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**HOSHIZAKI  
MODULAR CRESCENT CUBER**

**MODEL      KMD-410MAH  
                 KMD-410MWH**

**SERVICE MANUAL**

## IMPORTANT

Only qualified service technicians should install, service, and maintain the unit. No service or maintenance should be undertaken until the technician has thoroughly read this Service Manual. Failure to service and maintain the equipment in accordance with this manual may adversely affect safety, performance, component life, and warranty coverage.

Hoshizaki provides this manual primarily to assist qualified service technicians in the maintenance and service of the unit.

Should the reader have any questions or concerns which have not been satisfactorily addressed, please call, write, or send an e-mail message to the Hoshizaki Technical Support Department for assistance.

HOSHIZAKI AMERICA, INC.  
618 Highway 74 South  
Peachtree City, GA 30269

Attn: Hoshizaki Technical Support Department

Phone: 1-800-233-1940 Technical Support  
(770) 487-2331

Fax: 1-800-843-1056  
(770) 487-3360

E-mail: [techsupport@hoshizaki.com](mailto:techsupport@hoshizaki.com)

Web Site: [www.hoshizaki.com](http://www.hoshizaki.com)

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

- Model Number \_\_\_\_\_
- Serial Number \_\_\_\_\_
- Complete and detailed explanation of the problem.

## IMPORTANT

This manual should be read carefully before the icemaker is serviced or maintenance operations are performed. Only qualified service technicians should install, service, and maintain the icemaker. Read the warnings contained in this booklet carefully as they give important information regarding safety. Please retain this booklet for any further reference that may be necessary.

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# I. SPECIFICATIONS

## 1. SPECIFICATIONS

### [a] KMD-410MAH (air-cooled)

AC SUPPLY VOLTAGE	115/60/1			
AMPERAGE	8.0 A (5 Min. Freeze AT 104°F / WT 80°F)			
MINIMUM CIRCUIT AMPACITY	20 A			
MAXIMUM FUSE SIZE	20 A			
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient	WATER TEMP. (°F)		
	Temp.(°F)	50	70	90
	70	*415 (188)	388 (176)	354 (160)
	80	395 (179)	353 (160)	320 (145)
	90	388 (176)	*324 (147)	289 (131)
	100	382 (173)	316 (143)	257 (117)
SHAPE OF ICE	Crescent Cube			
ICE PRODUCTION PER CYCLE	8.5 lbs. (3.9 kg) 416 pcs.			
APPROXIMATE STORAGE CAPACITY	N/A			
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F		
ELECTRIC    W (kWH/100 lbs.)	780(5.8)	710(4.1)		
WATER    gal./24HR (gal./100 lbs.)	73(22.6)	148(35.7)		
EXTERIOR DIMENSIONS (WxDxH)	22-1/4" x 24-1/8" x 24" (565 x 613 x 610 mm)			
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)			
WEIGHT	Net 126 lbs. (57 kg), Shipping 161 lbs. (73 kg)			
CONNECTIONS - ELECTRIC	Permanent - Connection			
- WATER SUPPLY	Inlet	1/2" FPT		
- DRAIN	Outlet	3/4" FPT		
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	Mechanical Level Switch with Delay			
COMPRESSOR	Hermetic, Model NT6217GKV			
CONDENSER	Air-Cooled, Fin and tube type			
EVAPORATOR	Vertical type, Stainless Steel and Copper			
REFRIGERANT CONTROL	Thermostatic Expansion Valve			
REFRIGERANT CHARGE	R-404A, 1 lb. 2.3 oz. (520g)			
DESIGN PRESSURE	High 467PSIG, Low 206PSIG			
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 Dispenser or Ice Storage Bin			
OPERATING CONDITIONS	VOLTAGE RANGE	104 - 127 V		
	AMBIENT TEMP.	45 -100° F		
	WATER SUPPLY TEMP.	45 - 90° F		
	WATER SUPPLY PRESSURE	10 - 113PSIG		

