CE 89/336
73/23

NUMBER: 73125
ISSUED: December 17, 2004

MODULAR CRESCENT CUBER

KM-280MAH-E
KM-500MAH-E
KM-630MAH-E

SERVICE MANUAL

FOR QUALIFIED SERVICE PERSON

IMPORTANT

Only qualified service technicians should attempt to service or maintain this icemaker. No service or maintenance should be undertaken until the technician has thoroughly read this Service Manual.

HOSHIZAKI provides this manual primarily to assist qualified service technicians in the service and maintenance of the icemaker.

Should the reader have any questions or concerns which have not been satisfactorily addressed, please call HOSHIZAKI CARE for assistance.

TEL: +44 (0) 1707322493
FAX: +44 (0) 1707322315

Hoshizaki Care Branch Offices:

Benelux
TEL: +31 (0) 206918499
FAX: +31 (0) 206918768

Germany
TEL: +49 (0) 215492810
FAX: +49 (0) 2154928128

France
TEL: +33 (0) 148137130
FAX: +33 (0) 148130992

Note: To expedite assistance, all correspondence/communication MUST include the following information:

- Model Number
- Serial Number
- Complete and detailed explanation of the problem

Please review this manual. It should be read carefully before the icemaker is serviced or maintenance operations performed. Only qualified service technicians should service and maintain the icemaker. This manual should be made available to the technician prior to service or maintenance.

CONTENTS

I. Specifications

A. KM-280MAH-E (air-cooled)

AC SUPPLY VOLTAGE	220-240/50/1			
AMPERAGE	5.1 A (5 Min. Freeze AT 104°F / WT 80°F)			
MAXIMUM FUSE SIZE	15 A	MINIMUM CIRCUIT AMPACITY 15A		
APPROXIMATE ICE PRODUCTION	Ambient	WATER TEMP. (°F)		
PER 24 HR.	Temp.(°F)	50	70	90
lbs./day (kg/day)	70	*258 (117)	231 (105)	204 (93)
Reference without *marks	80	237 (108)	196 (89)	175 (79)
	90	231 (105)	*166 (75)	142 (164)
	100	229 (104)	160 (73)	120 (54)

FOR THE EUROPEAN MARKET	10/10°C	21/15°C	30/25°C
ICE CAPACITY	304 (138)	252 (114)	178 (81)

SHAPE OF ICE	Crescent Cube	
ICE PRODUCTION PER CYCLE	4.7 lbs. (2.16 kg) 240 pcs.	
APPROXIMATE STORAGE CAPACITY	N/A	
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F
ELECTRIC W (kWH/100 lbs.)	802 (11.6)	763 (7.1)
WATER gal./24HR (gal./100 lbs.)	59 (35.3)	99 (38.3)
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)	
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)	
WEIGHT	Net 151 lbs. (69 kg), Shipping 175 lbs. (80 kg)	
CONNECTIONS - ELECTRIC	Cord - Connection	
- WATER SUPPLY	Inlet	1/2" FPT
- DRAIN	Outlet	3/4" FPT
		3/8" OD Pipe
CUBE CONTROL SYSTEM	Float Switch	
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer	
ICE MAKING WATER CONTROL	Timer Controlled. Overflow Pipe	
COOLING WATER CONTROL	N/A	
BIN CONTROL SYSTEM	Thermostat	
COMPRESSOR	Hermetic, Model AKA9438ZXC	
CONDENSER	Air-cooled, Fin and tube type	
EVAPORATOR	Vertical type, Stainless Steel and Copper	
REFRIGERANT CONTROL	Thermostatic Expansion Valve	
REFRIGERANT CHARGE	R-404A, 12 oz. (340 g)	
DESIGN PRESSURE	High 467 PSIG, Low 230 PSIG	
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-out (Internal)	
COMPRESSOR PROTECTION	Auto-reset Overload Protector (Internal)	
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch	
LOW WATER PROTECTION	Float Switch	
ACCESSORIES -SUPPLIED	N/A	
-REQUIRED	Ice Storage Bin	
OPERATING CONDITIONS	VOLTAGE RANGE	198 - 254 V
	AMBIENT TEMP.	45 -100° F
	WATER SUPPLY TEMP.	45 - 90° F
	WATER SUPPLY PRESSURE	10 - 113 PSIG

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

B. KM-500MAH-E (air-cooled)

AC SUPPLY VOLTAGE	220-240/50/1			
AMPERAGE	5.5 A (5 Min. Freeze AT 104°F / WT 80°F)			
MINIMUM CIRCUIT AMPACITY	15 A	MAXIMUM FUSE SIZE	15 A	
APPROXIMATE ICE PRODUCTION	Ambient	WATER TEMP. (°F)		
PER 24 HR.	Temp.(°F)	50	70	90
lbs./day (kg/day)	70	*480 (218)	446 (202)	403 (183)
Reference without *marks	80	454 (206)	402 (182)	360 (163)
	90	446 (202)	*365 (166)	321 (146)
	100	438 (199)	355 (161)	281 (127)

FOR THE EUROPEAN MARKET	10/10 °C	21/15 °C	30/25 °C
ICE CAPACITY lbs./day (kg/day)	540 (245)	471 (214)	355 (161)

SHAPE OF ICE	Crescent Cube		
ICE PRODUCTION PER CYCLE	9.5 lbs. (4.3 kg) 480 pcs.		
APPROXIMATE STORAGE CAPACITY	N/A		
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F	
ELECTRIC W (kWH/100 lbs.)	1019 (6.7)	940 (4.7)	
WATER gal./24HR (gal./100 lbs.)	149 (40.8)	242 (50.5)	
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)		
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)		
WEIGHT	Net 146 lbs. (66 kg), Shipping 170 lbs. (77 kg)		
CONNECTIONS - ELECTRIC	Cord - Connection		
- WATER SUPPLY	Inlet	1/2" FPT	
- DRAIN	Outlet	3/4" FPT	
		3/8" OD Pipe	
CUBE CONTROL SYSTEM	Float Switch		
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer		
ICE MAKING WATER CONTROL	Timer Controlled. Overflow Pipe		
COOLING WATER CONTROL	N/A		
BIN CONTROL SYSTEM	Thermostat		
COMPRESSOR	Hermetic, Model AKA9455ZXC		
CONDENSER	Air-cooled, Fin and Tube type		
EVAPORATOR	Vertical type, Stainless Steel and Copper		
REFRIGERANT CONTROL	Thermostatic Expansion Valve		
REFRIGERANT CHARGE	R-404A, 1 lbs. 10 oz. (735 g)		
DESIGN PRESSURE	High 467 PSIG, Low 230 PSIG		
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-out (Internal)		
COMPRESSOR PROTECTION	Auto-reset Overload Protector (Internal)		
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch		
LOW WATER PROTECTION	Float Switch		
ACCESSORIES -SUPPLIED	N/A		
-REQUIRED	Ice Storage Bin		
OPERATING CONDITIONS	VOLTAGE RANGE		198 - 254 V
	AMBIENT TEMP.		45 -100° F
	WATER SUPPLY TEMP.		45 - 90° F
	WATER SUPPLY PRESSURE		10 - 113 PSIG

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

C. KM-630MAH-E (air-cooled)

AC SUPPLY VOLTAGE	220-240/50/1			
AMPERAGE	9 A (5 Min. Freeze AT 104°F / WT 80°F)			
MINIMUM CIRCUIT AMPACITY	15 A	MAXIMUM FUSE SIZE	15 A	
APPROXIMATE ICE PRODUCTION	Ambient	WATER TEMP. (°F)		
PER 24 HR.	Temp.(°F)	50	70	90
lbs./day (kg/day)	70	*624 (283)	576 (261)	520 (236)
Reference without *marks	80	587 (266)	513 (233)	463 (210)
	90	576 (261)	*460 (209)	406 (184)
	100	568 (258)	447 (203)	357 (162)

FOR THE EUROPEAN MARKET	10/10 °C	20/15 °C	30/25 °C
ICE CAPACITY lbs./day (kg/day)	701 (318)	611 (277)	461 (209)

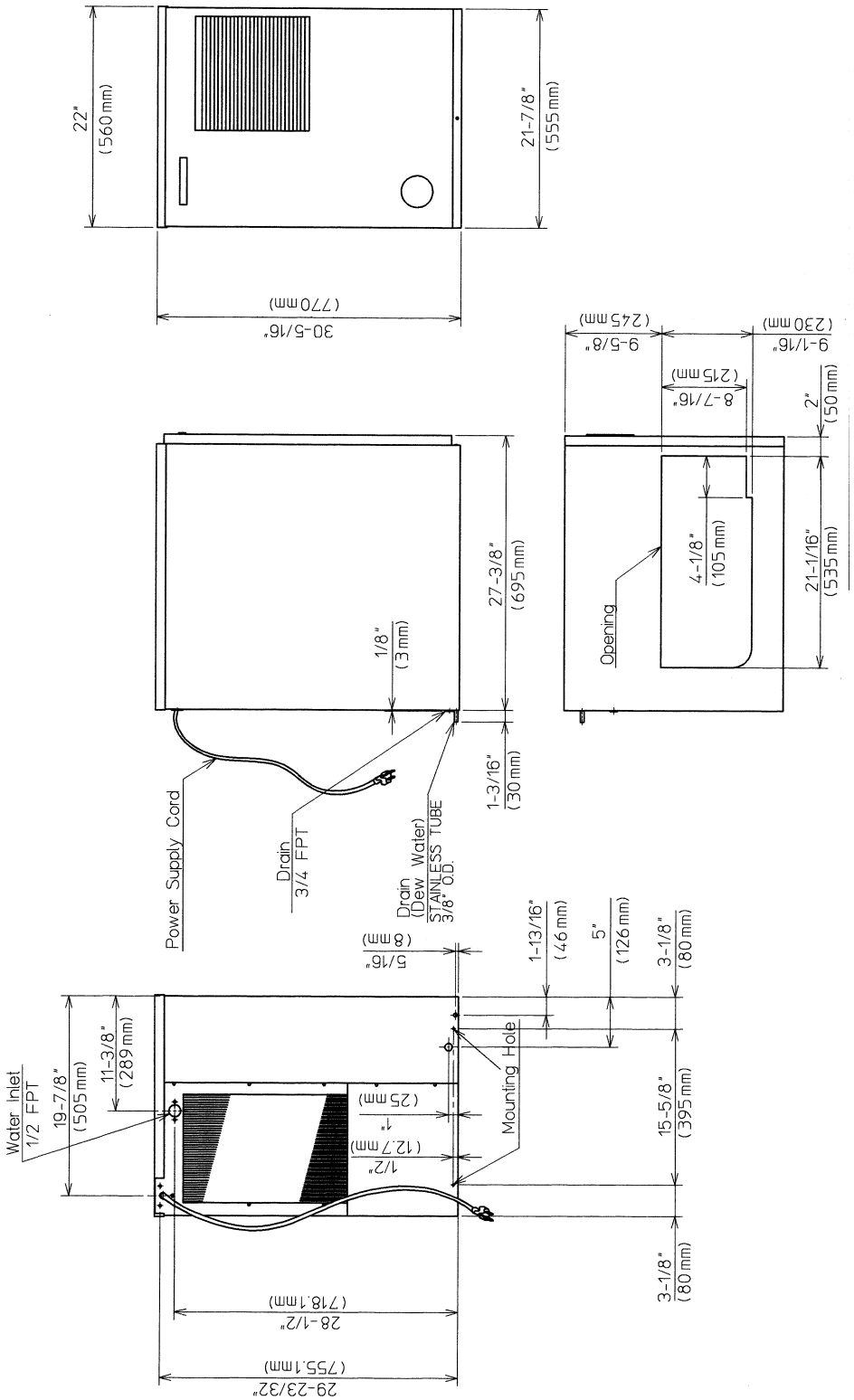
SHAPE OF ICE	Crescent Cube	
ICE PRODUCTION PER CYCLE	14.3 lbs. (6.5 kg) 720 pcs.	
APPROXIMATE STORAGE CAPACITY	N/A	
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F
ELECTRIC W (kWH/100 lbs.)	1399 (7.3)	1300 (5.0)
WATER gal./24HR (gal./100 lbs.)	153 (33.2)	208 (33.3)
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 37-7/16" (560 x 695 x 950 mm)	
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)	
WEIGHT	Net 165 lbs. (75 kg), Shipping 185 lbs. (84 kg)	
CONNECTIONS - ELECTRIC	Permanent - Connection	
- WATER SUPPLY	Inlet 1/2" FPT	
- DRAIN	Outlet 3/4" FPT	
	3/8" OD Pipe	
CUBE CONTROL SYSTEM	Float Switch	
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer	
ICE MAKING WATER CONTROL	Timer Controlled. Overflow Pipe	
COOLING WATER CONTROL	N/A	
BIN CONTROL SYSTEM	Thermostat	
COMPRESSOR	Hermetic, Model RS64C2E-IAZ-219	
CONDENSER	Air-cooled, Fin and Tube type	
EVAPORATOR	Vertical type, Stainless Steel and Copper	
REFRIGERANT CONTROL	Thermostatic Expansion Valve	
REFRIGERANT CHARGE	R-404A, 1 lbs. 6 oz. (635 g)	
DESIGN PRESSURE	High 467 PSIG, Low 230 PSIG	
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-out (Internal)	
COMPRESSOR PROTECTION	Auto-reset Overload Protector (Internal)	
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch	
LOW WATER PROTECTION	Float Switch	
ACCESSORIES -SUPPLIED	N/A	
-REQUIRED	Ice Storage Bin	
OPERATING CONDITIONS	VOLTAGE RANGE	198 - 254 V
	AMBIENT TEMP.	45 -100° F
	WATER SUPPLY TEMP.	45 - 90° F
	WATER SUPPLY PRESSURE	10 - 113 PSIG

