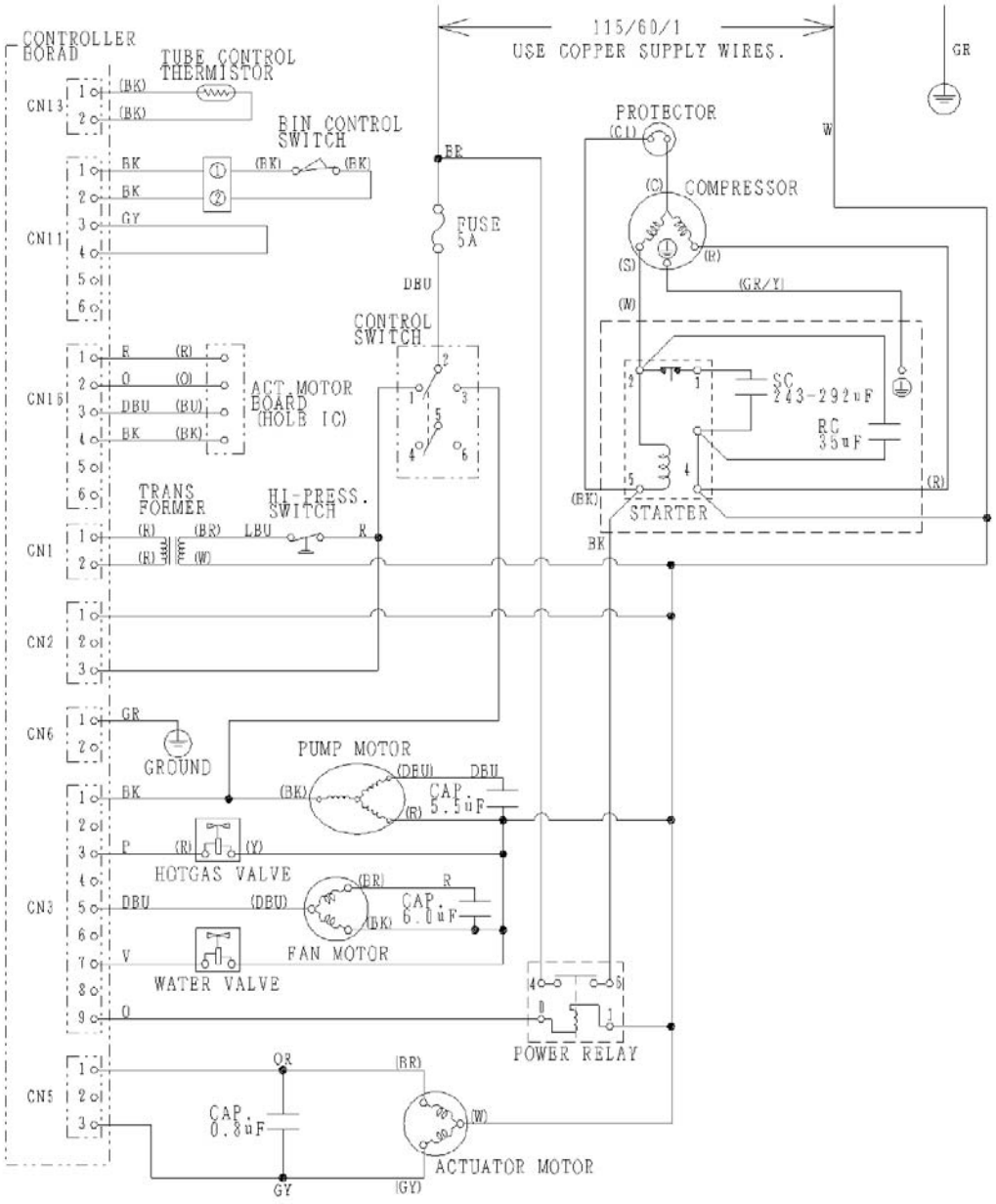
APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (°F/°C)	WATER TEMP. (°F/°C)					
		50/10		70/21		90/32	
	70/21	**500**	227	481	218	447	203
	80/27	485	220	456	207	417	189
	90/32	481	218	**435**	197	397	180
lbs./day kg./day	100/38	471	214	426	193	**363**	165
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**920**		941		967	
	80/27	936		968		993	
	90/32	941		**990**		1016	
watts	100/38	945		996		**1040**	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**105**	0.40	99	0.38	92	0.35
	80/27	101	0.38	92	0.35	84	0.32
	90/32	99	0.38	**86**	0.33	78	0.30
gal./day m^3/day	100/38	91	0.34	84	0.32	**71**	0.27
FREEZING CYCLE TIME	70/21	**17**		18		20	
	80/27	18		20		23	
	90/32	18		**22**		24	
min.	100/38	19		23		**27**	
HARVEST CYCLE TIME	70/21	**3.6**		3.0		2.0	
	80/27	3.2		2.2		2.0	
	90/32	3.0		**1.6**		1.5	
min.	100/38	2.4		1.6		**1.4**	
HEAD PRESSURE	70/21	**210**	14.8	231	16.3	255	18.0
	80/27	226	15.9	260	18.2	281	19.7
	90/32	231	16.3	**283**	19.9	306	21.5
PSIG kg/cm^2G	100/38	234	16.5	288	20.3	**327**	23.0
SUCTION PRESSURE	70/21	**42**	3.0	45	3.1	48	3.4
	80/27	44	3.1	48	3.4	52	3.6
	90/32	45	3.1	**51**	3.6	55	3.8
PSIG kg/cm^2G	100/38	45	3.2	52	3.6	**58**	4.1