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

**[b] KMD-410MWH (water-cooled)**

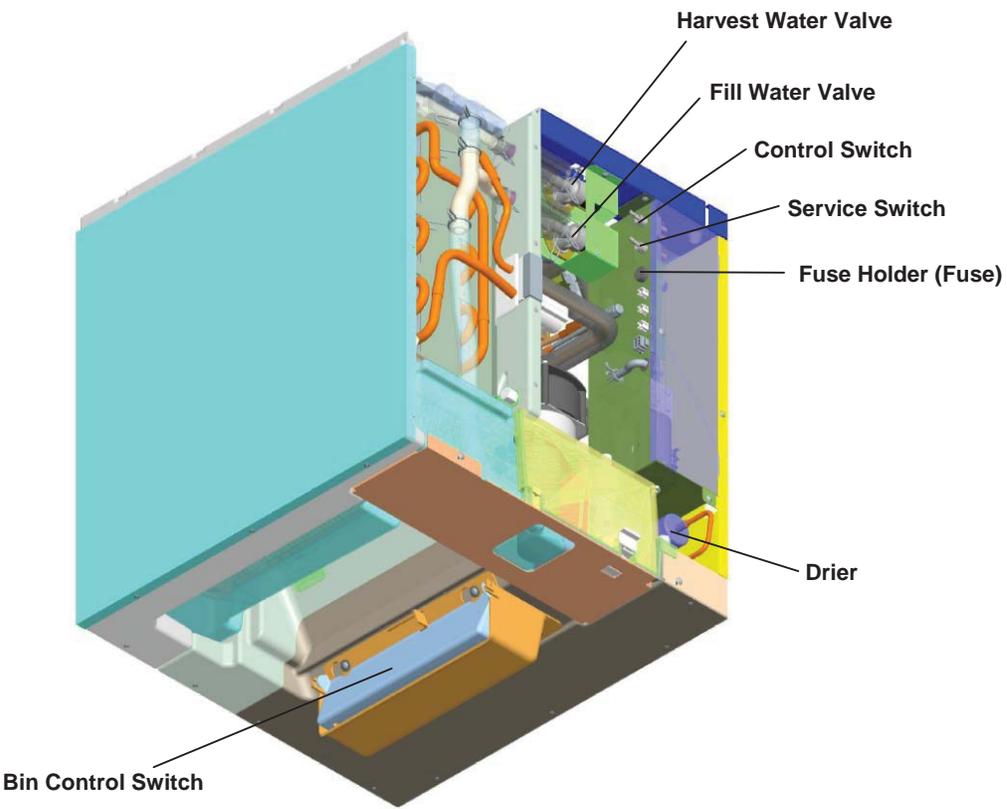
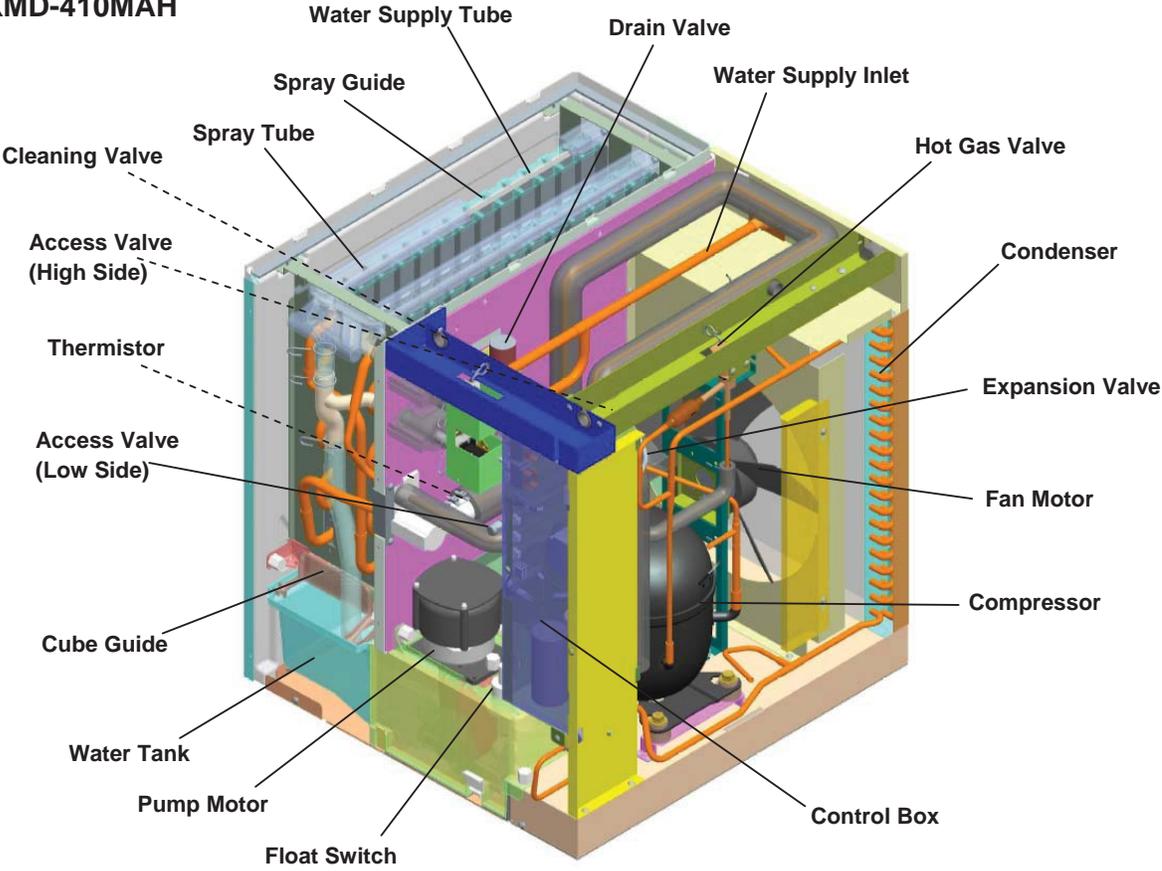
AC SUPPLY VOLTAGE	115/60/1			
AMPERAGE	6.5 A (5 Min. Freeze AT 104°F / WT 80°F)			
MINIMUM CIRCUIT AMPACITY	20 A			
MAXIMUM FUSE SIZE	20 A			
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient Temp.(°F)	WATER TEMP. (°F)		
		50	70	90
	70	*440 (200)	423 (192)	392 (178)
	80	427 (194)	401 (182)	364 (165)
	90	423 (192)	*382 (173)	347 (157)
	100	414 (188)	373 (169)	315 (143)
SHAPE OF ICE	Crescent Cube			
ICE PRODUCTION PER CYCLE	8.2 lbs. (3.7 kg) 416 pcs.			
APPROXIMATE STORAGE CAPACITY	N/A			
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F		
ELECTRIC    W (kWH/100 lbs.)	680(4.3)	670(3.7)		
WATER    gal./24HR (gal./100 lbs.)	89(23.2)	120(27.2)		
WATER COOLED CONDENSER gal./24HR (gal./100 lbs.)	552(145)	267(61)		
EXTERIOR DIMENSIONS (WxDxH)	22-1/4" x 24-1/8" x 24" (565 x 613 x 610 mm)			
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)			
WEIGHT	Net 128 lbs. (58 kg), Shipping 163 lbs. (74 kg)			
CONNECTIONS - ELECTRIC	Permanent - Connection			
- WATER SUPPLY	Inlet	1/2" FPT	Cond. Inlet 1/2" FPT	
- DRAIN	Outlet	3/4" FPT	Cond. Outlet 1/2" FPT	
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	Mechanical Level Switch with Delay			
COMPRESSOR	Hermetic, Model NT6217GKV			
CONDENSER	Water-Cooled, Tube in tube type			
EVAPORATOR	Vertical type, Stainless Steel and Copper			
REFRIGERANT CONTROL	Thermostatic Expansion Valve			
REFRIGERANT CHARGE	R-404A, 14.1 oz. (400g)			
DESIGN PRESSURE	High 427PSIG, Low 206PSIG			
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 Dispenser or Ice Storage Bin			
OPERATING CONDITIONS	VOLTAGE RANGE	104 - 127 V		
	AMBIENT TEMP.	45 -100° F		
	WATER SUPPLY TEMP.	45 - 90° F		
	WATER SUPPLY PRESSURE	10 - 113 PSIG		