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

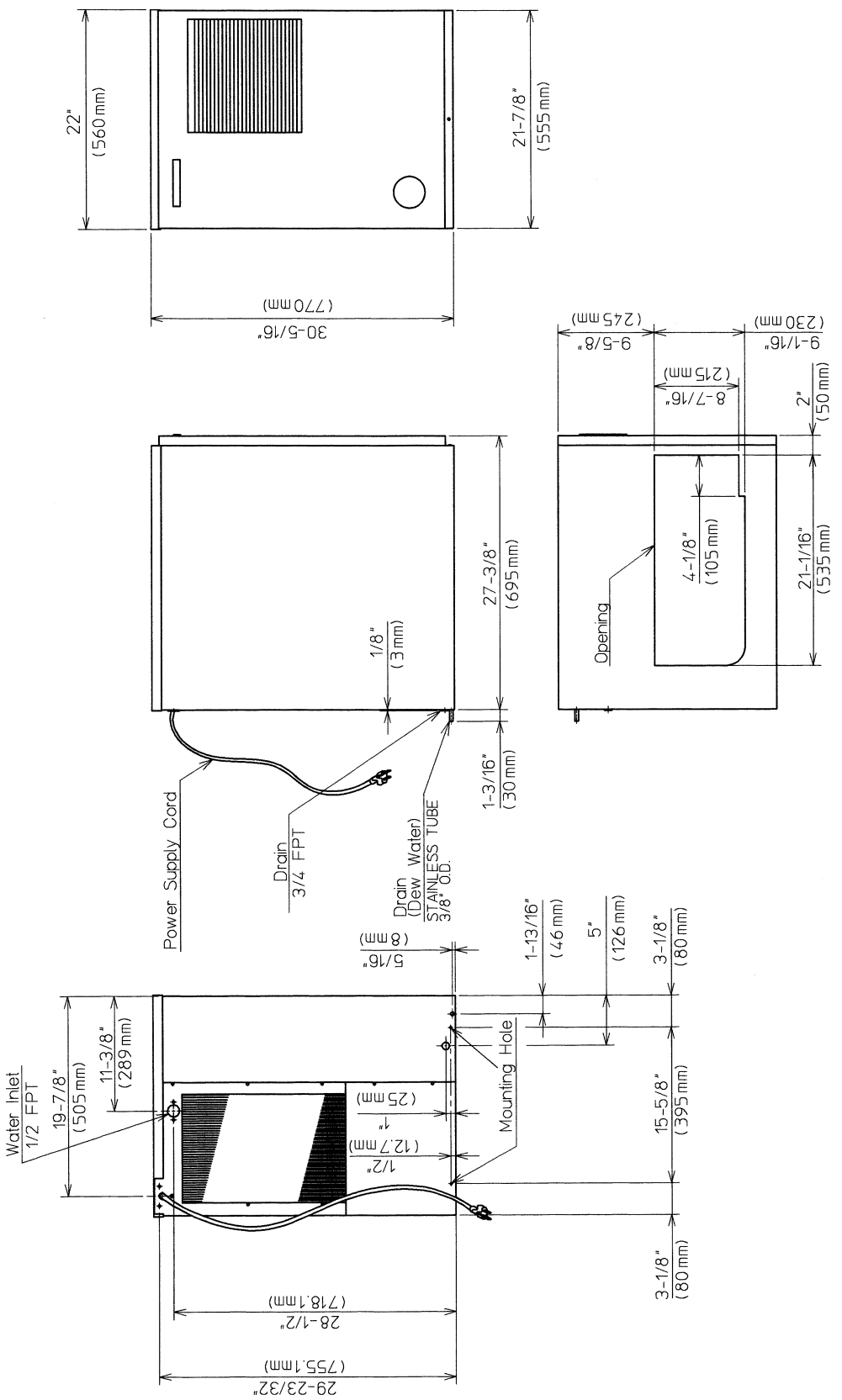
II. General Information

A. Dimensions

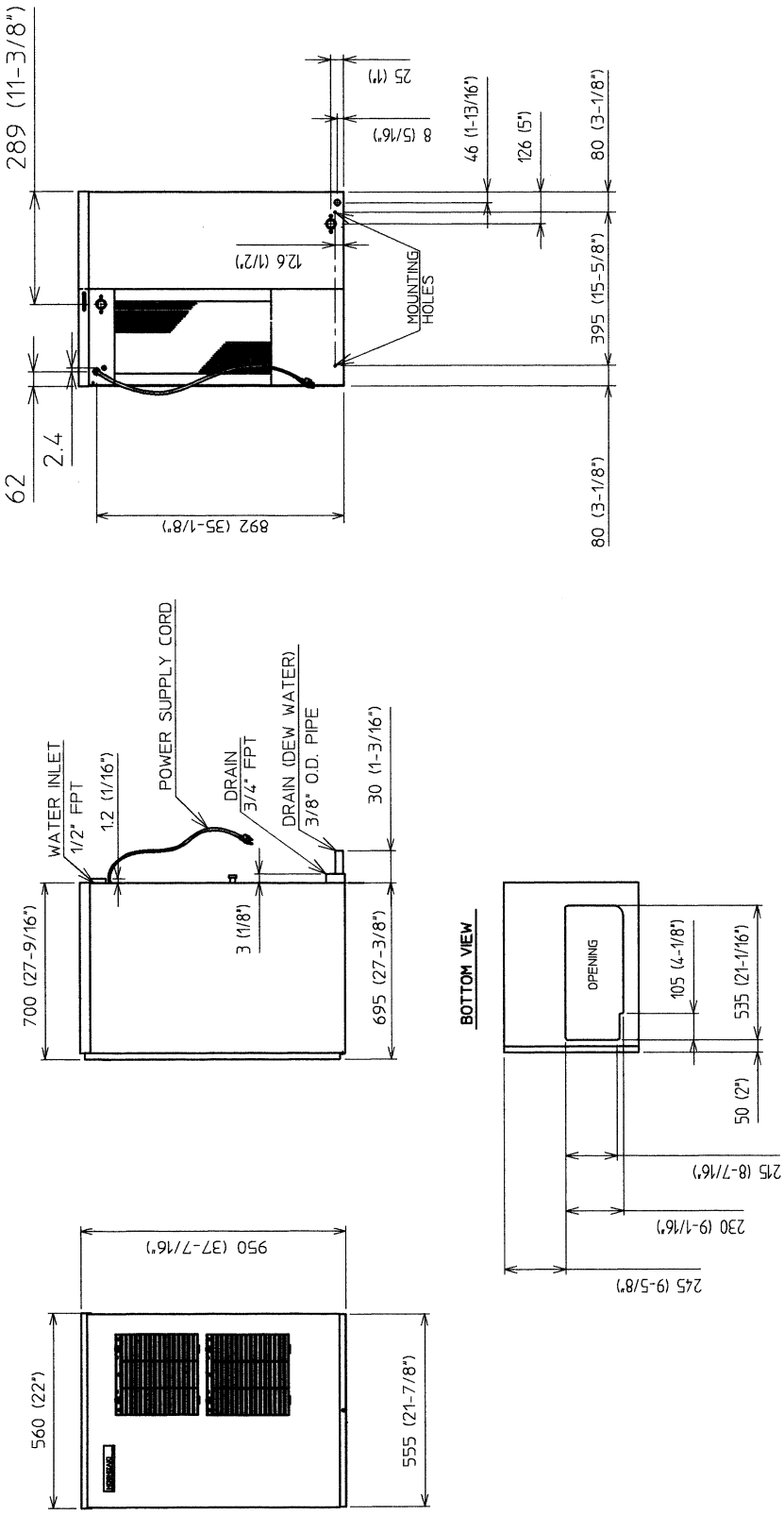
1. KM-280MAH-E



2. KM-500MAH-E

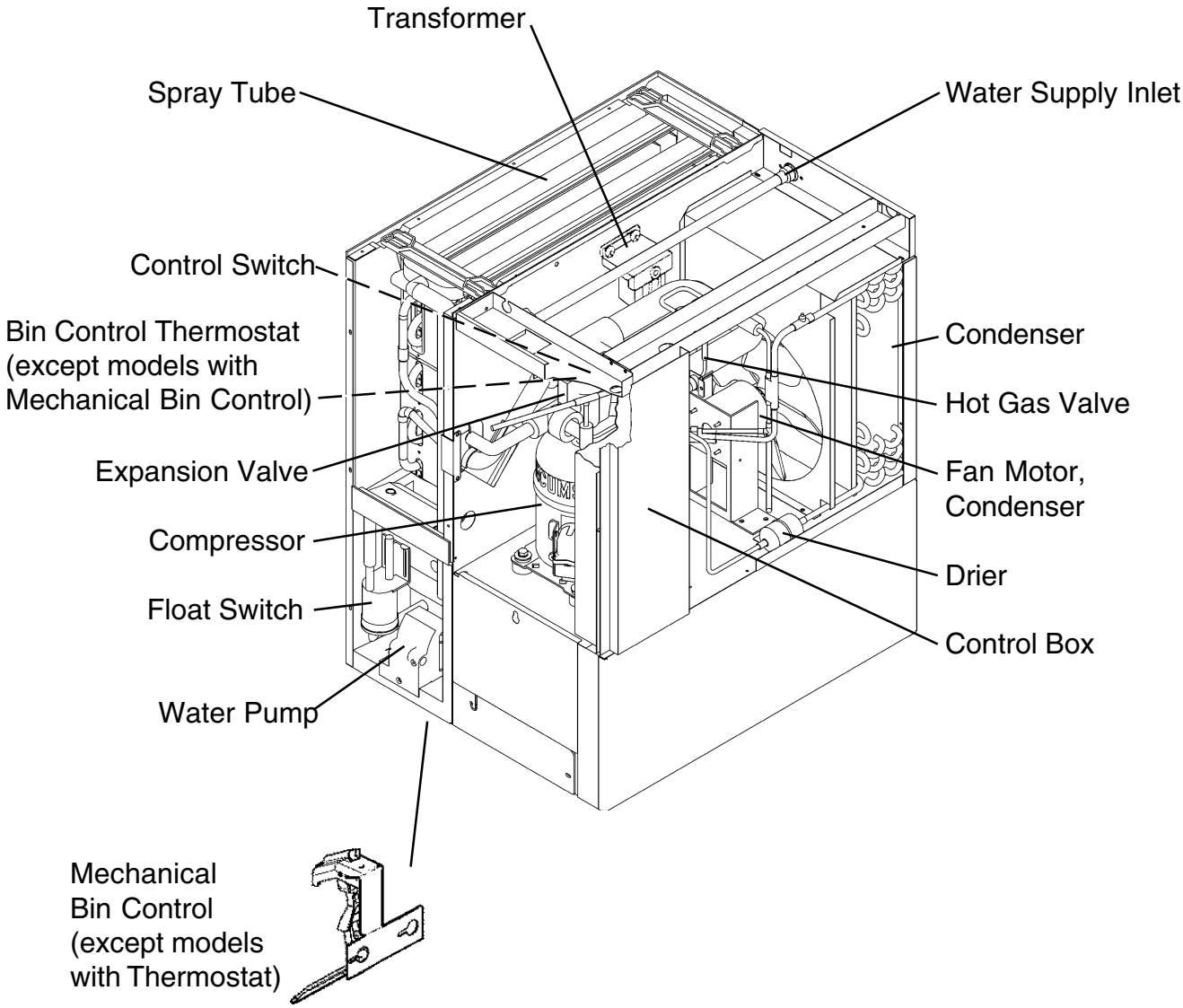

22"
(560mm)
21-7/8"
(555mm)
30-5/16"
(770mm)
9-5/8"
(245mm)
9-1/16"
(230mm)
8-7/16"
(215mm)
2"
(50mm)
4-1/8"
(105mm)
21-1/16"
(535mm)
Opening
27-3/8"
(695mm)
1/8"
(3mm)
1-3/16"
(30mm)
Power Supply Cord
Drain
3/4 FPT
Drain
(Dew Water)
STAINLESS TUBE
3/8" O.D.
5/16"
(8mm)
1-13/16"
(46mm)
5"
(126mm)
3-1/8"
(80mm)
Water Inlet
1/2 FPT
19-7/8"
(505mm)
11-3/8"
(289mm)
1"
(25mm)
1/2"
(12.7mm)
Mounting Hole
15-5/8"
(395mm)
3-1/8"
(80mm)
28-1/2"
(718.1mm)
29-23/32"
(755.1mm)

3. KM-630MAH-E

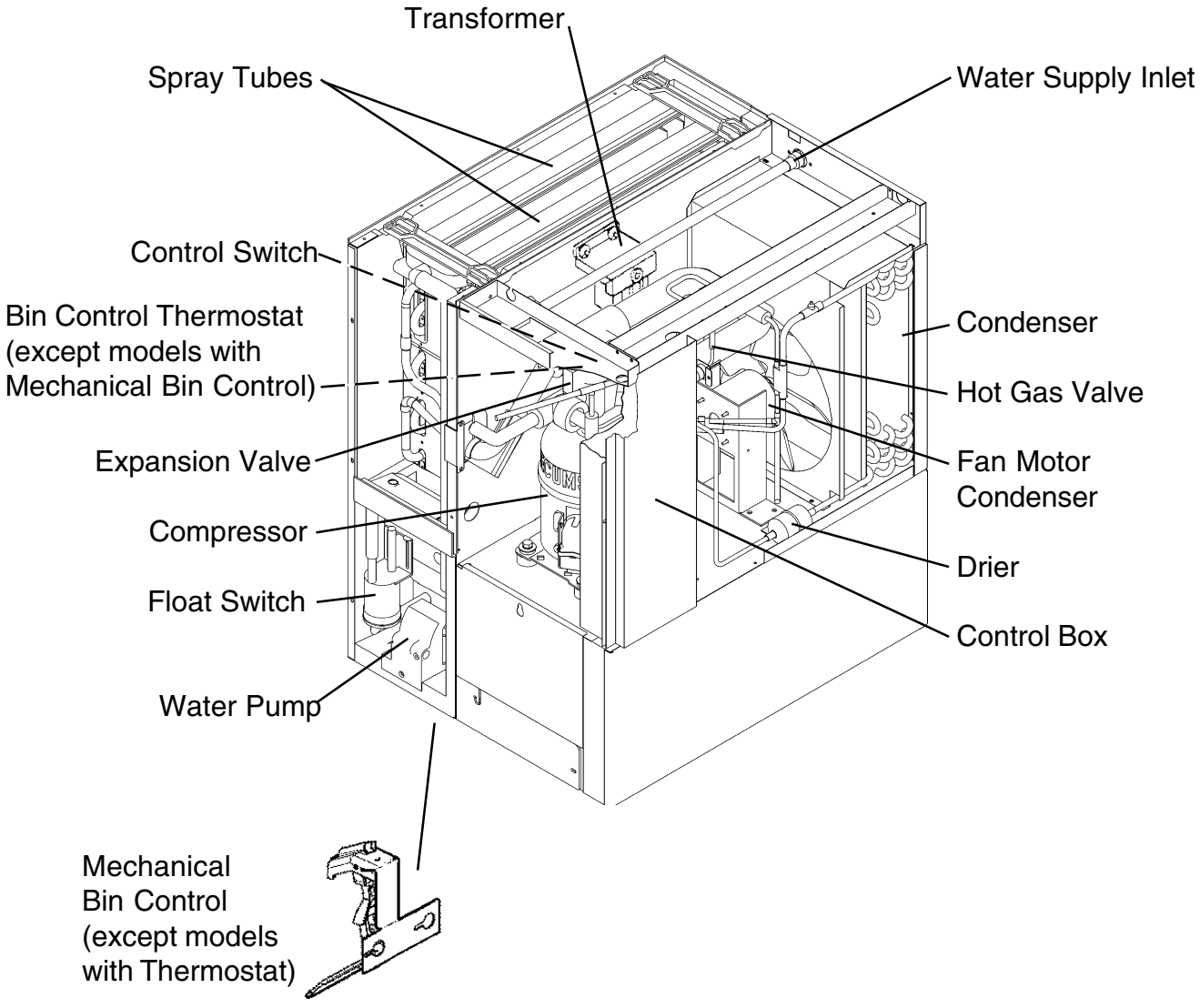

289 (11-3/8")
25 (1")
8 (5/16")
46 (1-13/16")
126 (5")
80 (3-1/8")
12.6 (1/2")
MOUNTING HOLES
395 (15-5/8")
62
2.4
892 (35-1/8")
80 (3-1/8")
WATER INLET 1/2" FPT
1.2 (1/16")
POWER SUPPLY CORD
DRAIN 3/4" FPT
DRAIN (DEW WATER) 3/8" O.D. PIPE
30 (1-3/16")
700 (27-9/16")
3 (1/8")
695 (27-3/8")
BOTTOM VIEW
OPENING
105 (4-1/8")
535 (21-1/16")
50 (2")
215 (8-7/16")
230 (9-1/16")
245 (9-5/8")
950 (37-7/16")
560 (22")
555 (21-7/8")

B. Construction

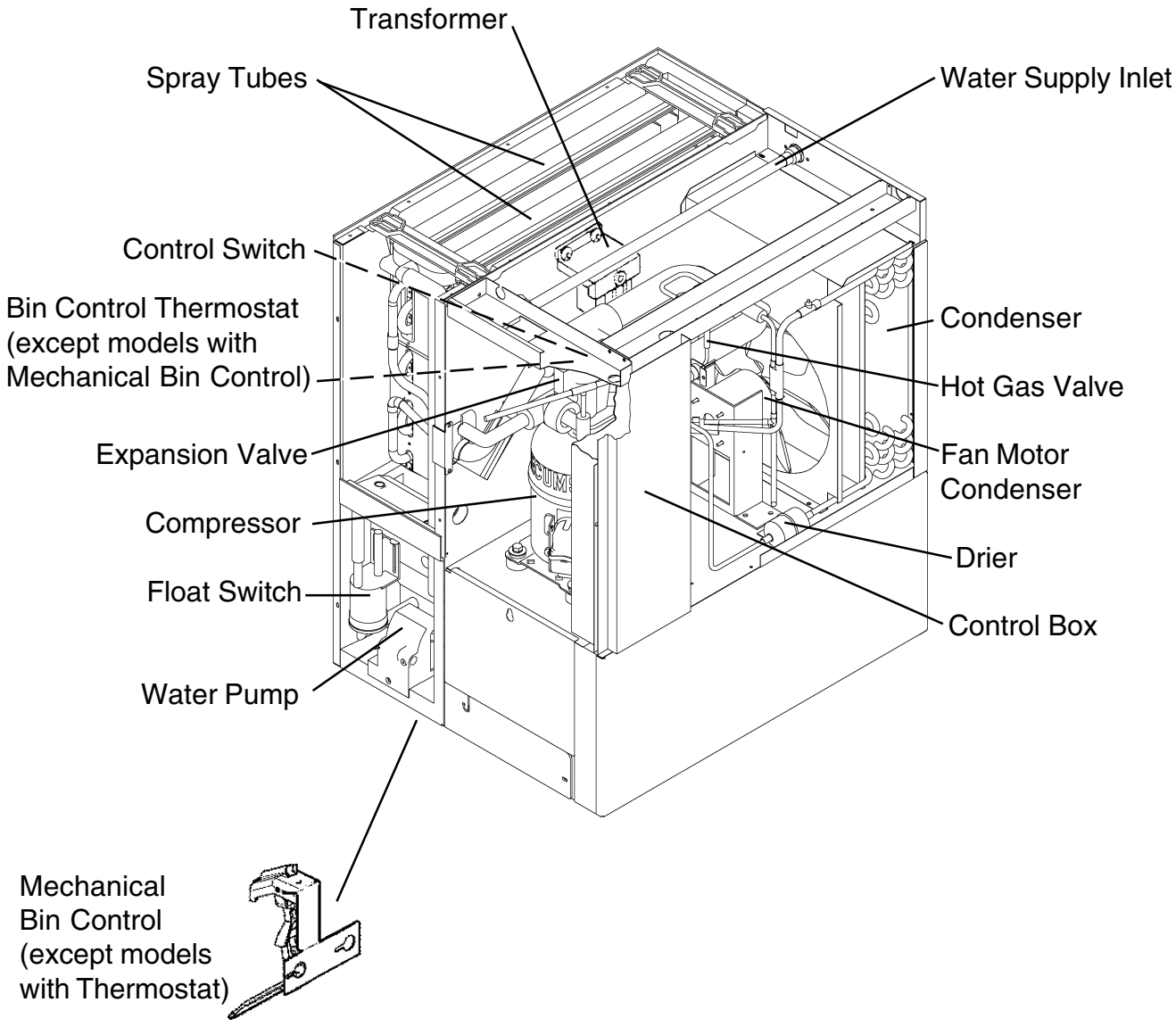
1. KM-280MAH-E



2. KM-500MAH-E


Transformer
Spray Tubes
Water Supply Inlet
Control Switch
Bin Control Thermostat
(except models with
Mechanical Bin Control)
Condenser
Hot Gas Valve
Expansion Valve
Fan Motor
Condenser
Compressor
Drier
Float Switch
Control Box
Water Pump
Mechanical
Bin Control
(except models
with Thermostat)

3. KM-630MAH-E


Transformer
Spray Tubes
Water Supply Inlet
Control Switch
Bin Control Thermostat
(except models with
Mechanical Bin Control)
Condenser
Hot Gas Valve
Expansion Valve
Fan Motor
Condenser
Compressor
Drier
Float Switch
Control Box
Water Pump
Mechanical
Bin Control
(except models
with Thermostat)

C. Controller Board

1. Solid-State Control

a) A HOSHIZAKI exclusive solid-state control is employed in Modular Crescent Cubers.

b) A printed circuit board (hereafter called “controller board”) includes a stable and high quality control system.

c) All models are pretested and factory-adjusted.