TOTAL HEAT OF REJECTION FROM CONDENSER	4,500 BTU/h	[AT 90°F (32°C) / WT 70°F (21°C)]
TOTAL HEAT OF REJECTION FROM CONDENSER	1,000 BTU/h	[AT 90°F (32°C) / WT 70°F (21°C)]

Note: Pressure data is recorded at 5 minutes into freezing cycle.
The data not in **bold** should be used for reference only.

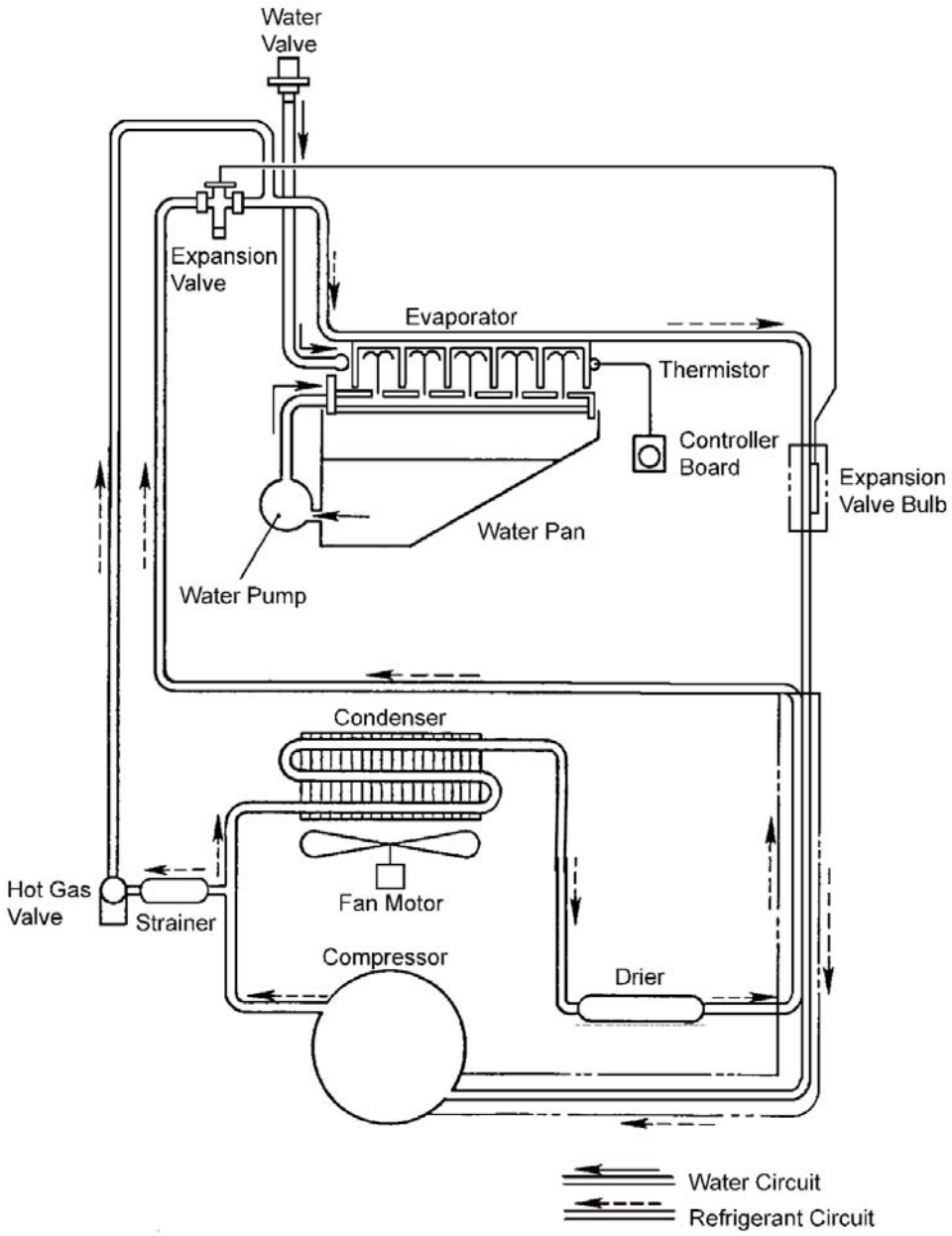
We reserve the right to make changes in
specifications and design without prior notice.