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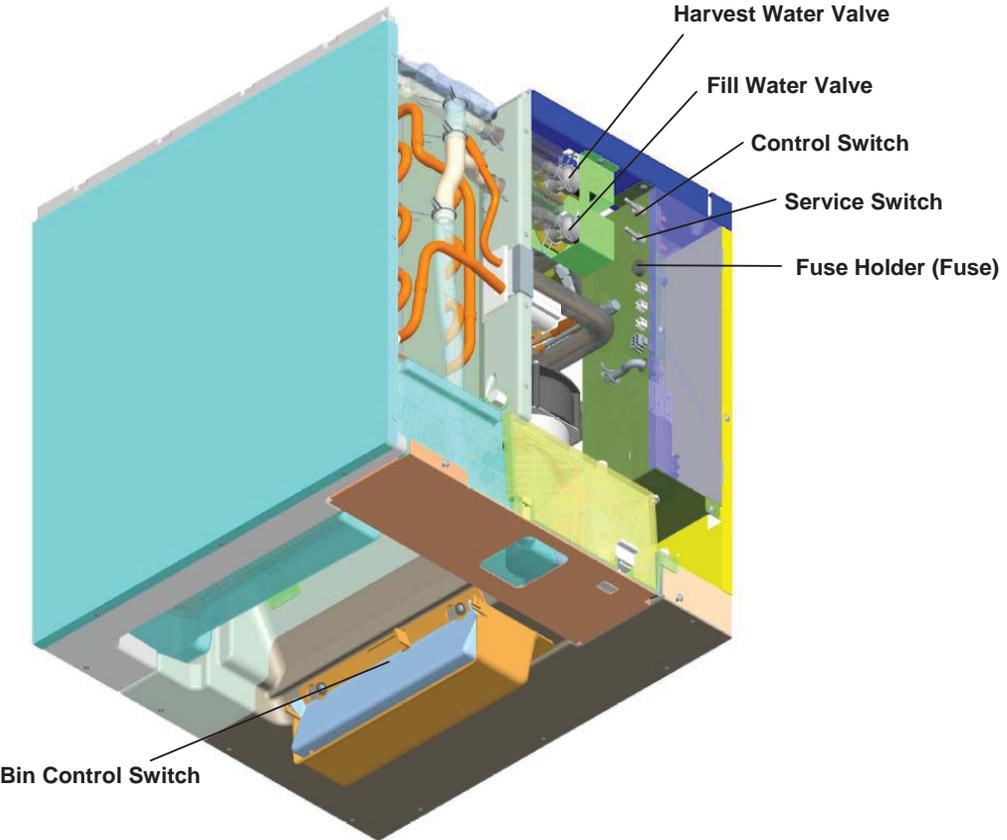
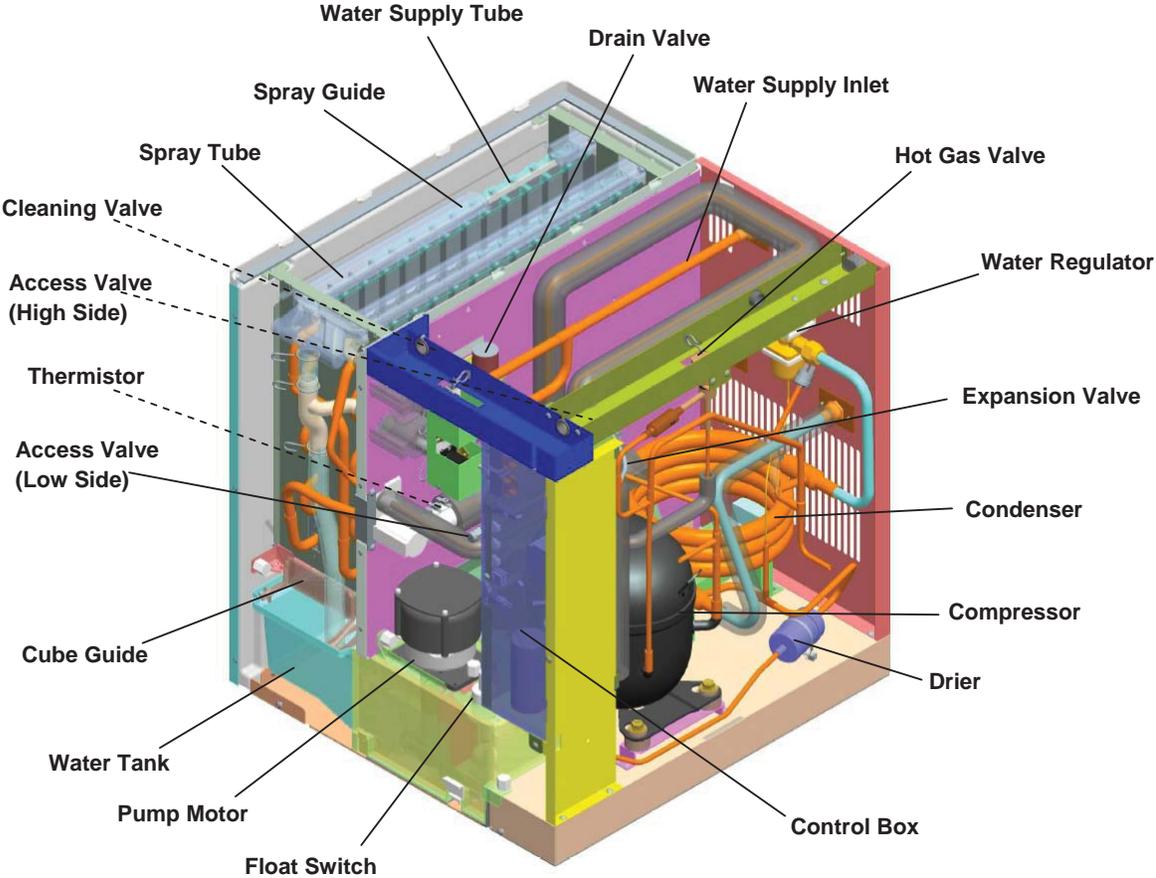
# II. GENERAL INFORMATION