2. Controller Board

CAUTION

1. Fragile, handle very carefully.
2. A controller board contains integrated circuits, which are susceptible to failure due to static discharge. It is especially important to touch the metal part of the unit when handling or replacing the board.
3. Do not touch the electronic devices on the board or the back of the board to prevent damage to the board.
4. Do not change wiring and connections. Do not misconnect K3, K4 and K5, because the same connector is used for the thermistor (white), float switch (black), and mechanical bin control (red).
   (For machines with thermostat, there is no connection on K4.)
5. Always replace the whole board assembly when it goes bad.
6. Do not short out power supply to test for voltage.

Controller Board	
Part Number	Type
2A1410-01	HOS-001A (Control Products - 10 Pin)

Features of Control Products “E” Controller Board

a) Maximum Water Supply Period - 6 minutes

Water solenoid valve opening in the defrost (harvest) cycle is limited by the defrost timer. The water valve cannot remain open longer than the maximum period. The water valve can close in less than six minutes if the defrost cycle is completed.

b) Defrost Timer

The defrost cycle starts when the float switch opens and completes the freeze cycle. But the defrost timer does not start counting until the thermistor senses 9°C at the evaporator outlet. The period from the end of the freeze cycle up to the point of the thermistor's sensing varies depending on the ambient and water temperatures.

c) High Temperature Safety — 53 ± 4°C

The temperature of the suction line in the refrigerant circuit is limited by the high temperature safety. During the defrost cycle the evaporator temperature rises. The thermistor senses 9°C and starts the defrost timer. After the defrost timer counts down to zero, the normal freeze cycle begins. If the evaporator temperature continues to rise, the thermistor will sense the rise in temperature and at 53 ±4°C the thermistor operates the high temperature safety. This high temperature safety shuts down the circuit and the icemaker automatically stops. This high temperature safety protects the unit from excessive temperature. To reset the safety, turn the power off and back on again. This high temperature safety protects the unit from excessive temperature. The control board will beep every 3 seconds. The white reset button on the control board must be pressed with power on to reset the safety.

d) Low Water Safety

If the pump motor is operated without water, the mechanical seal can fail. To prevent this type of failure, the controller board checks the position of the float switch at the end of the initial one minute water fill cycle and at the end of each defrost cycle.
If the float switch is in the up position (electrical circuit closed), the controller board changes to the ice making cycle. If the float switch is in the down position (electrical circuit open), the controller board changes to a one minute water fill cycle before starting the ice making cycle. This method allows for a low water safety shut down to protect the water pump from mechanical seal failure.

e) High Voltage Cut-out — control voltage > 147Vac ±5%

The maximum allowable supply voltage of this icemaker is limited by the high voltage cut-out. If miswiring causes excessive voltage on the controller board, the high voltage cut-out shuts down the circuit in 3 seconds and the icemaker automatically stops. When the proper supply voltage is resumed, the icemaker automatically starts running again. The control board will signal this problem using 7 beeps every 3 seconds.

f) LED Lights and Audible Alarm Safeties

The red LED indicates proper control voltage and will remain on unless a control voltage problem occurs. At startup a 5 second delay occurs while the board conducts an internal timer check. A short beep occurs when the power switch is turned ON or OFF.

The green LEDs 1-4 represent the corresponding relays and energize and sequence 5 seconds from initial startup as follows:

Sequence Step	LED	Time LEDs are Lit		
		Min.	Max.	Avg.
1 Minute Fill Cycle	4			60 seconds
Harvest Cycle	1, 4, and 2	2 minutes	20 minutes	3 to 5 minutes
Freeze Cycle	1	5 minutes	60 minutes	30 to 35 minutes
Reverse Pump Out	1, 3, and 2	10 seconds	20 seconds	factory setting

{LED 1 – Comp; LED 2 - HGV/CFM; LED 3 – PM; LED 4 - WV}

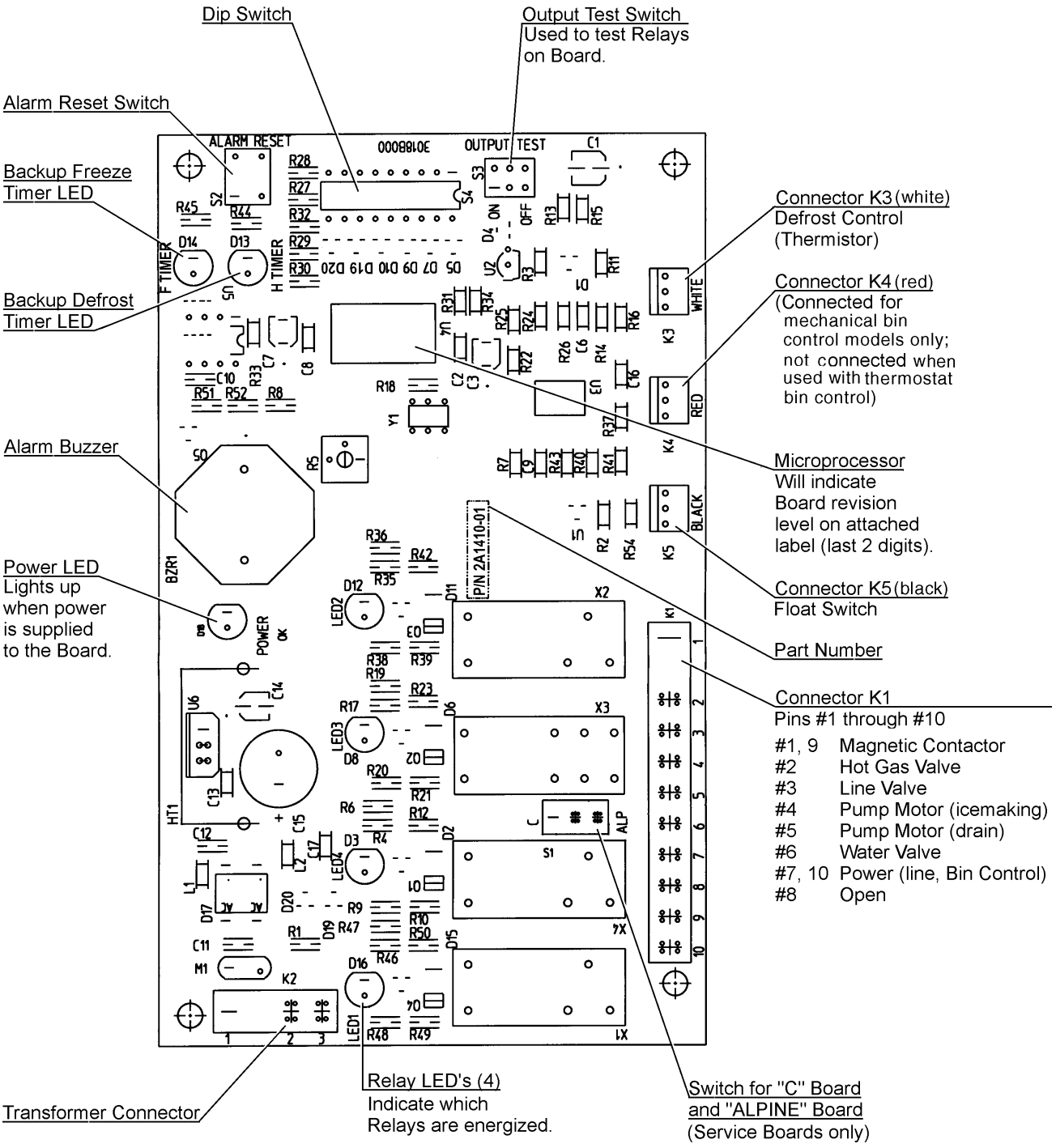
The built in safeties shut down the unit and have alarms as follows:

No. of Beeps (every 3 sec.)	Type of Alarm	Notes
1	High Evaporator Temp. (temperature > 53°C)	Check for defrost problem (stuck HGV or relay), hot water entering unit, stuck headmaster, or shorted thermistor.
2	Defrost Backup Timer (defrost > 20 min.)	Orange LED marked 20 MIN lights up. Check for open thermistor, HGV not opening, TXV leaking by, low charge, or inefficient compressor.
3	Freeze Backup Timer (freeze > 60 min.)	Yellow LED marked 60 MIN lights up. Check for F/S stuck closed (up), WV leaking by, HGV leaking by, TXV not feeding properly, low charge, or inefficient compressor.
4	Short Circuit (machines with mechanical bin control ONLY)	Short circuit between the K4 connection on the control board and the bin control relay. Check connections and replace wire harness if necessary.
5	Open Circuit (machines with mechanical bin control ONLY)	Open circuit between the K4 connection on the control board and the bin control relay. Check connections and replace wire harness if necessary.
To manually reset the above safeties, press the white alarm reset button with the power supply on.		
6	Low Voltage (92Vac or less)	
7	High Voltage (control voltage > 147Vac ±5%)	Red LED will turn off if voltage protection operates. The voltage safety automatically resets when voltage is corrected.

The **Output Test** switch “S3” provides a relay sequence test. With power OFF, place S3 ON and switch power to ICE. The correct lighting sequence should be none, 2, 3, 4, 1, & 4, normal sequence every 5 seconds. (The LEDs are not in numerical order on the board. See the diagram on the next page for the location and numbering of LEDs). S3 should remain in the “OFF” position for normal operation.

The application switch located between relay X3 & X4 must be set to match the original board application. Place this switch in the ALP position if there is no white wire supplied to the K1 connector. If there is a white wire, place the switch in the C position. If this switch is placed in the wrong position either the compressor contactor will remain energized with the control switch OFF or the unit will not start.

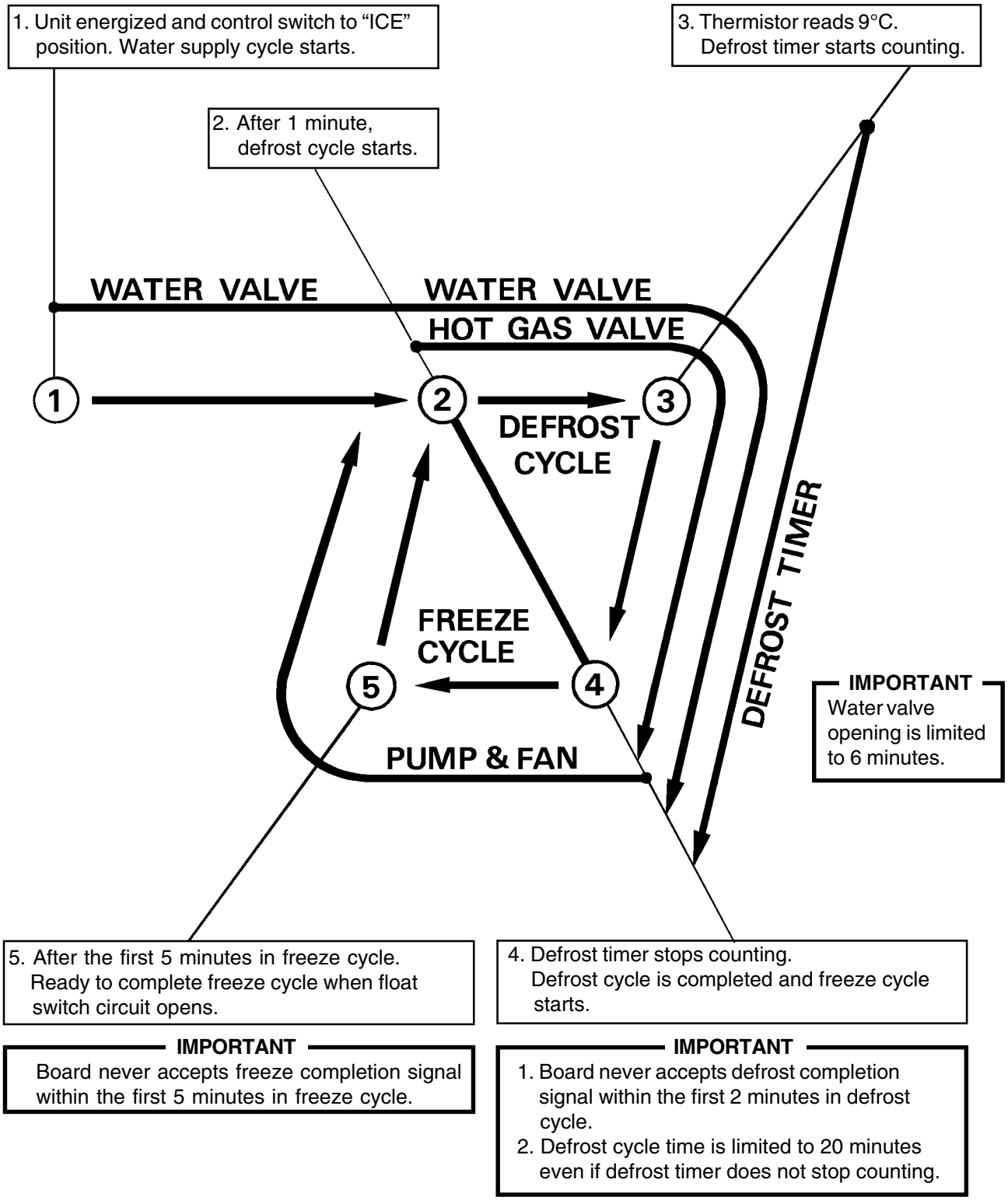
The dip switches should be adjusted per the adjustment chart in II.C.4., “Controls and Adjustments.” Number 8 must remain in the OFF position.



(Control Products HOS-001A Board)

3. Sequence

1st Cycle



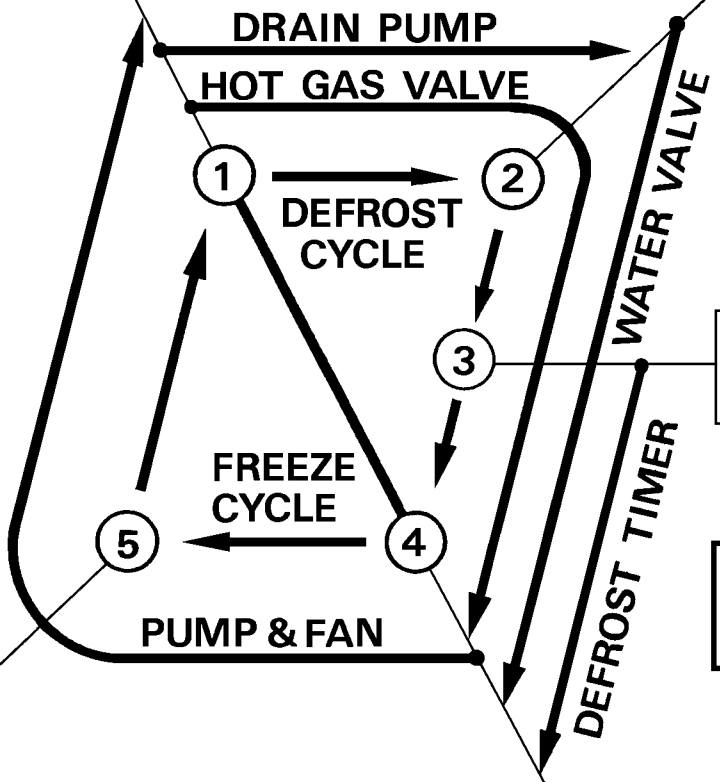
2nd Cycle and after with pump drain

IMPORTANT

Freeze cycle time is limited by the freeze timer factory setting even if the float switch does not open.

1. Float switch opens and signals to complete freeze cycle.
   Drain timer starts counting.

2. Drain timer stops counting.
   Pump drain is completed.



3. Thermistor reads 9°C.
   Defrost timer starts counting.

IMPORTANT

Water valve opening is limited to 6 minutes.

5. After the first 5 minutes in freeze cycle.
   Ready to complete freeze cycle when float switch circuit opens.

4. Defrost timer stops counting.
   Defrost cycle is completed and freeze cycle starts.

IMPORTANT

Board never accepts freeze completion signal within the first 5 minutes in freeze cycle.

IMPORTANT

1. Board never accepts defrost completion signal within the first 2 minutes in defrost cycle.
2. Defrost cycle time is limited to 20 minutes even if defrost timer does not stop counting.