B. Wiring Diagram



Electrical Specifications:
The unit is 115 volt/ 60 hz./1ph.
The IM-500SAA should be connected to a separate 20 Amp circuit.

A. Water Circuit and Refrigerant Circuit



A. Error Codes, Caution Codes

- When the control board detects an error, the display shows one of the following error and caution codes in the display mode. Operation depends on the type of error.
- The error and caution codes other than E1 and E2 are indicated as "EE" in the 7-segment display at the time of occurrence. The error log is indicated up to five errors from the latest entry.

Error	Item	Description	Operation	Reset
E1	Freeze error	Freeze backup timer (45 minutes after water pan starts to close) counts up before freeze cycle completes, and evaporator temperature is 0°C or higher.	Shut down	Press reset switch
E2	Defrost error	Defrost backup timer (30 minutes) counts up before defrost cycle completes.	Shut down	Press reset switch
EE (E3)	Water pan opening error	Water pan has not fully opened within 60 seconds, and 3 minutes have passed even with opening failure control.	Halt	Press reset switch
		Unit resumes operation after 60 minutes and repeats the above error.	Shut down	
EE (E4)	Water pan closing error	Water pan has not fully closed within 60 seconds, and 3 minutes have passed even with closing failure control.	Halt	Press reset switch
		Unit resumes operation after 60 minutes and repeats the above error.	Shut down	
EE (E5)	High temperature error	Evaporator temperature stays 60°C or higher for 5 seconds or more.	Shut down	Press reset switch
EE (E9)	Condenser thermistor error (note)	Condenser thermistor circuit is open or shorted for 2 seconds.	Shut down	Replace thermistor
EE (EA)	Data error	Model setting data memory IC is defective.	Shut down	Replace control board
EE (EC)	Cube control thermistor error	Cube control thermistor circuit is open or shorted for 2 seconds.	Shut down	Replace thermistor
EE (Ed)	Water regulator error	Cooling water cannot stop by water regulator error, and thermistor senses set point or lower temperature.	Continue	Press reset switch

Note: No condenser thermistor is provided on IM-500SAA so EE (E9) error will not occur.

B. Service Diagnosis

Error	Check	Possible Cause	Remedy
E1	Water valve	Closing failure	Clean or replace
	Refrigeration circuit	Gas leak	Repair
		Clogged capillary	Replace heat exchanger
		Clogged expansion valve	Replace
	Compressor	Defective	Replace
		Starting failure	Check supply voltage or replace electrical components
	Compressor relay	Coil circuit open	Replace
	Condenser	Clogged	Clean
	Fan Motor	Locked	Replace
		Low RPM	Replace
		Broken fan	Replace fan
	Hot gas valve	Closing failure	Replace
	Cube control thermistor	Disconnected	Reconnect
E2	Hot gas valve	Opening failure	Replace
	Control board	Defective	Replace
E3	Actuator motor	Defective	Replace
	Control board	Relay contact failure	Replace
		Defective	Replace
E4	Actuator motor	Defective	Replace
	Control board	Relay contact failure	Replace
		Defective	Replace
E5	Hot gas valve	Closing failure	Replace
	Control board	Relay contact failure	Replace
E9	Condenser thermistor (note)	Open or short circuit	Replace
	Control board	Connector disconnected	Reconnect
EA	Control board	Defective	Replace
EC	Cube control thermistor	Open or short circuit	Replace
	Control board	Connector disconnected	Reconnect
Ed	Water regulator	Clogged with foreign matter	Unclog
		Corroded spring	Replace

Note: No condenser thermistor is provided on IM-500SAA so E9 error will not occur.