## 1. CONSTRUCTION

[a] KMD-410MAH



[b] KMD-410MWH



## **2. SEQUENCE OF OPERATION**

The steps in the sequence are as outlined below. When power is supplied, a 5 second delay occurs at startup. Note that the order of the LEDs from the outer edge of the board is 5, 6, 8, 9, 4, 7.

### **[a] ONE MINUTE FILL CYCLE**

LED 8 is on. HWV opens and the fill period begins. After 1 minute, the board checks for a closed LF/S. If LF/S is closed, the harvest cycle begins. If not, HWV will remain energized through additional 1 minute cycles until water enters the sump and LF/S closes. This serves as a low water safety to protect the water pump.

### **[b] INITIAL HARVEST CYCLE**

LEDs 5, 6, and 8 are on. HWV remains open, Comp energizes, HGV opens, and harvest begins. As the evaporator warms, the thermistor located on the suction line checks for a 9°C temperature. When 9°C is reached, a 3.9 kΩ signal turns the harvest over to the adjustable harvest timer which is factory set for normal conditions. The timer has settings of 60, 90, 120, and 180 seconds (S1 dip switch 1 & 2). When the harvest timer completes its count down, the harvest cycle is complete and the freeze cycle starts.

The minimum total time allowed by the board for a complete harvest cycle is 2 minutes. HWV is open during harvest for a maximum of 6 minutes or the length of harvest minus 0, 10, 30, or 50 seconds (adjustable by S1 dip switch 7 & 8), whichever is shorter. LED 8 goes off when HWV closes. PM energizes and runs for the last 0, 10, 30, or 50 seconds of harvest depending on S1 dip switch 7 & 8 setting. LED 7 comes on when PM energizes. At the end of harvest, the control board checks the position of LF/S and proceeds to the freeze cycle if it is closed or calls for a 1-minute fill if it is open.

### **[c] FREEZE CYCLE**

LEDs 5 & 7 are on. Comp continues to run, PM and FMS energize, HGV closes and the freeze cycle starts. For the first 5 minutes after the thermistor temperature reaches 2°C, the control board will not accept a signal from LF/S and UF/S. This minimum freeze period acts as a short cycle protection. At the end of this period, LF/S and UF/S assumes control. As ice builds on the evaporator the water level in the sump lowers and LF/S opens, FWV opens (LED 9 is on when FWV is open). The refill will last until UF/S closes or for 60 seconds, whichever is shorter. After UF/S closes, FWV closes 3 seconds later. KMD-410 refills 1 time. After the refill, the freeze continues until LF/S opens again and terminates ice production.

### **[d] DRAIN CYCLE**

LEDs 4, 5, 6, and 7 are on. Comp continues to run, HGV opens, FMS de-energizes. PM stops for 2 seconds, DV energizes, then restarts to take water from the sump and force it through DV and down the drain. When the drain timer stops counting, the drain is complete. The drain timer is 10 or 20 seconds (S1 dip switch 3 & 4). Drain cycle always occurs on the 2nd harvest after startup. Then, depending on the control board setting, drain cycle occurs every cycle, or every 2nd, 5th, or 10th cycles (S1 dip switch 5 & 6).