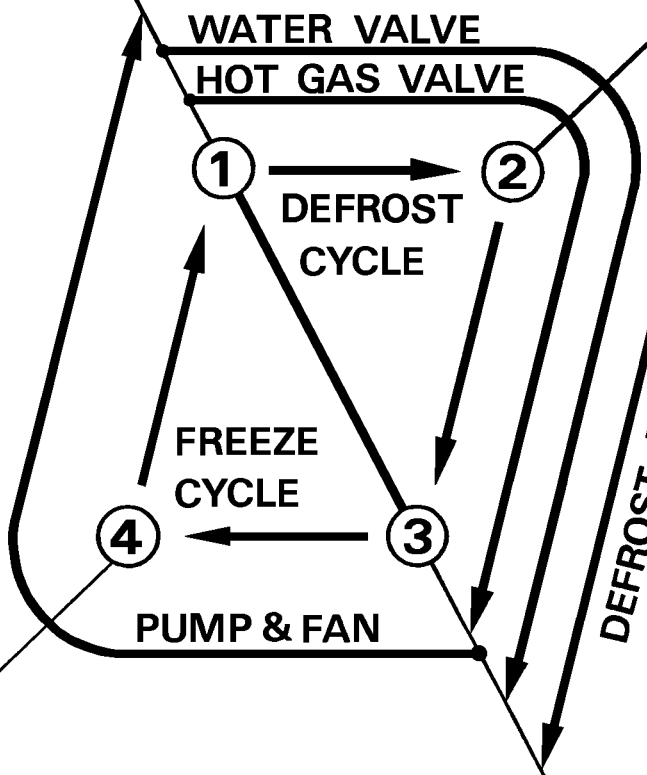
2nd Cycle and after with no pump drain

IMPORTANT

Freeze cycle time is limited by the freeze timer factory setting even if the float switch does not open.

1. Float switch opens and signals to complete freeze cycle.

2. Thermistor reads 9°C.
Defrost timer starts counting.



IMPORTANT

Water valve opening is limited to 6 minutes.

4. After the first 5 minutes in freeze cycle.
Ready to complete freeze cycle when float switch circuit opens.

3. Defrost timer stops counting.
Defrost cycle is completed and freeze cycle starts.

IMPORTANT

Board never accepts freeze completion signal within the first 5 minutes in freeze cycle.

IMPORTANT

1. Board never accepts defrost completion signal within the first 2 minutes in defrost cycle.
2. Defrost cycle time is limited to 20 minutes even if defrost timer does not stop counting.

4. Controls and Adjustments

The dip switch is factory-adjusted to the positions outlined below.

For models with mechanical bin control.

Dip Switch No.	1	2	3	4	5	6	7	8	9	10
KM-280MAH-E	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
KM-500MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
KM-630MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF

For models with bin thermostat.

Dip Switch No.	1	2	3	4	5	6	7	8	9	10
KM-280MAH-E	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
KM-500MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
KM-630MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF

Switch Nos. 1 and 2:

Used for adjustment of the defrost timer. The defrost timer starts counting when the thermistor reads a certain temperature at the evaporator outlet.

Switch Nos. 3 and 4:

Used for adjustment of the drain timer. When a freeze cycle is completed, the pump motor stops, and resumes operation in reverse after 2 seconds. Then the pump motor drains the water tank for the time determined by the drain timer. The drain timer also determines the time to restrain completion of a defrost cycle, i.e. the minimum defrost time.

Switch Nos. 5 and 6:

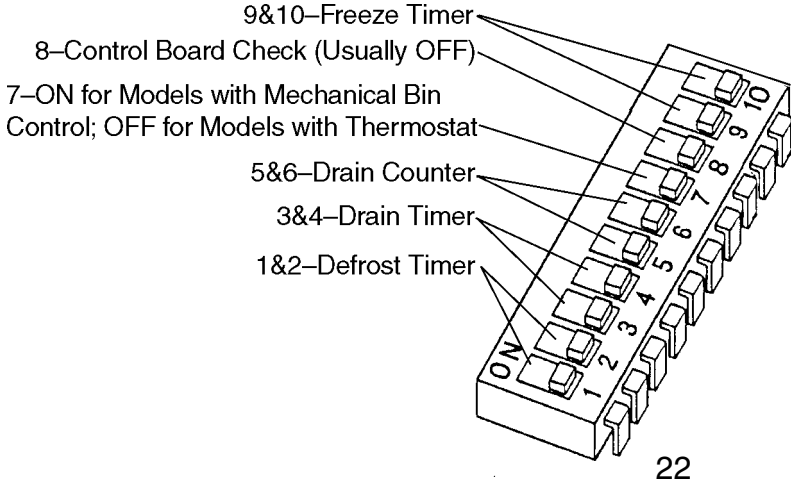
Used for adjustment of the drain counter. The pump motor drains the water tank at the frequency determined by the drain counter.

Switch No. 7:

Used only on models with mechanical bin control. Should be ON for models with mechanical bin control, and OFF for models with bin thermostat.

Switch No. 8:

Used only for checking the controller board. Usually OFF.



Switch Nos. 9 and 10:

Used for adjustment of freeze timer. The freeze timer determines maximum freeze cycle time. Upon termination of freeze timer, machine initiates the harvest cycle. After 2 consecutive timer terminations, machine will shut down, possibly indicating a problem.

a) Defrost Control

A thermistor (semiconductor) is used for a defrost control sensor. The resistance varies depending on the suction line temperatures. The thermistor detects the temperature of the evaporator outlet to start the defrost timer. No adjustment is required. If necessary, check for resistance between thermistor leads, and visually check the thermistor mounting, located on the suction line next to the evaporator outlet.

Temperature (°C)	Resistance (kΩ)
-18	14.401
-12	10.613
0	6.000
10	3.871
21	2.474
32	1.633

Check a thermistor for resistance by using the following procedures.

(1) Disconnect the connector K3 on the board.

(2) Remove the thermistor. See “V. H. Removal and Replacement of Thermistor.”

(3) Immerse the thermistor sensor portion in a glass containing ice and water for 2 or 3 minutes.

(4) Check for a resistance between thermistor leads.
Normal reading is within 3.5 to 7 kΩ. Replace the thermistor if it exceeds the normal reading.

b) Defrost Timer

No adjustment is required under normal use, as the defrost timer is adjusted to the suitable position. However, if necessary because all the ice formed on the evaporator does not fall into the bin in the harvest cycle, adjust the defrost timer to a longer setting by adjusting the dip switch (No. 1 & 2) on the controller board.

Dip Switch Setting		Time
No. 1	No. 2	(seconds)
OFF	OFF	60
ON	OFF	90
OFF	ON	120
ON	ON	180

c) Drain Timer

The drain timer is factory-adjusted and no adjustment is required.

Dip Switch Setting		Time (seconds)	
No. 3	No. 4	T1	T2
OFF	OFF	10	150
ON	OFF	10	180
OFF	ON	10	120
ON	ON	20	180

T1: Time to drain the water tank
T2: Time to restrain defrost completion

d) Drain Counter

CAUTION

Do not adjust the drain counter, or the evaporator may freeze up.

The drain counter is factory-adjusted to drain the water tank every 10 cycles, and no adjustment is required. However, where water quality is bad and the icemaker needs a pump drain more often, the drain counter can be adjusted as shown in the table below.

Dip Switch Setting		Frequency
No. 5	No. 6	
OFF	OFF	every cycle
ON	OFF	every 2 cycles
OFF	ON	every 5 cycles
ON	ON	every 10 cycles

e) Freeze Timer

CAUTION

Adjust to proper specification, or the unit may not operate correctly.

The freeze timer is factory adjusted and no adjustment is required. This setting determines the maximum allowed freeze time to prevent possible freeze-up issues.

Dip Switch Setting		Time (minutes)
No. 9	No. 10	
OFF	OFF	60
OFF	ON	50
ON	OFF	70
ON	ON	75

f) Bin Control

(1) Models with Thermostat

CAUTION

When the ambient temperature is below 7°C, the bin control thermostat operates to stop the icemaker even if the ice storage bin is empty. When the thermostat is set in the prohibited range, the icemaker operates continuously even if the ice storage bin is filled with ice. Setting in the prohibited range might cause severe damage to the icemaker resulting in failure.

No adjustment is required under normal use, as the bin control is factory-adjusted. Adjust it, if necessary, so that the icemaker stops automatically within 10 seconds after ice contacts the bin control thermostat bulb.

(2) Models with Mechanical Bin Control

CAUTION

Dip switch no. 7 must be set to the ON position. If no. 7 is set to the OFF position, the machine will run continuously, causing a freeze-up condition.

No adjustment is required. The bin control is factory-adjusted.

5. Checking the Controller Board

1) Visually check the sequence with the icemaker operating.

2) Visually check the controller board by using the following procedures:

(i) Adjust the defrost timer to minimum position.
Disconnect the thermistor (K3) from the controller board.
Connect a 1.5 kΩ - 3.5 kΩ resistor to the connector K3 (pins #1 and #2), and energize the unit.

After the 1 minute ± 5 second water supply cycle and the 2 minute ± 10 second defrost cycle, the unit should start the freeze cycle.

(ii) After the above step (i), disconnect the float switch leads (K5) from the controller board within the first 5 minutes of the freeze cycle.

The unit should go into the defrost cycle after the first 5 minutes ± 20 seconds of the freeze cycle.

(iii) Reconnect the float switch connector to the controller board. After the first 5 minutes of the freeze cycle, disconnect the float switch leads from the controller board.

At this point, the unit should start the defrost cycle.

(iv) After step (iii), de-energize the unit and confirm that the defrost timer is in the minimum position. Disconnect the resistor from the controller board, and energize the unit. After the 1 minute water supply cycle, the defrost cycle starts.
Re-connect a 1.5 kΩ - 3.5 kΩ resistor to the connector K3 (pins #1 and #2) after the first 2 minutes of the defrost cycle. The unit should start the freeze cycle after 1 minute ± 5 seconds from the resistor connection.

3) Check the controller board using the controller board's test program.

The output test switch "S3" provides a relay sequence test. With power OFF, place S3 on and switch power to ICE. The correct lighting sequence should be none, 2, 3, 4, 1, and 4, normal sequence every 5 seconds. S3 should remain in the "OFF" position for normal operation.

D. Mechanical Bin Control

(These instructions are not applicable to models with thermostat.)

1. Proximity Switch

This machine uses a lever-actuated proximity switch (hereafter called "mechanical bin control") to control the ice level in the storage bin.

2. Explanation of Operation

a) The startup and shutdown of the ice machine is controlled via the controller board. Dip switch number 7 must be in the ON position for the controller board to receive input from the bin control.

(1) The controller board receives a resistance value input via the red K4 connector from the bin control. A resistor wire harness is connected from the bin control to the controller board.

(2) When the bin control is activated in the bin full position (pushed to the right), a 15.8 KΩ signal will be sent to the control board to shut down the unit.

(3) When the bin control is in the normal position (bin is not full), a 7.9 KΩ reading is sent to the control board to continue operation.

b) During operation, the controller board will only shut down the machine if a 15.8 KΩ signal is received from the bin control during the first 5 minutes of the freeze cycle.

(1) If ice pushes the lever to the right after the first five minutes of the freeze cycle, the controller board will allow the machine to complete the freeze cycle and the following harvest cycle before shutting down the machine. This will prevent incomplete batches of ice from forming on the evaporator.

3. Troubleshooting (Mechanical Bin Control Only)

a) Machine will not start

(1) Move dip switch No. 7 to the "OFF" position. If the machine starts up within a few seconds, the bin control is the likely problem. If the machine does not start up, refer to Section "IV. Service Diagnosis" to verify that non-bin control related issues are resolved.

(2) Check to make sure shipping tape has been removed and the wires are connected properly.

(3) Check to make sure no obstruction prevents the lever from moving to the bin empty position.

b) Machine will not shut off

(1) Refer to Section "IV. Service Diagnosis" to verify that non-bin control related issues are resolved.

(2) Dip switch No. 7 should be in the on position. If the switch is in the off position, the controller board will not receive input from the bin control.

(3) Move the lever to the far right.

(a) If the machine does not shut off, check the resistance values of the resistor wire harness. You should read approximately 15.8 KΩ between the black terminal and the red terminal that connect to the K4 connector on the controller board, when the lever is in the bin full position (far right). If this reads approximately 7.9 KΩ, the resistors may be miswired. Switch the black and white wires in the terminal housing or order a replacement wire harness.

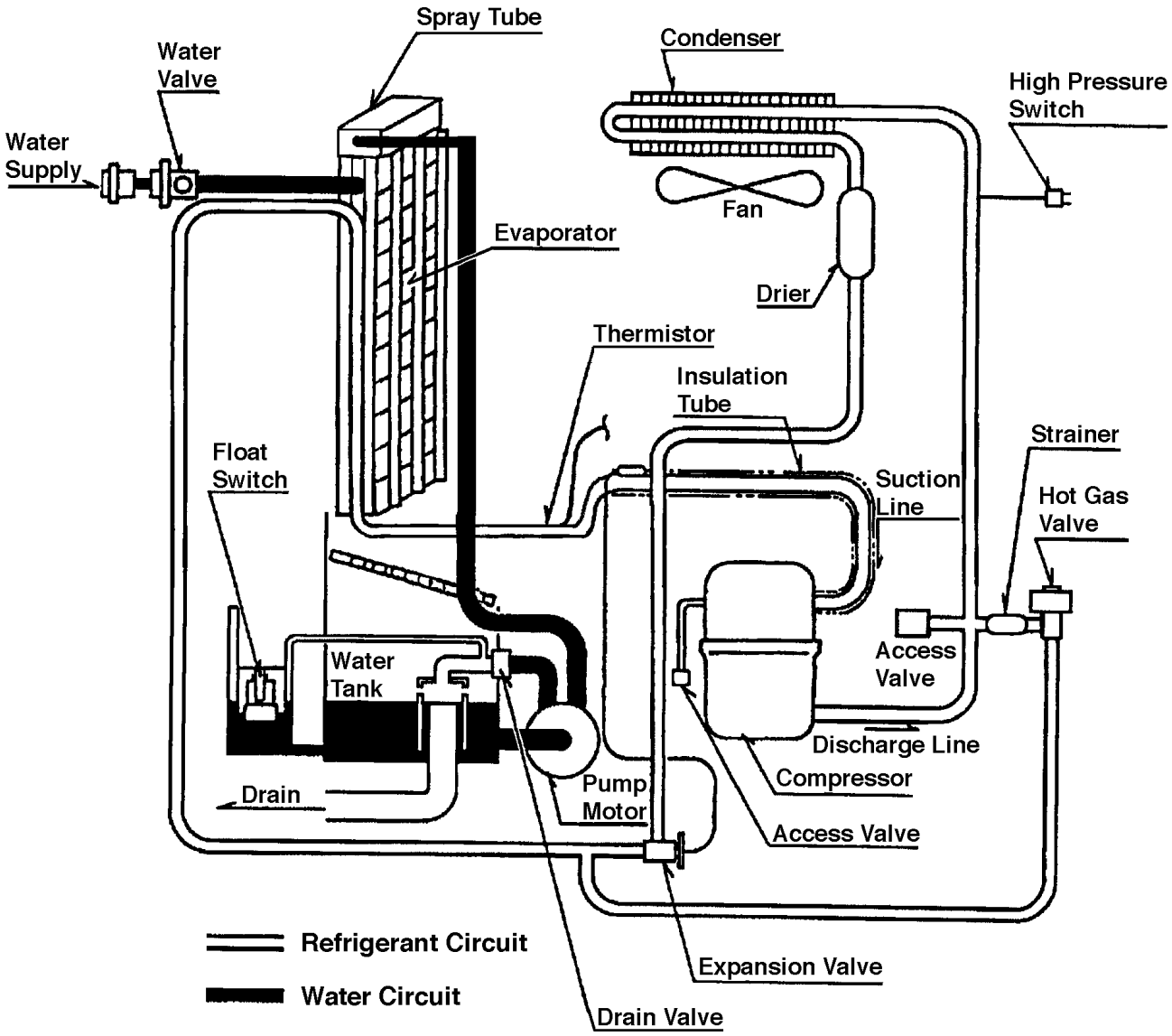
(b) Check the stainless steel bracket that the bin control is mounted to.

(c) If the preceding items do not resolve the problem, replace the bin control assembly.