C. No Error Code Indication

Problem	Check	Possible Cause	Remedy
Icemaker will not start.	Power source	Turned off.	Turn on.
		Supply voltage too low.	Remove cause
		Power failure	Wait until power is resumed.
	Transformer	Defective.	Replace.
	Power cord	Not connected properly.	Reconnect.
		Open circuit (damaged).	Replace.
	Control board	Defective.	Replace.
	Fuse	Blown out.	Check for cause. Replace.
	Bin control switch	Stuck on other parts (e.g. ice guide).	Remove ice.
		Short circuit (display shows "on").	Replace.
	Fan motor	Locked.	Replace.
		Low RPM.	Replace.
		Broken fan.	Replace.
	Control switch	"OFF" or "WASH" position.	Move to "ICE" position.
	Air filter	Dirty air filter or condenser.	Clean.
	Temperature	Ambient temperature too warm.	Reduce temperature.
Slab does not break into separate cubes.	Extension spring	Over-extended.	Replace.
	Water plate	Obstacle caught between evaporator and water plate.	Remove obstacle.
Icemaker will not stop when bin is filled with ice.	Bin control switch actuator	Out of position.	Place in position.
		Broken.	Replace.
	Bin control switch	Out of position.	Place in position.
		Broken.	Replace.
	Bin control switch detector	Out of position.	Place in position.
		Broken.	Replace.
	Bin control micro switch	Disconnected from switch box.	Reconnect.
		Seizing with open contacts.	Replace.
	Control board	Defective.	Replace.
Cloudy cubes.	Water quality	High hardness.	Set hard water control.
			Switch to full drain flush (see note below).
	Ice condition	Slush ice.	Set slush ice control.
Abnormal noise	Pump motor	Bearing worn out.	Replace.
		Vapor lock.	Clean water valve filter.
			Check water supply cycle time setting.
	Fan motor	Bearing worn out.	Replace.
		Fan touching obstacle.	Remove obstacle.
	Actuator motor	Gear worn out.	Replace.
Cubes drop separately.	Refrigeration circuit	Gas leaks (long defrost cycle).	Repair.
	Cam arm	Worn out.	Replace.

Note:

Full drain flush - After a freeze cycle ends, the unit drains all the remaining water in the tank and refills the tank in the next freeze cycle.

Partial drain flush (default setting) - After a freeze cycle ends, the unit leaves the remaining water in the tank and adds some water to fill the tank in the next freeze cycle.

Problem	Check	Possible Cause	Remedy
Imperfect ice production.	Insufficient water supply	Water valve filter clogged.	Clean.
		Water supply cycle too short.	Extend.
		Water supply pressure too low.	Remove cause.
	Water leaks from water tank or water plate	Water tank broken.	Replace.
		Water plate broken.	Replace.
		Icemaker not level.	Adjust.
	Water valve	Water leaks from valve body.	Replace.
		Water leaks from water supply pipe joint.	Check hose clamp.
			Replace connection hose.
	Water plate	Spray holes clogged.	Unclog.
	Pump motor	Defective.	Replace.
Large-hole cubes.	Refrigeration circuit	Gas leaks (low refrigeration capacity).	Repair.
	Condenser	Not clean (low condensing capacity).	Clean.
		Filter clogged.	Clean.
	Fan motor	Defective.	Replace.
	Installation site	No clearance at right side and rear.	Ensure clearance.
		Ambient temperature above 38°C.	Ensure ventilation to lower temperature.
	Power supply	Supply voltage too low (low refrigeration capacity).	Remove cause.
	Water valve	Water leaks.	Replace.
	Insufficient water supply	Water supply pressure too low.	Remove cause.
Freeze cycle time is too long.	Installation site	Ambient temperature too high.	Ensure ventilation to lower temperature.
	Condenser	Not clean (low condensing capacity).	Clean.
		Air filter clogged.	Clean.
	Fan motor	Defective.	Replace.
	Refrigeration circuit	Gas leaks (low refrigeration capacity).	Repair.

IM SERIES REVIEW QUIZ

Choose the best answer for each question below.

1. The IM control board is located in the rear or the unit.

☐ **True** ☐ **False**

2. The IM unit uses a thermostatic bin control.

☐ **True** ☐ **False**

3. The bin control switch must **OPEN** or **CLOSE** to shut the unit down?

4. The IM series uses **R-404A** or **R-134A** refrigerant.

5. The IM-500SAA only uses one thermistor located on the evaporator?

☐ **True** ☐ **False**

6. The freeze cycle is temperature and time terminated.

☐ **True** ☐ **False**

7. On the initial freeze cycle the water valve will remain open for 30 seconds.

☐ **True** ☐ **False**

8. The water valve will remain energized for the entire harvest cycle regardless of how long.

☐ **True** ☐ **False**

9. The IM-500SAA makes a square cube.

☐ **True** ☐ **False**

NOTE: Quiz answers are at the bottom of next page.

NOTES:

Quiz answers:
1.False, 2. False 3. Open, 4. R-404A, 5. True, 6. True, 7. False, 8. False., 9. True