## [e] NORMAL HARVEST CYCLE

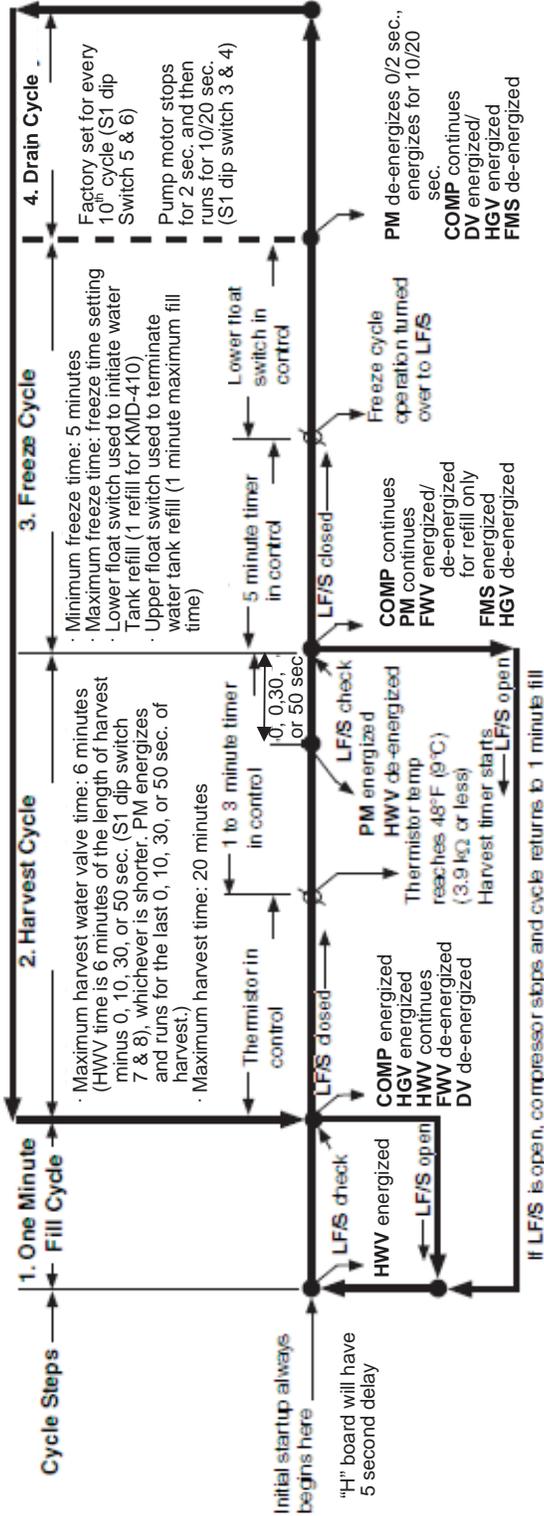
LEDs 5, 6, and 8 are on. Comp continues to run, HGV remains open and HWV opens. As the evaporator warms, the thermistor reaches 9°C. The control board then receives the thermistor's 3.9kΩ signal and starts the harvest timer. HWV is open during harvest for a maximum of 6 minutes or the length harvest minus 0, 10, 30, or 50 seconds (adjustable by S1 dip switch 7 & 8), whichever is shorter. LED 8 goes off when HWV closes. PM energizes and runs for the last 0, 10, 30, or 50 seconds of harvest depending on S1 dip switch 7 & 8 setting. LED 7 comes on when PM energizes. At the end of harvest, the control board checks for the position of LF/S and proceeds to the freeze cycle if it is closed or calls for a 1-minute fill if it is open.

The unit continues to cycle through [c], [d], and [e] sequence until the bin control is activated and shuts the unit down. When the bin control is activated, the "POWER OK" LED flashes.

Note: To prevent incomplete batches of ice from foaming on the evaporator, the control board will only shut down the machine within the first 5 minutes of the freeze cycle after the thermistor temperature reaches 2°C. If ice pushes the bin control actuator in (open) after this minimum freeze period, the control board will allow the machine to complete the freeze cycle and the following harvest cycle before shutting down the machine.

Legend: **Comp**—compressor; **DV**—drain valve; **FMS**—self-contained fan motor; **FWV**—fill water valve; **HGV**—hot gas valve; **HWV**—harvest water valve; **LF/S**—lower float switch contacts; **UF/S**—upper float switch contacts; **PM**—pump motor

## KMD-410MAH, 410MWH Sequence Flow Chart and Component Operation



**Legend:**  
 COMP - compressor  
 DV - drain valve  
 FMS - self-contained fan motor  
 FWV - fill water valve  
 HGV - hot gas valve  
 HWV - harvest water valve  
 LF/S - lower float switch contacts  
 PM - pump motor  
 UF/S - upper float switch contacts

**Components Energized when the Control Switch is in the SERVICE Position**

When in the "SERVICE" position, the control switch supplies power to the service switch and the machine is in service mode. The service switch has three positions: "DRAIN," "CIRCULATE" and "WASH." See the information below for details of each function.

DRAIN	Power is supplied to the pump and drain valve. This drains the water tank.
CIRCULATE	Power is supplied to the pump only. This operation can be used to circulate cleaner for extended periods of time over the outside surface of the evaporator.
WASH	Power is supplied to the pump and wash valve. This operation is used to circulate cleaner and sanitizer over both the inside and outside surfaces of the evaporator.