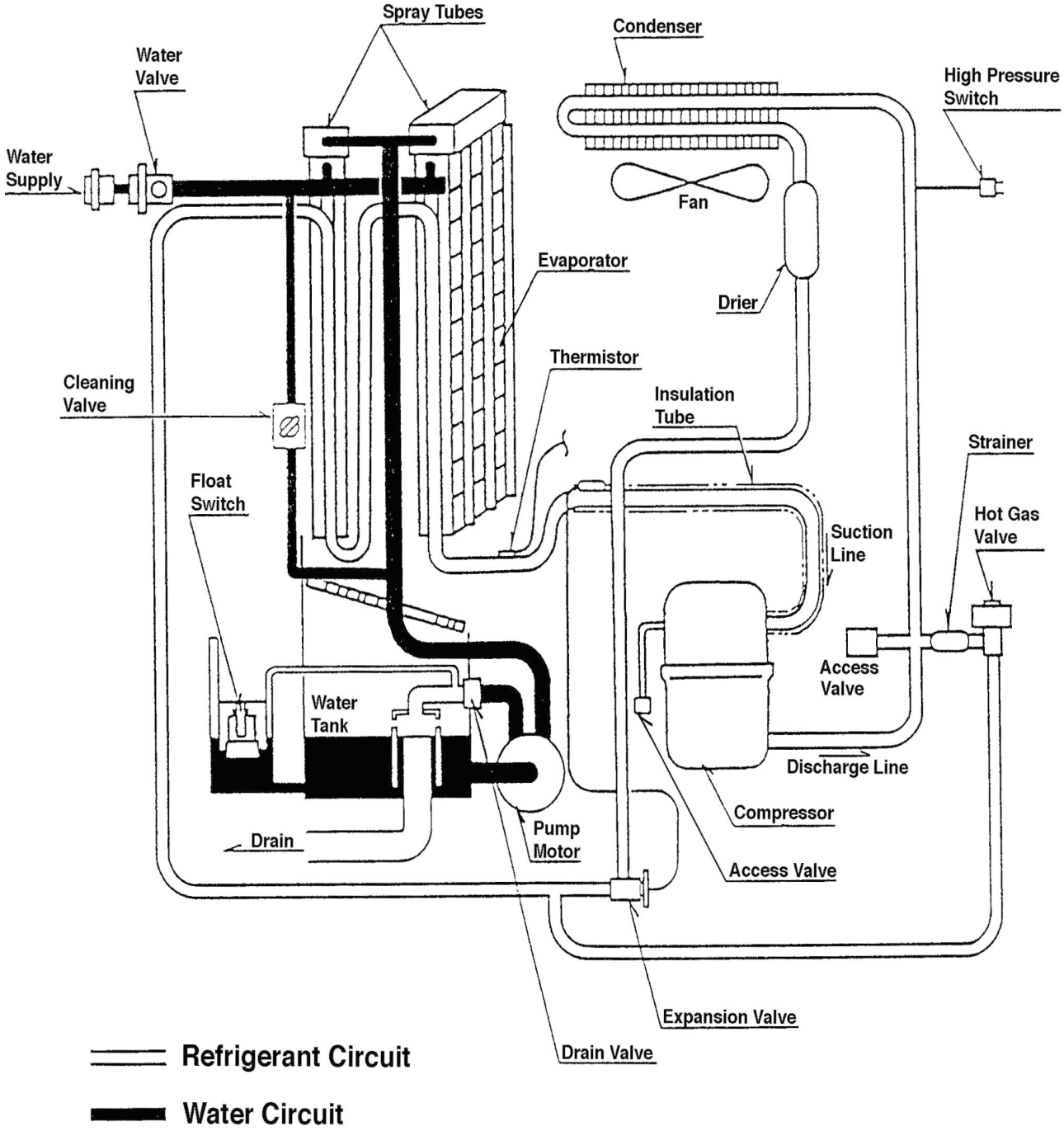
III. Technical Information

A. Water Circuit and Refrigerant Circuit

1. KM-280MAH-E



2. KM-500MAH-E, KM-630MAH-E

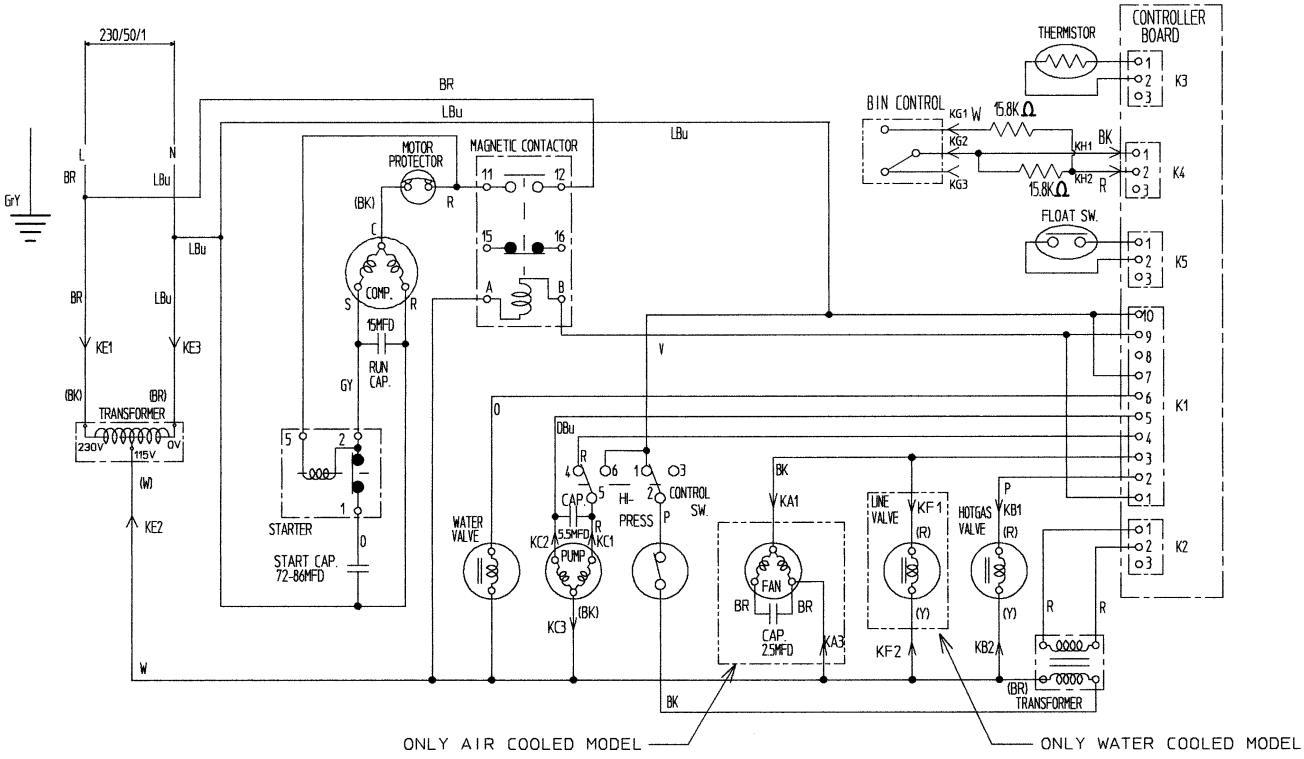


B. Wiring Diagrams

1a. KM-280MAH-E (auxiliary codes L-0 through M-1)

WIRE COLOR CODE

BR	BROWN	R	RED	P	PINK
W	WHITE	O	ORANGE	DBu	DARKBLUE
BK	BLACK	GY	GRAY	V	VIOLET
Y	YELLOW	GrY	GREEN/YELLOW	LBu	LIGHT BLUE



Pressure Switch

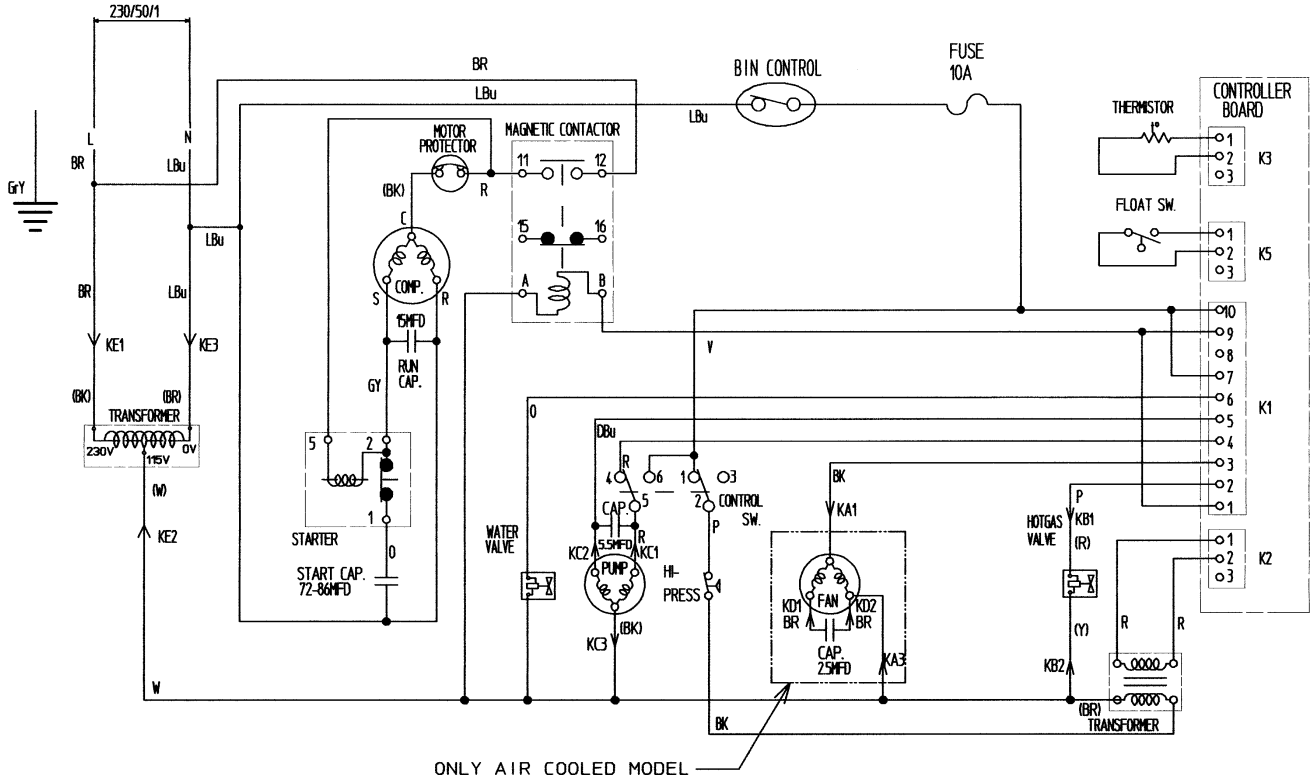
Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

1b. KM-280MAH-E (auxiliary codes M-2 and later)

WIRE COLOR CODE

BR	BROWN	R	RED	P	PINK
W	WHITE	O	ORANGE	DBu	DARKBLUE
BK	BLACK	GY	GRAY	V	VIOLET
Y	YELLOW	GrY	GREEN/YELLOW	LBu	LIGHT BLUE



Pressure Switch

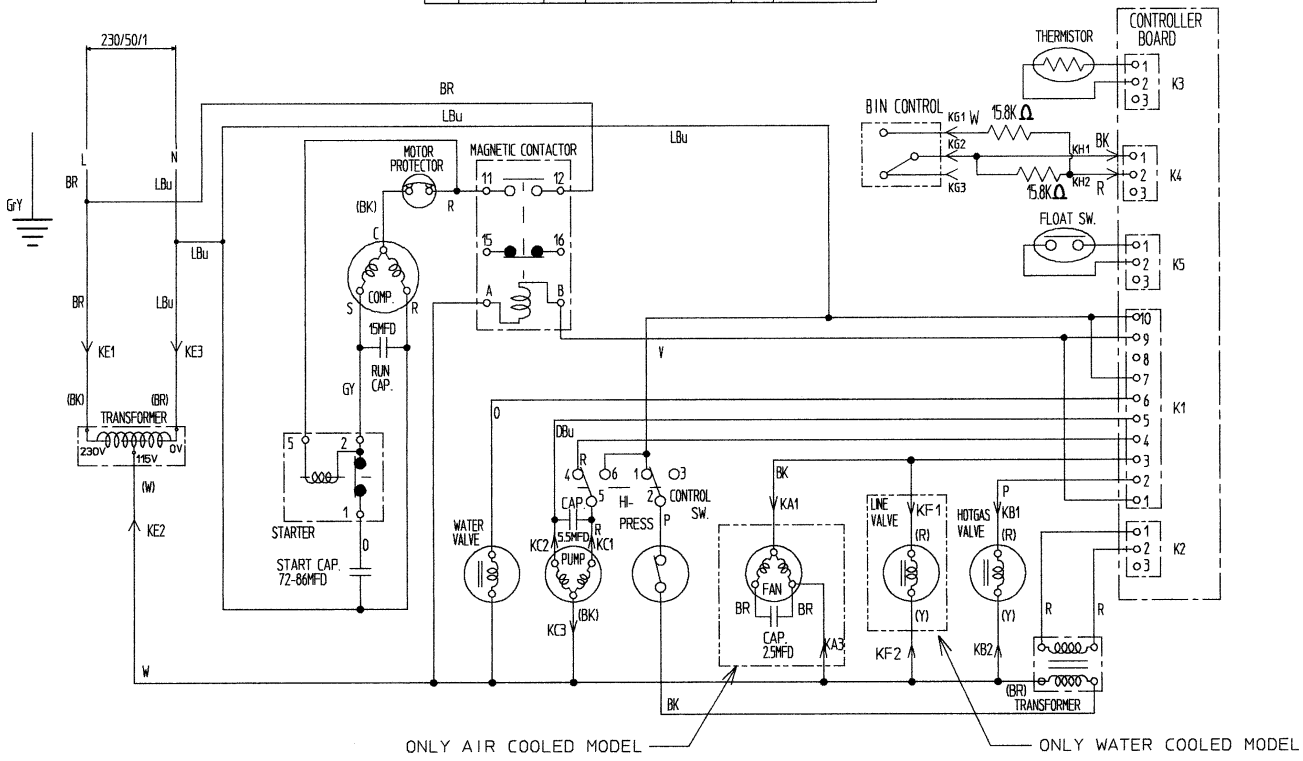
Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

2a. KM-500MAH-E (auxiliary codes L-0 through M-1)

WIRE COLOR CODE

BR	BROWN	R	RED	P	PINK
W	WHITE	O	ORANGE	DBu	DARKBLUE
BK	BLACK	GY	GRAY	V	VIOLET
Y	YELLOW	GrY	GREEN/YELLOW	LBu	LIGHT BLUE



Pressure Switch

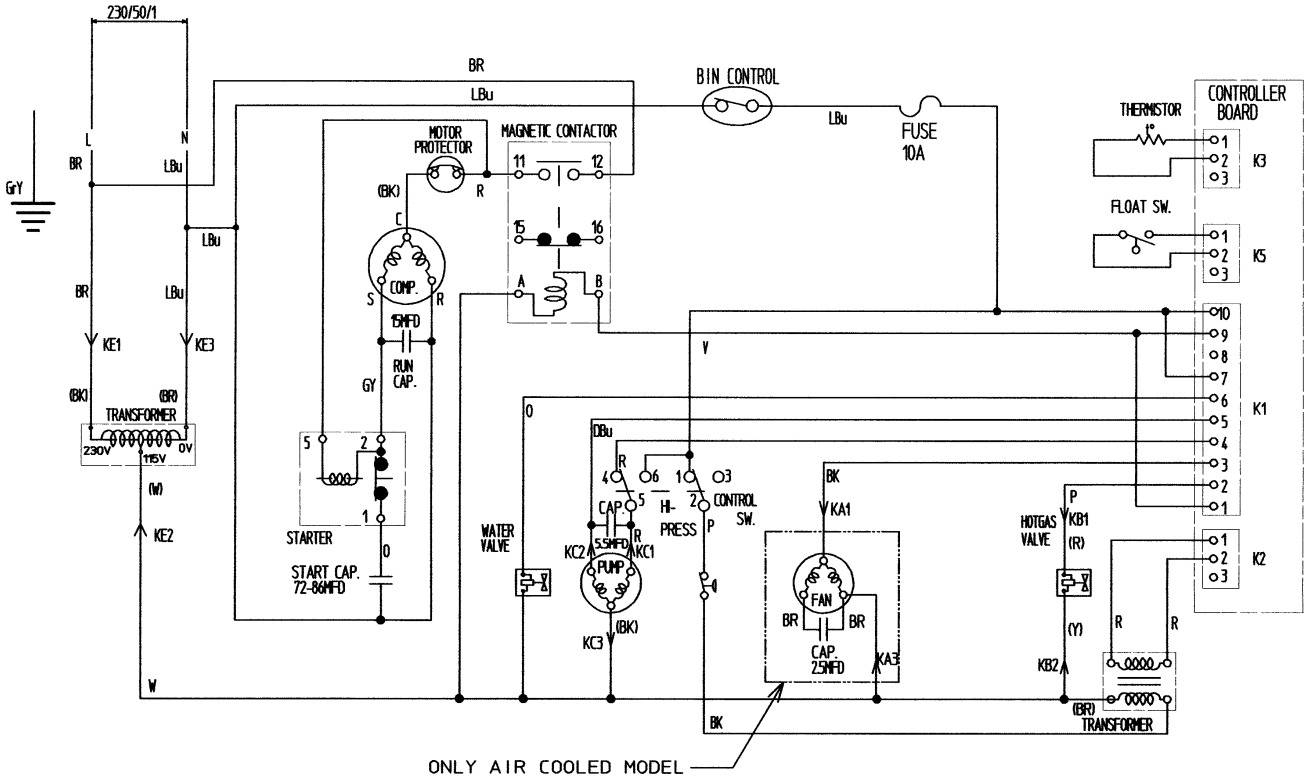
Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

2b. KM-500MAH-E (auxiliary codes M-2 and later)

WIRE COLOR CODE

BR	BROWN	R	RED	P	PINK
W	WHITE	O	ORANGE	DBu	DARKBLUE
BK	BLACK	GY	GRAY	V	VIOLET
Y	YELLOW	GrY	GREEN/YELLOW	LBu	LIGHT BLUE



Pressure Switch

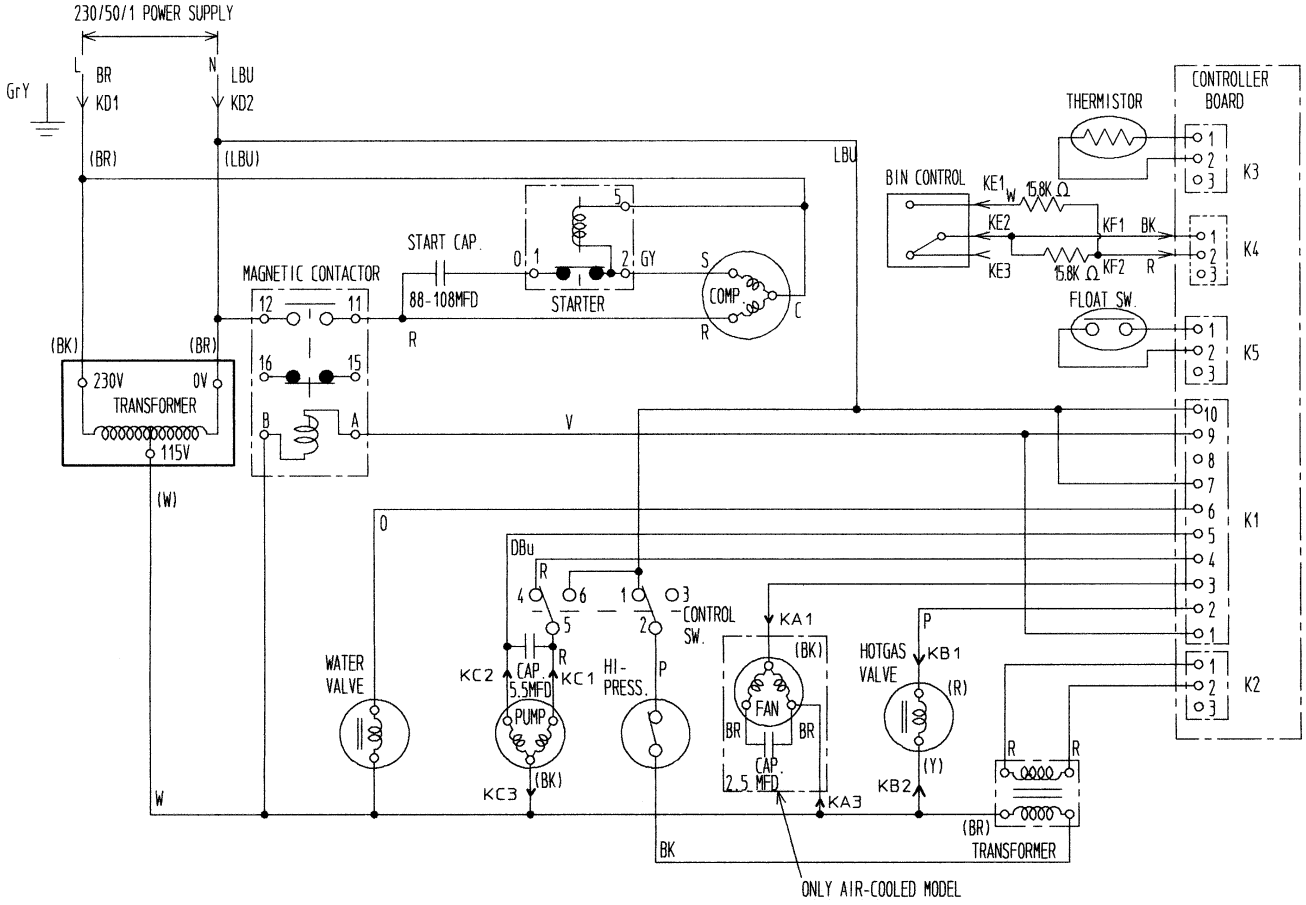
Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

3a. KM-630MAH-E (auxiliary codes L-0 through M-1)

WIRE COLOR CODE

BR	BROWN	O	ORANGE	V	VIOLET
W	WHITE	GY	GRAY	Y	YELLOW
BK	BLACK	P	PINK	LBU	LIGHT BLUE
R	RED	DBU	DARKBLUE	GrY	GREEN/YELLOW

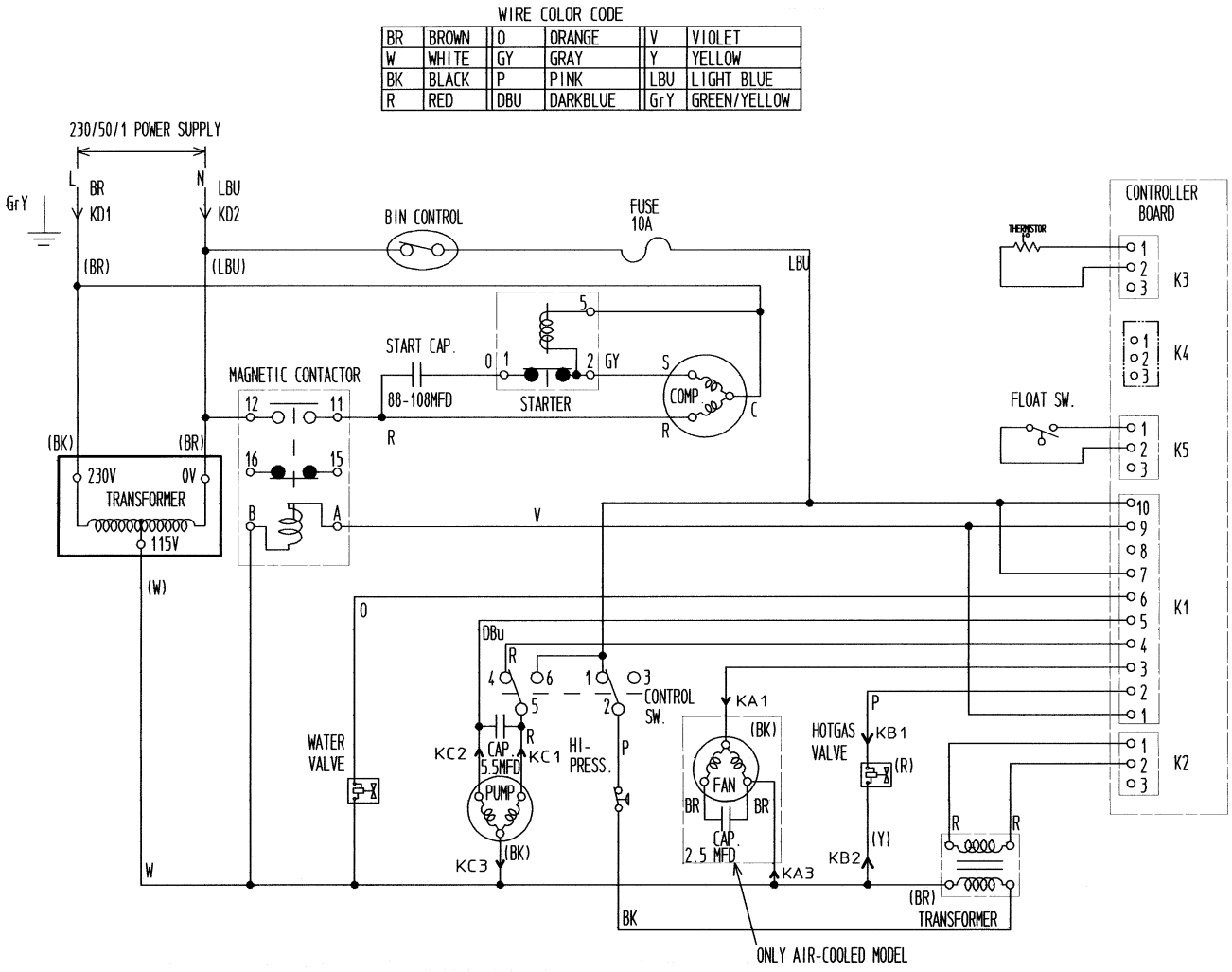


Pressure Switch

Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

3b. KM-630MAH-E (auxiliary codes M-2 and later)

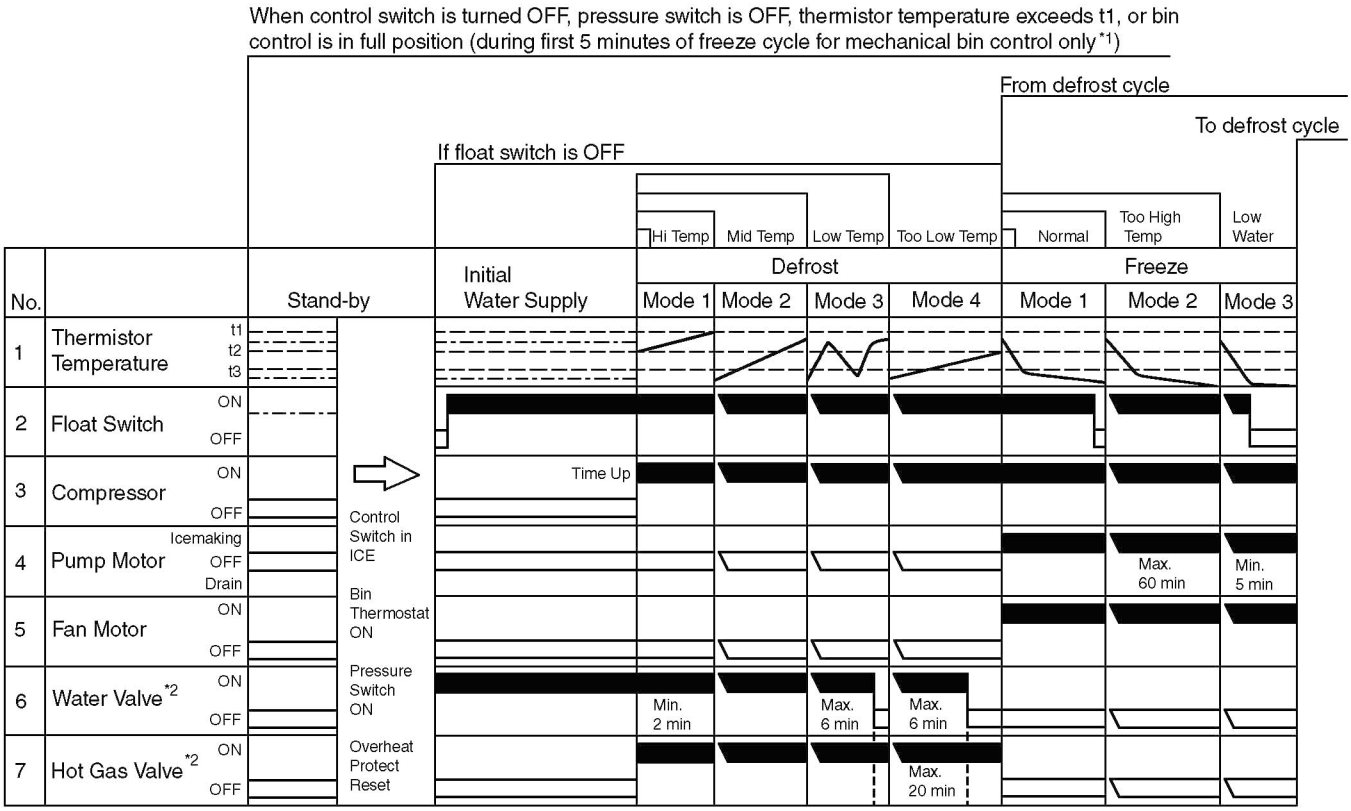


Pressure Switch

Cut-out 412^{+21}_{-0} psig
$28.4^{+1.5}_{-0}$ bar

Cut-in 327 ± 21 psig
22.5 ± 1.5 bar

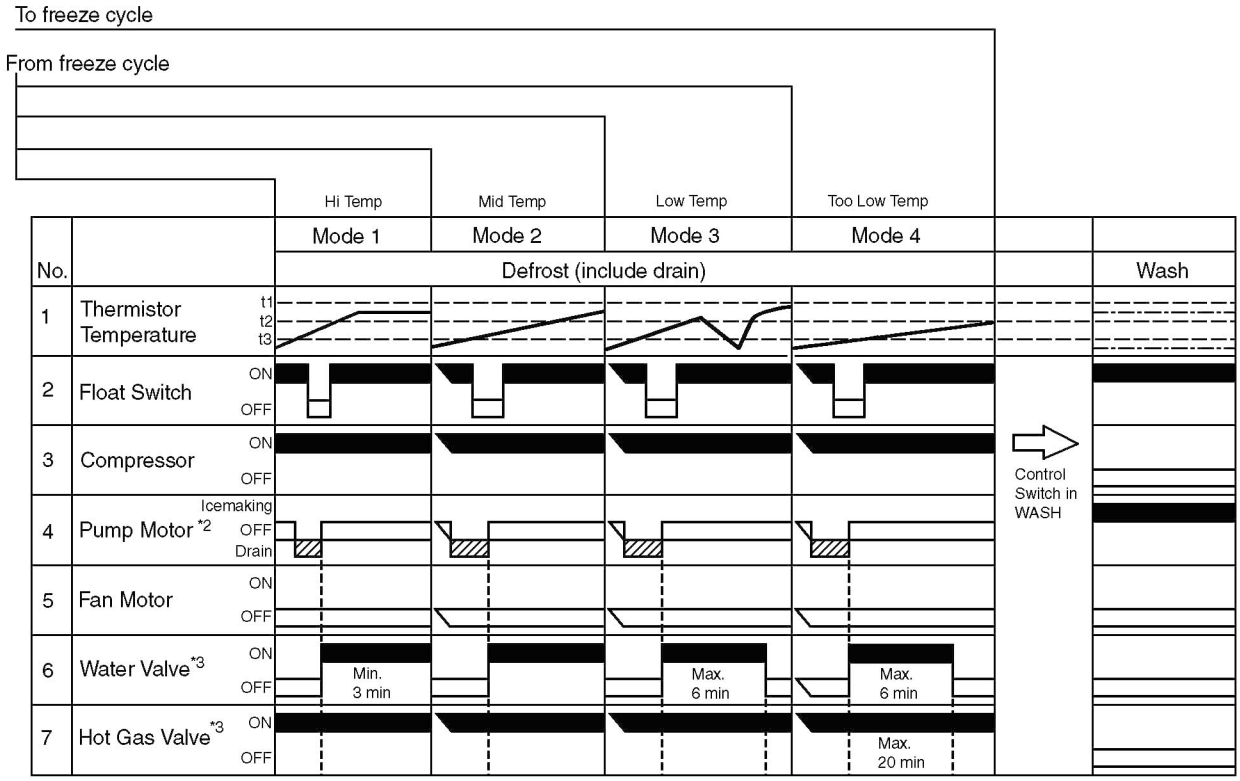
C. Timing Chart



*1 Mechanical Bin Control Only—The bin control will only shut off the ice machine during the first five minutes of the freeze cycle.

*2 The icemaker does not complete a defrost cycle in the first 2 or 3 minutes. See "II.C.4. Controls and Adjustments."

To stand-by cycle (When control switch is turned OFF, pressure switch is OFF, thermistor temperature exceeds t1, or bin control is in full position*1)



*1 Mechanical Bin Control Only—The bin control will only shut off the ice machine during the first five minutes of the freeze cycle.

*2 The pump motor waits for 2 seconds before starting a drain cycle. See “II.C.4. Controls and Adjustments.”

*3 The icemaker does not complete a defrost cycle in the first 2 or 3 minutes. See “II.C.4. Controls and Adjustments.”

D. Performance Data

1. KM-280MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (ºF/ºC)	WATER TEMP. (ºF/ºC)					
		50/10		70/21		90/32	
	70/21	**258**	117	231	105	204	93
	80/27	237	108	196	89	175	79
	90/32	231	105	**166**	75	142	64
lbs./day kg./day	100/38	229	104	160	73	120	54
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**763**		775		783	
	80/27	772		790		795	
	90/32	775		**802**		809	
watts	100/38	789		804		815	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**99**	0.37	87	0.33	77	0.29
	80/27	90	0.34	72	0.27	64	0.24
	90/32	87	0.33	**59**	0.22	50	0.19
gal./day m^3/day	100/38	80	0.30	50	0.19	41	0.16
FREEZING CYCLE TIME	70/21	**20**		23		30	
	80/27	22		28		35	
	90/32	23		**31**		39	
min.	100/38	25		33		45	
HARVEST CYCLE TIME	70/21	**3.1**		3.1		3.0	
	80/27	3.1		3.0		2.5	
	90/32	3.1		**2.9**		2.9	
min.	100/38	3.0		2.9		2.9	
HEAD PRESSURE	70/21	**245**	17.2	267	18.8	290	20.4
	80/27	262	18.4	296	20.8	315	22.1
	90/32	267	18.8	**320**	22.5	341	24.0
PSIG kg/cm^2G	100/38	269	18.9	325	22.8	360	25.3
SUCTION PRESSURE	70/21	**55**	3.9	58	4.1	61	4.3
	80/27	57	4.0	62	4.3	64	4.5
	90/32	58	4.1	**65**	4.6	68	4.8
PSIG kg/cm^2G	100/38	58	4.1	66	4.6	**70**	4.9

TOTAL HEAT OF REJECTION FROM CONDENSER 8159 BTU/h [AT 90ºF (32ºC) / WT 70ºF (21ºC)]

Note: Pressure data is recorded at 5 minutes into freeze 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.