### 3. CONTROL BOARD

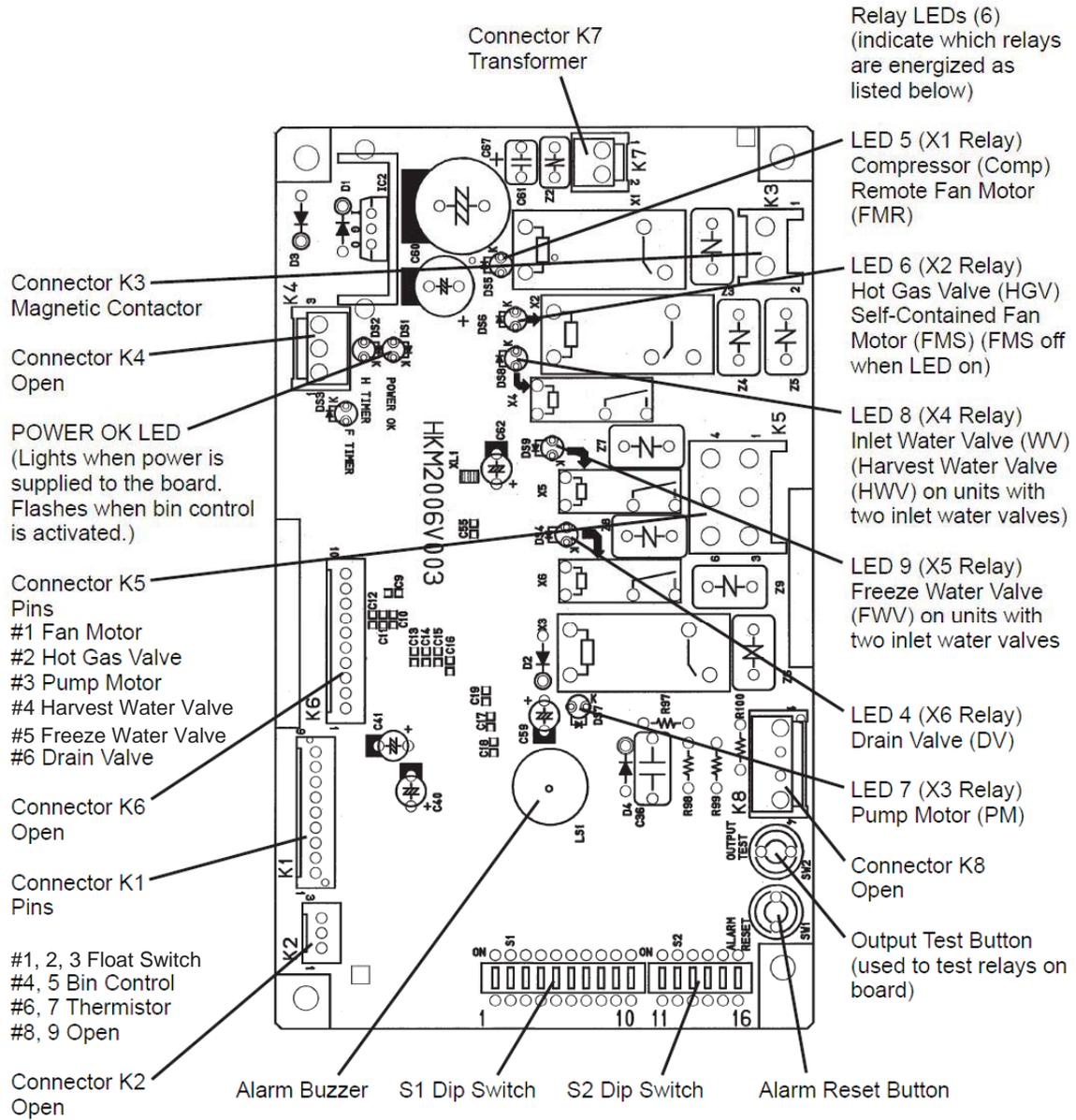
- \* A HOSHIZAKI exclusive solid-state control is employed in KMD-410MAH and KMD-410MWH Crescent Cubers.
- \* All models are pretested and factory-adjusted.

#### CAUTION

1. Fragile, handle very carefully.
2. A control 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.
5. Always replace the whole board assembly if it goes bad.
6. Do not short out power supply to test for voltage.

[a] CONTROL BOARD LAYOUT

"H" Control Board



Control Board		
Auxiliary Code	V1 or Earlier	V2 or Later
Part Number	P00013-02	P01771-02
Type	HKM2006V003	

## **[b] FEATURES**

### **a) Maximum Water Supply Period - 6 minutes**

The harvest water valve will be open during harvest for 6 minutes or the length of harvest minus 0, 10, 30, or 50 seconds (adjustable by S dip switch 7 & 8), whichever is shorter.

### **b) Harvest Backup Timer and Freeze Timer**

The harvest backup timer shuts down the icemaker if, for two cycles in a row, the harvest cycle takes more than 20 minutes to complete. The control board will signal this problem using 2 beeps every 3 seconds.

The freeze timer shuts down the icemaker if, for two cycles in a row, the freeze cycle takes longer than the time specified to complete. The control board will signal this problem using 3 beeps every 3 seconds. The time is factory set using S1 dip switch 9 & 10.

The alarm reset button on the control board must be pressed with power on to reset either of these safeties.

### **c) High Temperature Safety**

The temperature of the suction line in the refrigeration circuit is limited by the high temperature safety. This protects the unit from excessively high temperatures. If the evaporator temperature rises above  $53^{\circ}\text{C} \pm 4^{\circ}\text{C}$ , the thermistor operates the safety.

This shuts down the circuit and the icemaker automatically stops.

The control board will signal this problem using 1 beep every 3 seconds. The alarm reset button on the control board must be pressed with power on to reset the safety.

### **d) Low Water Safety**

The control board checks the position of the lower float switch at the end of the initial one minute water fill cycle and at the end of each harvest cycle.