2. KM-500MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (°F/°C)	WATER TEMP. (°F/°C)					
		50/10		70/21		90/32	
	70/21	**480**	218	446	202	403	183
	80/27	454	206	402	182	360	163
	90/32	446	202	**365**	166	321	146
lbs./day kg./day	100/38	438	199	355	161	281	127
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**940**		963		1039	
	80/27	958		994		1095	
	90/32	963		**1019**		1111	
watts	100/38	993		1041		1196	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**242**	0.92	215	0.81	193	0.73
	80/27	222	0.84	179	0.68	166	0.63
	90/32	215	0.81	**149**	0.56	132	0.50
gal./day m^3/day	100/38	194	0.73	145	0.55	116	0.44
FREEZING CYCLE TIME	70/21	**29**		32		37	
	80/27	31		36		41	
	90/32	32		**39**		44	
min.	100/38	33		40		50	
HARVEST CYCLE TIME	70/21	**3.4**		3.3		3.2	
	80/27	3.3		3.1		3.0	
	90/32	3.3		**2.9**		2.9	
min.	100/38	3.3		2.9		2.8	
HEAD PRESSURE	70/21	**250**	17.6	268	18.8	293	20.6
	80/27	263	18.5	291	20.4	316	22.3
	90/32	268	18.8	**310**	21.8	336	23.6
PSIG kg/cm^2G	100/38	273	19.2	316	22.2	360	25.3
SUCTION PRESSURE	70/21	**50**	3.5	53	3.7	55	3.8
	80/27	52	3.7	56	3.9	57	4.0
	90/32	53	3.7	**59**	4.1	61	4.3
PSIG kg/cm^2G	100/38	53	3.7	59	4.2	62	4.4

TOTAL HEAT OF REJECTION 7371 BTU/h [AT 90°F (32°C) / WT 70°F (21°C)

Note: Pressure data is recorded at 5 minutes into freeze 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.

3. KM-630MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (°F/°C)	WATER TEMP. (°F/°C)					
		50/10		70/21		90/32	
	70/21	**624**	283	576	261	520	236
	80/27	587	266	513	233	463	210
	90/32	576	261	**460**	209	406	184
lbs./day kg./day	100/38	568	258	447	203	357	162
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**1300**		1329		1361	
	80/27	1322		1367		1395	
	90/32	1329		**1399**		1430	
watts	100/38	1333		1406		1458	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**208**	0.79	192	0.73	173	0.66
	80/27	195	0.74	170	0.65	154	0.58
	90/32	192	0.73	**153**	0.58	135	0.51
gal./day m^3/day	100/38	189	0.72	149	0.56	119	0.45
FREEZING CYCLE TIME	70/21	**32**		35		42	
	80/27	35		40		47	
	90/32	35		**44**		51	
min.	100/38	37		45		57	
HARVEST CYCLE TIME	70/21	**3**		3		3	
	80/27	3		3		3	
	90/32	3		**2.9**		2.9	
min.	100/38	3		2.8		2.8	
HEAD PRESSURE	70/21	**270**	19.0	291	20.4	309	21.7
	80/27	286	20.1	318	22.3	330	23.2
	90/32	291	20.4	**340**	23.9	356	25.0
PSIG kg/cm^2G	100/38	291	20.5	344	24.2	370	26.0
SUCTION PRESSURE	70/21	**50**	3.5	51	3.6	52	3.7
	80/27	50	3.5	51	3.6	53	3.7
	90/32	51	3.6	**52**	3.7	54	3.8
PSIG kg/cm^2G	100/38	51	3.6	52	3.7	55	3.9

TOTAL HEAT OF REJECTION 10375 BTU/h [AT 90°F (32°C) / WT 70°F (21°C

Note: Pressure data is recorded at 5 minutes into freeze 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.

IV. Service Diagnosis
A. No Ice Production

Problem	Possible Cause		Remedy
[1] The icemaker will not start.	a) Power Supply	1. OFF position.	1. Move to ON position.
		2. Loose connection.	2. Tighten.
		3. Bad contacts.	3. Check for continuity and replace.
		4. Voltage too high.	4. Check and get recommended voltage.
	b) Fuse (Inside fused disconnect, if any)	1. Blown.	1. Check for short circuit and replace.
	c) Control Switch	1. OFF position.	1. Move to ICE position.
		2. Bad contacts.	2. Check for continuity and replace.
	d) Bin Control Thermostat (For mechanical bin control, see II.D.3.)	1. Tripped with bin filled with ice.	1. Remove ice.
		2. Ambient temperature too cool.	2. Increase ambient temperature.
		3. Set too warm.	3. See "II.C.4. Controls and Adjustments, f) Bin Control."
		4. Bulb out of position.	4. Place in position.
		5. Bad contacts or leaks in bulb.	5. Check for continuity and replace.
	e) High Pressure Control	1. Bad contacts.	1. Check for continuity and replace.
	f) Transformer	1. Thermal fuse blown or coil winding opened.	1. Replace.
	g) Wiring to Controller Board	1. Loose connections or open.	1. Check for continuity and replace.
	h) Thermistor	1. Leads short-circuit or open and high temperature safety operates.	1. See "II.C.4. Controls and Adjustments, a) Defrost Control."
	i) Hot Gas Solenoid Valve	1. Continues to open in freeze cycle and high temperature safety operates.	1. Check for power off in freeze cycle and replace.

Problem	Possible Cause		Remedy
[1] Continued from previous page.	j) Water Supply Line	1. Water supply off and water supply cycle does not finish.	1. Check and get recommended pressure.
		2. Condenser water pressure too low or off and pressure control opens and closes frequently to finally operate high temperature safety.	2. Check and get recommended pressure.
	k) Water Solenoid	1. Mesh filter or orifice gets clogged and water supply cycle does not finish.	1. Clean.
		2. Coil winding opened.	2. Replace.
		3. Wiring to water valve.	3. Check for loose connection or open, and replace.
	l) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[2] Water continues to be supplied, and the icemaker will not start.	a) Float Switch	1. Connector disconnected.	1. Place in position.
		2. Leads opened or defective switch.	2. Check and replace.
		3. Float does not move freely.	3. Clean or replace.
	b) Controller Board	1. Defective.	1. Replace.
[3] Compressor will not start or stops operating.	a) Wash Switch	1. WASH position.	1. Move to ICE position.
		2. Bad contacts.	2. Check and replace.
	b) High Pressure Control	1. Dirty air filter or condenser.	1. Clean.
		2. Ambient or condenser water temperature too warm.	2. Reduce temperature.
		3. Refrigerant overcharged.	3. Recharge.
		4. Refrigerant line or components plugged.	4. Clean and replace drier.
		5. Fan not operating.	5. See chart A.[6]

Problem	Possible Cause		Remedy
[3] Continued from previous page.	c) Overload Protector	1. Bad contacts.	1. Check for continuity and replace.
		2. Voltage too low.	2. Increase voltage.
		3. Refrigerant overcharged or undercharged.	3. Recharge.
		4. Line valve continues to close in freeze cycle and overload protector operates.	4. Check line valve's operation in freeze cycle and replace.
	d) Starter	1. Bad contacts.	1. Check and replace.
		2. Coil winding opened.	2. Replace.
	e) Start Capacitor or Run Capacitor	1. Defective.	1. Replace.
	f) Magnetic Contactor	1. Bad contacts.	1. Check for continuity and replace.
		2. Coil winding opened.	2. Replace.
	g) Compressor	1. Wiring to compressor.	1. Check for loose connection or open, and replace.
		2. Defective.	2. Replace.
		3. Protector tripped.	3. Reduce temperature.
	h) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[4] Water continues to be supplied in freeze cycle.	a) Water Solenoid Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker off.
	b) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[5] No water comes from spray tubes. Water pump will not start, or freeze cycle time is too short.	a) Water Supply Line	1. Water pressure too low and water level in water tank too low.	1. Check and get recommended pressure.
	b) Water Solenoid Valve	1. Dirty mesh filter or orifice and water level in water tank too low.	1. Clean.
	c) Water System	1. Water leaks.	1. Check connections for water leaks, and replace.
		2. Clogged.	2. Clean.
		3. Pump out check valve leaking by.	3. Check assembly and clean.

Problem	Possible Cause		Remedy
[5] Continued from previous page.	d) Pump Motor	1. Motor winding opened.	1. Replace.
		2. Bearing worn out.	2. Replace.
		3. Wiring to pump motor.	3. Check for loose connection or open, and replace.
		4. Defective capacitor.	4. Replace.
		5. Defective or bound impeller.	5. Replace and clean.
		6. Mechanical seal worn out.	6. Check and replace.
	e) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[6] Fan motor will not start, or is not operating.	a) Fan Motor	1. Motor winding opened.	1. Replace.
		2. Bearing worn out.	2. Replace.
		3. Wiring to fan motor.	3. Check for loose connection or open, and replace.
		4. Defective capacitor.	4. Replace.
		5. Fan blade bound.	5. Check and replace.
	b) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[7] All components run, but no ice is produced.	a) Refrigerant	1. Undercharged.	1. Check for leaks and recharge.
		2. Air or moisture trapped.	2. Replace drier and recharge.
	b) Compressor	1. Defective valve.	1. Replace.
	c) Hot Gas Solenoid Valve	1. Continues to open in freeze cycle.	1. Check and replace.

B. Evaporator is Frozen Up

Problem	Possible Cause		Remedy
[1] Freeze cycle time is too long.	a) Float Switch	1. Leads short-circuit or defective switch.	1. Check and replace.
		2. Float does not move freely.	2. Clean or replace.
	b) Water Solenoid Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker off.
	c) Controller Board	1. Defective.	1. See "II.C.5. Checking the Controller Board."
[2] All ice formed on evaporator does not fall into bin in harvest cycle.	a) Evaporator	1. Scaled up.	1. Clean.
	b) Water Supply Line	1. Water pressure too low.	1. Check and get recommended pressure.
	c) Water Filter System (if installed)	1. Dirty/Restricted	1. Replace filter.
	d) Water Solenoid Valve	1. Dirty mesh filter or orifice.	1. Clean.
		2. Diaphragm does not close.	2. Check for water leaks with icemaker off.
	e) Ambient and/or water temperature.	1. Too cool.	1. Increase temperature.
	f) Thermistor	1. Out of position or loose attachment.	1. See "V.H. Removal and Replacement of Thermistor."
	g) Controller Board	1. Defrost timer is set too short.	1. Adjust longer, referring to "II.C.4. Controls and Adjustments, b) Defrost Timer."
		2. Defective.	2. See "II.C.5. Checking the Controller Board."
[3] Other	a) Spray Tubes	1. Clogged.	1. Clean.
		2. Out of position.	2. Place in position.
	b) Water System	1. Dirty.	1. Clean.
	c) Refrigerant	1. Undercharged.	1. Check for leaks and recharge.
	d) Expansion Valve	1. Bulb out of position or loose attachment.	1. Place in position.
		2. Defective.	2. Replace.
	e) Hot Gas Solenoid Valve	1. Coil winding opened.	1. Replace.
		2. Plunger does not move.	2. Replace.
		3. Wiring to hot gas valve.	3. Check for loose connection or open, and replace.
	f) Water Supply Line	1. Too small; requires 3/8" OD line dedicated per machine.	1. Increase water line size.
	g) Water Filter (if installed)	1. Flow rate too small.	1. Replace with filter that has larger flow rate.

C. Low Ice Production

Problem	Possible Cause	Remedy
[1] Freeze cycle time is long.	a) See chart A.[3] and check high pressure controller.	
	b) See chart B.[1] and check float switch, water solenoid valve and controller board.	
[2] Harvest cycle time is long.	a) See chart B.[2] and check evaporator, water supply line, water filter system, water solenoid valve, ambient and/or water temperature, thermistor, and controller board.	

D. Abnormal Ice

Problem	Possible Cause		Remedy
[1] Small cubes.	a) Ice Cube Guide	1. Out of position. Circulated water falls into bin.	1. Place in position.
	b) See chart A.[5] and check water supply line, water solenoid valve, water system, pump motor, and controller board.		
	c) Pump Out Check Valve	1. Dirty.	1. Clean.
[2] Cloudy or irregular cubes.	a) See chart B.[1] and B.[3], and check float switch, water solenoid valve, controller board, spray tubes, water system, refrigerant charge, and expansion valve.		
	b) Spray Guide	1. Dirty.	1. Clean.
	c) Water Quality	1. High hardness or contains impurities.	1. Install a water softener or filter.

E. Other

Problem	Possible Cause		Remedy
[1] Icemaker will not stop when bin is filled with ice.	a) Bin Control Thermostat (For mechanical bin control, see II.D.3.)	1. Set too cold.	1. Adjust warmer.
		2. Defective.	2. Replace.
[2] Abnormal noise.	a) Pump Motor	1. Bearings worn out.	1. Replace.
	b) Fan Motor	1. Bearings worn out.	1. Replace.
		2. Fan blade deformed.	2. Replace fan blade.
		3. Fan blade does not move freely.	3. Replace.
	c) Compressor	1. Bearings worn out or cylinder valve broken.	1. Replace.
		2. Mounting pad out of position.	2. Reinstall.
	d) Refrigerant Lines	1. Rub or touch other lines or surfaces.	1. Replace.
[3] Ice in storage bin often melts.	a) Bin Drain	1. Plugged.	1. Clean.
	b) Icemaker and Bin Drains	1. Drains not run separately.	1. Separate the drain lines.

V. Removal and Replacement of Components

IMPORTANT

Ensure all components, fasteners and thumbscrews are securely in place after the equipment is serviced.

IMPORTANT

1. The Polyol Ester (POE) oils used in R-404A units can absorb moisture quickly. Therefore it is important to prevent moisture from entering the system when replacing or servicing parts.
2. Always install a new filter drier every time the sealed refrigeration system is opened.
3. Do not leave the system open for longer than 15 minutes when replacing or servicing parts.

A. Service for Refrigerant Lines

1. Refrigerant Recovery

The icemaker unit is provided with two refrigerant access valves – one on the low-side and one on the high-side line. Using proper refrigerant practices recover the refrigerant from the access valves and store it in an approved container. Do not discharge the refrigerant into the atmosphere.

2. Evacuation and Recharge [R-404A]

1) Attach charging hoses, a service manifold and a vacuum pump to the system. If possible, use quick-release connectors on the access valves (especially the high side).

IMPORTANT

The vacuum level and vacuum pump may be the same as those for current refrigerants. However, the rubber hose and gauge manifold to be used for evacuation and refrigerant charge should be exclusively for POE oils.

2) Turn on the vacuum pump. Never allow the oil in the vacuum pump to flow backward.

3) Allow the vacuum pump to pull down to a 29.9" Hg (760 mm Hg) vacuum. Evacuating period depends on pump capacity.

4) Close the low-side valve and high-side valve on the service manifold.

5) Disconnect the vacuum pump, and attach a refrigerant service cylinder to the high-side line. Remember to loosen the connection, and purge the air from the hose. See the nameplate for the required refrigerant charge. Hoshizaki recommends only virgin refrigerant or reclaimed refrigerant which meets ARI Standard No. 700-88 be used.

6) A liquid charge is recommended for charging an R-404A system. Invert the service cylinder. Open the high-side, service manifold valve.

7) Allow the system to charge with liquid until the pressures balance.

8) If necessary, add any remaining charge to the system through the low-side. Use a throttling valve or liquid dispensing device to add the remaining liquid charge through the low-side access port with the unit running.

9) Close the two refrigerant access valves and disconnect the hoses and service manifold.

10) Cap the access valves to prevent a possible leak.

B. Brazing

DANGER

1. Refrigerant R-404A itself is not flammable at atmospheric pressure and temperatures up to 80°C.
2. Refrigerant R-404A itself is not explosive or poisonous. However, when exposed to high temperatures (open flames) R-404A can be decomposed to form hydrofluoric acid and carbonyl fluoride both of which are hazardous.
3. Always recover the refrigerant and store it in an approved container. Do not discharge the refrigerant into the atmosphere.
4. Do not use silver alloy or copper alloy containing arsenic.
5. Do not use R-404A as a mixture with pressurized air for leak testing. Refrigerant leaks can be detected by charging the unit with a little refrigerant, raising the pressure with nitrogen and using an electronic leak detector.

Note: All brazing-connections inside the evaporator case are clear-paint coated. Sandpaper the brazing connections before unbrazing the components. Use a good abrasive cloth to remove coating.

C. Removal and Replacement of Compressor

IMPORTANT

Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made.

Note: When replacing a compressor with a defective winding, be sure to install the new start capacitor and start relay supplied with the replacement compressor. Due to the ability of the POE oil in the compressor to absorb moisture quickly, the compressor must not be opened more than 15 minutes for replacement or service. Do not mix lubricants of different compressors even if both are charged with R-404A, except when they use the same lubricant.

1) Turn off the power supply, and unplug the icemaker.

2) Remove the panels.

3) Recover the refrigerant and store it in an approved container. (See “V.A.1. Refrigerant Recovery”.)

4) Remove the terminal cover on the compressor, and disconnect the compressor wiring.

5) Remove the discharge and suction pipes using brazing equipment.

6) Remove the hold-down bolts, washers and rubber grommets.

7) Slide and remove the compressor. Unpack the new compressor package. Install the new compressor.

8) Attach the rubber grommets of the prior compressor.

9) Sandpaper the suction, discharge and process pipes.

10) Place the compressor in position, and secure it using the bolts and washers.

11) Remove plugs from the suction, discharge and process pipes.

12) Braze the process, suction and discharge lines (Do not change this order), while purging with nitrogen gas flowing at a pressure of 3 to 4 psig (.21 to .28 bar).

13) Install the new filter drier. (See “V.D. Removal and Replacement of Drier”.)

14) Check for leaks using nitrogen gas at 140 psig (9.65 bar) and soap bubbles.

15) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge. (See “V.A.2. Evacuation and Recharge [R-404A]”.)

16) Connect the terminals, and replace the terminal cover in its correct position.

17) Replace the panels in their correct positions.

18) Plug in the icemaker. Turn on the power supply.

D. Removal and Replacement of Drier

IMPORTANT

Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Recover the refrigerant and store it in an approved container. (See “V.A.1. Refrigerant Recovery”.)

4) Remove the drier.

5) Install the new drier with the arrow on the drier in the direction of the refrigerant flow. Use nitrogen gas at a pressure of 3 to 4 psig (.21 to .28 bar) when brazing the tubings.