If the lower float switch is in the up position (electrical circuit closed), the control board changes to the next cycle. If the lower float switch is in the down position (electrical circuit open), the control board changes to additional one minute water fill cycles until water enters the sump and the float switch closes. When the float switch closes, the control board changes to the next cycle. The unit will not start without adequate water in the sump. This serves as a low water safety to protect the water pump.

For water-cooled model, if the condenser water supply is shut off, the unit is protected by the high-pressure switch.

### **e) High Voltage and Low Voltage Cut-outs**

The maximum and minimum allowable supply voltages of this icemaker are limited by the high voltage and low voltage cut-outs.

If miswiring (especially on single 3 phase wire models) causes excessive voltage ( $147\text{ Vac} \pm 5\%$  or more) on the control board, the high voltage cut-out shuts down the circuit in 3 seconds and the icemaker automatically stops. The control board will signal this problem using 7 beeps every 3 seconds.

The icemaker also automatically stops in cases of insufficient voltage ( $92\text{Vac} \pm 5\%$  or less). The control board will signal this problem using 6 beeps every 3 seconds.

When the proper supply voltage is resumed, the icemaker automatically starts running again.

## f) LED Lights and Audible Alarm Safeties

The control board includes LED indicator lights, audible alarm safeties, and an output test feature. The "POWER OK" LED indicates control voltage and will remain on unless a control voltage problem occurs. The "POWER OK" LED flashes continuously when the bin is full and DV energizes for a maximum of 5 minutes to drain the water tank.

At startup, a 5 second delay occurs to stabilize the circuit. LEDs 4 through 8 energize and sequence from initial startup as listed in the table below. Note that the order of the LEDs from the outer edge of the board is 5, 6, 8, 9, 4, 7. For more information, see "2. SEQUENCE OF OPERATION".

Sequence Step	LED	Energized Components	Time LEDs are On		
			Min.	Max.	Avg.
1 Minute Fill Cycle	8	HWV			60 seconds
Harvest Cycle	5, 6, 8	HWV, HGV, Comp	2 minutes	20 minutes	3 to 5 minutes
Last 0, 10, 30, or 50 seconds (adjustable by dip switch) of harvest, WV de-energizes and PM energizes (LEDs 5, 6, and 7 are on)					
Freeze Cycle	5, 7 (and 9 at refill)	Comp, PM, FMS (FWV at refill)	5 minutes	freeze timer setting	25 to 30 minutes
Drain	5, 6, 4, 7	Comp, HGV, DV, PM	10 seconds	20 seconds	factory default setting

The built in safeties shut down the unit and have alarms as listed below.

No. of Beeps (every 3 sec.)	Type of Alarm	Notes
1	High Evaporator Temp. (temperature > 53°C)	Check for harvest problem (stuck HGV or relay), hot water entering unit, stuck HM, or shorted thermistor.
2	Harvest Backup Timer (harvest > 20 min. for two cycles in a row)	Check for open thermistor, HGV not opening, TXV leaking by, low charge, inefficient Comp, or WRV leaking by.
3	Freeze Timer (freeze > specified setting for two cycles in a row) Timer is factory set using S1 dip switch 9 & 10	Check for a float switch stuck closed (up), WV leaking by, HGV leaking by, PM not pumping, TXV not feeding properly, low charge, or inefficient Comp.
To reset the above safeties, press the "ALARM RESET" button with the power supply on.		
6	Low Voltage (92Vac ± 5% or less)	"POWER OK" LED will turn off if voltage protection operates.
7	High Voltage (147Vac ± 5% or less)	The control voltage safeties automatically reset when voltage is corrected.

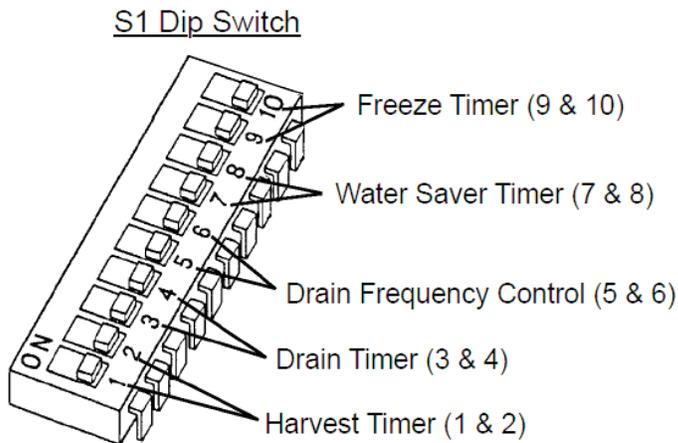
Legend: **Comp**—compressor; **DV**- drain valve; **FMS**-self-contained fan motor; **FWV**—fill water valve; **HGV**—hot gas valve; **HM**—headmaster; **HWV**—harvest water valve; **WRV**-water regulating valve; **PM**—pump motor; **TXV**—thermostatic expansion valve

## [c] CONTROLS AND ADJUSTMENTS

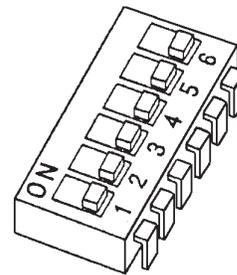
### a) Default Dip Switch Settings

The dip switch is factory-adjusted to the following positions:

S1 Dip Switch No.	1	2	3	4	5	6	7	8	9	10
KMD-410MAH	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF
KMD-410MWH	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF



S2 Dip Switch



\* Functions of S2 dip switch nos. 2 through 6 depend on program version.