6) Check for leaks using nitrogen gas at 140 psig (9.65 bar) and soap bubbles.

7) Evacuate the system and charge it with refrigerant. See the nameplate for the required refrigerant charge. (See “V.A.2. Evacuation and Recharge [R-404A]”.)

8) Replace the panels in their correct positions.

9) Plug in the icemaker. Turn on the power supply.

E. Removal and Replacement of Expansion Valve

IMPORTANT

Sometimes moisture in the refrigerant circuit exceeds the drier capacity and freezes up at the expansion valve. Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Recover the refrigerant and store it in an approved container. (See “V.A.1. Refrigerant Recovery”.)

4) Remove the insulation and the expansion valve bulb on the suction line.

5) Remove the expansion valve cover, and disconnect the expansion valve using brazing equipment. Protect adjacent components from excessive heat using damp cloths or similar.

6) Braze the new expansion valve, with nitrogen gas flowing at a pressure of 3 to 4 psig (.21 to .28 bar).

WARNING

1. Do not heat the wall. Place a steel barrier for protection.
2. Always protect the valve body by using a damp cloth to prevent the valve from overheating. Do not braze with the valve body exceeding 121°C.

7) Install the new drier.

8) Check for leaks using nitrogen gas at 140 psig (9.65 bar) and soap bubbles.

9) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge. (See “V.A.2. Evacuation and Recharge [R-404A]”.)

10) Attach the bulb to the suction line in position. Be sure to secure it with clamps and to insulate it.

11) Place the new set of expansion valve covers in position.

12) Replace the panels in their correct position.

13) Plug in the icemaker. Turn on the power supply.

F. Removal and Replacement of Hot Gas Valve

CAUTION

Always use a copper tube of the same diameter and length when replacing the hot gas lines; otherwise performance may be reduced.

IMPORTANT

Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Recover the refrigerant and store it in an approved container. (See “V.A.1. Refrigerant Recovery”.)

4) Remove the screw and the solenoid.

5) Disconnect the hot gas valve or line valve using brazing equipment.

6) Install the new valve, with nitrogen gas flowing at a pressure of 3 to 4 psig (.21 to .28 bar).

WARNING

Always protect the valve body by using a damp cloth to prevent the valve from overheating. Do not braze with the valve body exceeding 121°C.

7) Install the new drier.

8) Check for leaks using nitrogen gas at 140 psig (9.65 bar) and soap bubbles.

9) Evacuate the system and charge it with refrigerant. See the nameplate for the required refrigerant charge. (See “V.A.2. Evacuation and Recharge [R-404A]”.)

10) Cut the leads of the solenoid allowing enough lead length to reconnect using closed end connectors.

11) Connect the new solenoid leads.

12) Attach the solenoid to the valve body, and secure it with a screw.

13) Replace the panels in their correct positions.

14) Plug in the icemaker. Turn on the power supply.

G. Removal and Replacement of Evaporator

IMPORTANT

Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels and the top and front insulation from the evaporator.

3) Recover the refrigerant and store it in an approved container. (See “V.A.1. Refrigerant Recovery”.)

4) Remove the spray tubes and the insulations at the “U” shaped notch where the refrigeration tubings go through the chassis.

5) Remove the insulation tube and disconnect the evaporator inlet tubing at the tee next to the expansion valve using brazing equipment. (Protect the valve from excessive heat.)

6) Lift up the evaporator, and disconnect the evaporator outlet tubing.

7) Install the new evaporator, with nitrogen gas flowing at a pressure of 3 to 4 psig (.21 to .28 bar).

8) Install the new drier.

9) Check for leaks using nitrogen gas at 140 psig (9.65 bar) and soap bubbles.

10) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge. (See “V.A.2. Evacuation and Recharge [R-404A]”.)

11) Replace the removed parts in the reverse order of which they were removed.

12) Replace the top and front insulation and the panels in their correct positions.

13) Plug in the icemaker. Turn on the power supply.

H. Removal and Replacement of Thermistor

CAUTION

1. Fragile, handle very carefully.
2. Always use a recommended sealant (high thermal conductive type), Model KE4560RTV manufactured by Shinetsu Silicone, Part Code 60Y000-11, or Part Code 4A0683-01, or equivalent.
3. Always use a recommended foam insulation (non-absorbent type) or equivalent.
4. Do not shorten or cut the thermistor leads when installing it.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Remove the control box cover.

4) Disconnect the thermistor leads from the K3 connector on the controller board.

5) Remove the plastic cable ties, foam insulation, thermistor holder and thermistor. See Fig. 1.

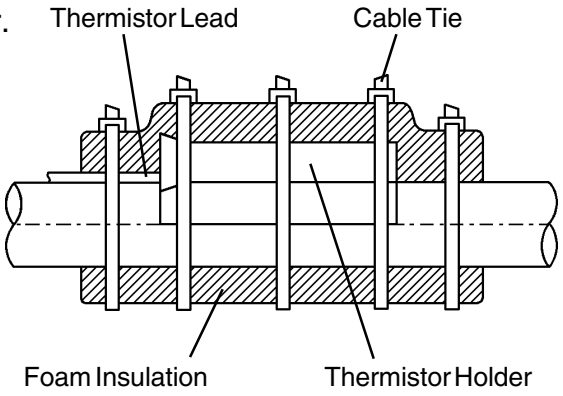


Fig. 1

6) Scrape away the old sealant on the thermistor holder and the suction pipe.

7) Wipe off moisture or condensation on the suction pipe.

8) Smoothly apply recommended sealant (KE4560RTV, Part Code 60Y000-11 or 4A0683-01) to the thermistor holder concave.

9) Attach the new thermistor to the suction pipe very carefully to prevent damage to the leads. Secure it using the thermistor holder and recommended foam insulation.

10) Secure the insulation using the plastic cable ties.

11) Connect the thermistor leads through the bushing of the control box to the K3 connector on the controller board.

Note: Do not cut the leads of the thermistor while installing it.

12) Replace the control box cover and the panels in their correct positions.

13) Plug in the icemaker. Turn on the power supply.

I. Removal and Replacement of Fan Motor

Note: When replacing a fan motor with defective winding, it is recommended that a new capacitor be installed.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Remove the closed end connectors from the fan motor leads.

4) Remove the fan motor bracket and fan motor.

5) Install the new fan motor, and replace the removed parts in the reverse order of which they were removed.

6) Replace the panels in their correct positions.

7) Plug in the icemaker. Turn on the power supply.

J. Removal and Replacement of Water Valve

1) Turn off the power supply. Unplug the icemaker.

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

3) Remove the top panel and front panel.

4) Remove the valve outlet tubing by releasing the clamp.

5) Remove the bracket from the unit.

6) Remove the fitting nut and water valve. (Do not lose the packing/gasket.)

7) Disconnect the terminals from the water valve.

8) Install the new water valve, and replace the removed parts in the reverse order of which they were removed.

9) Open the water supply line shut-off valve.

10) Plug in the icemaker. Turn on the power supply.

11) Check for leaks.

12) Replace the top and front panels in their correct positions.

K. Removal and Replacement of Pump Motor

Note: When replacing a pump motor with defective winding, it is recommended that a new capacitor be installed.

1) Turn off the power supply. Unplug the icemaker.

2) Remove the front panel.

3) Remove the base cover.

4) Drain the water tank by removing one end of the pump tubing. (See Fig. 2.) Refit the hose back into position.

5) Disconnect the pump suction and discharge hoses.

6) Remove the closed end connectors from the pump motor leads.

7) Remove the two screws to remove the pump complete with the bracket. Remove the bracket from the pump.

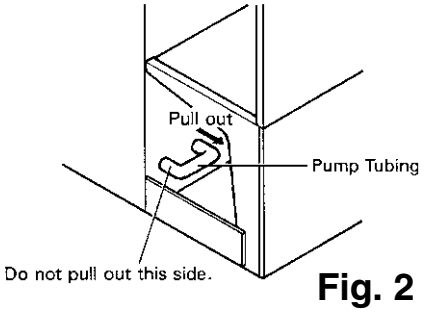


Fig. 2

8) Remove the pump housing and check the impeller.

9) If the impeller is defective, install a new impeller.

10) Install the new motor or new parts, and replace the removed parts in the reverse order of which they were removed.

11) Plug in the icemaker. Turn on the power supply and check for leaks.

12) Replace the base cover in its correct position.

13) Replace the front panel in its correct position.

L. Removal and Replacement of Float Switch

1) Turn off the power supply. Unplug the icemaker.

2) Remove the front panel.

3) Remove the base cover.

4) Drain the water tank by removing one end of the pump tubing. (See Fig. 3.) Refit the hose back into position.

5) Remove the black rubber connector from the base of the float switch.

6) Remove the screws securing the float switch bracket and the stainless steel adjusting guide.

7) Take off the hose sleeving the float switch leads.

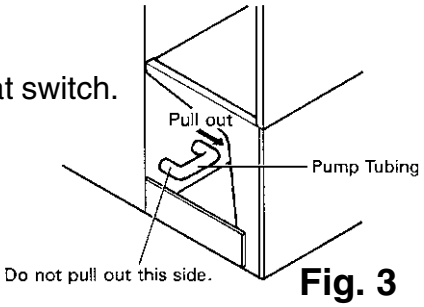


Fig. 3

8) Sleeve the leads of the new float switch with the hose.

9) Install the new float switch, and replace the removed parts in the reverse order of which they were removed.

10) Plug in the icemaker. Turn on the power supply and check for leaks.

11) Replace the base cover in its correct position.

12) Replace the front panel in its correct position.

M. Removal and Replacement of Spray Tubes

1) Turn off the power supply. Unplug the icemaker.

2) Remove the front panel and the insulation panel.

3) Remove the rubber hoses from the spray tubes (water supply pipe).

4) Release the clamps and disconnect the rubber hoses.

5) Remove the spray tubes by squeezing the side tabs.

6) Install the new spray tubes, and replace the removed parts in the reverse order of which they were removed.

7) Replace the panels in their correct positions.

8) Plug in the icemaker. Turn on the power supply.

N. Removal and Replacement of Transformer

1) Turn off the power supply. Unplug the icemaker.

2) Remove the panels.

3) Remove the closed end connectors from the transformer leads.

4) Remove the transformer cover.

5) Remove the transformer.

6) Install the new transformer.

7) Replace the transformer cover.

8) Install new closed end connectors.

9) Refit the panels.

10) Plug in the icemaker. Turn on the power supply.

VI. Cleaning and Maintenance Instructions

IMPORTANT

Ensure all components, fasteners and thumbscrews are securely in place after any maintenance or cleaning is done to the equipment.

A. Preparing the Icemaker for Long Storage

WARNING

When shutting off the icemaker for an extended time, drain out all water from the water tank and remove the ice from the storage bin. The storage bin should be cleaned and dried. Drain the icemaker to prevent damage to the water supply line at sub-freezing temperatures, using air or carbon dioxide. Shut off the icemaker until the proper ambient temperature is resumed.

Note: When the icemaker is not used for two or three days, it is sufficient to only move the control switch to the “OFF” position, unless the icemaker will be at sub-freezing temperatures.

1) Remove the front panel.

2) Move the control switch on the control box to the “OFF” position.

3) Wait 3 minutes.

4) Move the control switch to the “ICE” position.

5) When all the ice from the previous ice making cycle has defrosted from the evaporator, (approximately 2 minutes) close the potable water supply line shut-off valve and open the line drain valve.

6) Use compressed air or carbon dioxide to blow any remaining water from the pipes.

7) Move the control switch to the “OFF” position.

8) Turn off the power supply.

9) Close the potable water drain valve.

10) Drain the water tank by removing the base cover and one end of the pump tubing. See Fig. 4.

11) Replace the removed parts in their correct positions.

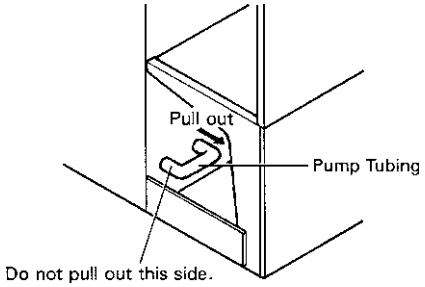


Fig. 4

12) Remove all ice from the storage bin, and clean the storage bin.

13) Refit the front panel in its correct position.

B. Cleaning and Sanitizing Procedures

WARNING

1. HOSHIZAKI recommends cleaning this unit at least once a year. More frequent cleaning, however, may be required in some existing water conditions.
2. To prevent injury to individuals and damage to the icemaker, do not use ammonia type cleaners.
3. Always wear suitable protection, e.g. liquid-proof gloves, eye protectors, etc. for safe handling of the cleaner and sanitizer.
4. Use the cleaners and sanitizers recommended by Hoshizaki. Contact your local Hoshizaki office for further details. (The instructions below give an example of those recommended cleaners and sanitizers.)
5. Never mix cleaning and sanitizing solutions in an attempt to shorten cleaning time.
6. Wipe off any splashed or spilt cleaner/sanitizer immediately.

1. Cleaning Procedure

1) Mix 3 gallons (11.4 l) of water with Hoshizaki "Scale-Away" (or "LIME-A-WAY," Economics Laboratory, Inc.) or Hoshizaki Cleaner (Rector Seal Corp.) using a mixing rate as recommended on the package.

2) Remove all ice from the evaporator and the storage bin.

Note: To remove cubes on the evaporator, turn off the power supply and turn it on after 3 minutes. The defrost cycle starts and the cubes will be removed from the evaporator.

3) Turn off the power supply.

4) Remove the front panel and then remove the insulation panel by lifting the panel slightly and pulling it toward you.

5) Remove the base cover.

6) Drain the water tank by removing one end of the pump tubing. See Fig. 5.

7) Refit the pump tubing in its correct position.

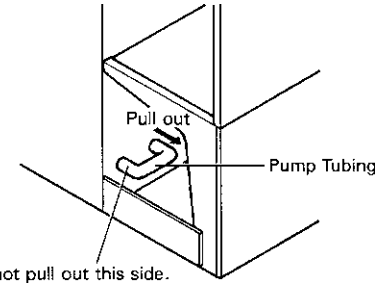


Fig. 5

8) Pour the cleaning solution into the water tank.

9) Move the control switch on the control box to the “WASH” position.

10) Refit the insulation panel and the front panel in their correct positions.

11) Turn on the power supply, and start the washing process.

12) Turn off the power supply after 30 minutes.

13) Remove the front panel and the insulation panel.

14) Drain the water tank. (See step 6 above).

15) Refit the pump tubing in its correct position.

16) Move the control switch to the “ICE” position.

17) Refit the front panel in its correct position.

18) Turn on the power supply to fill the water tank with water.

19) Turn off the power supply after 3 minutes.

20) Remove the front panel.

21) Move the control switch to the “WASH” position.

22) Refit the front panel in its correct position.

23) Turn on the power supply to rinse off the cleaning solution.

24) Turn off the power supply after 5 minutes.

25) Remove the front panel.

26) Drain the water tank by removing one end of the pump tubing. See Fig. 5.

27) Refit the pump tubing in its correct position.

28) Repeat the above steps 16) through 27) three more times to rinse thoroughly.

Note: Sanitizing should always be completed after cleaning or alternatively as an individual procedure if conditions exist to make it necessary.

If you do not sanitize the icemaker, go to step 11) in “2. Sanitizing Procedure.”

2. Sanitizing Procedure - Following Cleaning Procedure

1) Mix 3 gallons (11.4 l) of water and 1.5 fl. oz. (44.4 ml) of a 5.25% sodium hypochlorite solution (chlorine bleach).

2) Complete steps 2) through 7) as detailed in “1. Cleaning Procedure.”

3) Pour the sanitizing solution into the water tank.

4) Replace the insulation panel and the front panel in their correct positions.

Note: Make sure that the control switch is in the “WASH” position.

5) Turn on the power supply, and start the sanitizing process.

6) Turn off the power supply after 15 minutes.

7) Remove the front panel.

8) Drain the water tank. See step 6) in “1. Cleaning Procedure.”

9) Refit the pump tubing in its correct position.

10) Repeat the above steps 16) through 27) in “1. Cleaning Procedure” two times to rinse thoroughly.

11) Move the control switch to the “ICE” position.

12) Replace the front panel and the base cover in their correct positions.

13) Clean the storage bin with water.

14) Turn on the power supply, and start the automatic icemaking process.

C. Maintenance

IMPORTANT

This icemaker must be maintained individually, referring to the instruction manual and labels provided with the icemaker.

1. Stainless Steel Exterior

   To prevent corrosion, wipe the exterior occasionally with a clean and soft cloth. Use a damp cloth containing a neutral cleaner to wipe off oil or dirt build up.

2. Storage Bin and Scoop

   - Wash your hands before removing ice. Use the plastic scoop provided.
   - The storage bin is for ice use only. Do not store anything else in the bin.
   - Keep the scoop clean. Clean it by using a neutral cleaner and rinse thoroughly.
   - Clean the bin liner by using a neutral cleaner. Rinse thoroughly after cleaning.

3. Air Filter

   A plastic mesh air filter removes dirt or dust from the air, and keeps the condenser from getting clogged. As the filter becomes clogged, the icemaker's performance will be reduced. Check the filter at least twice a month. When it is clogged, use warm water and a neutral cleaner to wash the filter.

4. Condenser

   Check the condenser once a year, and clean if required by using a brush or vacuum cleaner. More frequent cleaning may be required depending on the location of the icemaker.