Control Board	Program Ver.	S2 Dip Switch No.	1	2	3	4	5	6
P00013-02	2.5 or earlier	KMD-410MAH	ON	OFF	ON	OFF	OFF	ON
		KMD-410MWH	ON	OFF	ON	OFF	OFF	ON
P01771-02	3.1	KMD-410MAH	ON	ON	ON	OFF	OFF	ON
		KMD-410MWH	ON	ON	ON	OFF	OFF	ON
	3.2	KMD-410MAH	ON	ON	ON	OFF	OFF	OFF
		KMD-410MWH	ON	ON	ON	OFF	OFF	OFF

Do not adjust the S2 dip switch. These must be left in the factory default position, or the unit will not operate properly.

### b) Harvest Timer (S1 dip switch 1 & 2)

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

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

### c) Drain Timer (S1 dip switch 3 & 4)

Once every ten freeze cycles, the drain valve opens to drain the water tank for the time determined by the drain timer. These switches also determine the time to delay completion of a defrost cycle, i.e. the minimum defrost time.

Do not change this setting, or the unit will not operate properly or produce high quality ice.

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

T1: Time to drain the water tank

T2: Harvest timer at drain

Drain cycle always occurs on the 2nd harvest after startup. Then, depending on the drain frequency control setting (dip switch 5 & 6), drain cycle occurs every cycle, or every 2nd, 5th, or 10th cycle.

### d) Drain Frequency Control (S1 dip switch 5 & 6)

The water tank drains at the frequency set by the drain frequency control.

The drain frequency control 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 drain more often, the drain frequency 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) Water Saver Timer (S1 dip switch 7 & 8)

The water saver timer allows the water valve to close and the pump motor to circulate water in the tank during the final part of harvest. The water valve is open during harvest for a maximum of 6 minutes or the length of harvest minus 0, 10, 30, or 50 seconds (determined by the water saver timer setting), whichever is shorter. When the water valve closes, the pump motor energizes and runs for the time determined by the water saver timer setting.

The water saver timer is factory-adjusted, and no adjustment is required.

Dip Switch Setting		Time (seconds)
No. 7	No. 8	
OFF	OFF	0
ON	OFF	10
OFF	ON	30
ON	ON	50

**f) Freeze Timer (S1 dip switch 9 & 10)**

**CAUTION**

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

The freeze timer setting determines the maximum allowed freeze time to prevent possible freeze-up issues. Upon termination of freeze timer, machine initiates the harvest cycle. After 2 consecutive timer terminations, machine will shut down, possibly indicating a problem. The freeze timer is factory adjusted, and no adjustment is required.

Dip Switch Setting		Time(50/60Hz) (minutes)
No. 9	No. 10	
OFF	OFF	60/60
ON	OFF	80/50
OFF	ON	100/70
ON	ON	120/100

**g) Pump-Out Pump Motor Delay (S2 dip switch 1)**

The pump-out pump motor delay determines whether or not the pump motor de-energizes for 2 seconds before restarting at the beginning of a drain cycle. The pump-out pump motor delay is factory adjusted and no adjustment is required.

S2 Dip Switch Setting	Delay (seconds)
No. 1	
OFF	0
ON	2

**Control Board P00013-02**

**h) Refill Counter (S2 dip switch 2, 3, & 4) [Program Ver. 2.5 or earlier]**

Do not adjust. These must be left in the factory default position or the unit will not operate properly. The KMD-410MAH and KMD-410MWH refill 1 time.

**i) Factory Use (S2 dip switch 5) [Program Ver. 2.5 or earlier]**

Must remain off.

**j) Anti-Slush Control (S2 dip switch 6) [Program Ver. 2.5 or earlier]**

The anti-slush control (Ver. 1.0) helps prevent slushing during the freeze cycle on small icemakers.

It is deactivated on the KMD-410 series.

When activated, the thermistor located on the suction line checks for a 34°F (1°C) temperature as the evaporator cools. When 34°F (1°C) is reached, a 5.9 kΩ signal causes the control board to de-energize the pump motor for 10 seconds.

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

S2 Dip Switch Setting	Anti-Slush Control	
No. 6		
OFF		Activated (Ver. 1.0)
ON		Deactivated

### **Control Board P01771-02**

#### **k) Harvest Promotion Control (S2 dip switch 2) [Program Ver. 3.1, Ver. 3.2]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

It is deactivated on the KMD-410 series.

When activated, this control promotes harvest of ice on the evaporator that is hard to remove. If the harvest cycle exceeds 6 minutes, the pump motor starts to operate for a maximum of 3 minutes.

S2 Dip Switch Setting	Harvest Promotion Control	
No. 2		
OFF		Activated
ON		Deactivated

#### **l) Refill Counter (S2 dip switch 3) [Program Ver. 3.1, Ver. 3.2]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly. The KMD-410MAH and KMD-410MWH refill 1 time.

#### **m) Harvest Completion Detection Control (S2 dip switch 4) [Program Ver. 3.1, Ver. 3.2]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

It is deactivated on the KMD-410 series.

When activated, this control determines whether ice remains on the evaporator at the end of a harvest cycle and at the beginning of a freeze cycle. If ice drops and activates the bin control switch in the last 10 seconds of a harvest cycle, the control determines that ice still remains on the evaporator and extends the harvest cycle for 30 seconds. If the bin control switch is activated at the beginning of a freeze cycle, the control determines that ice still remains on the evaporator and starts a harvest cycle after the minimum freeze cycle time has passed.

S2 Dip Switch Setting	Harvest Completion Detection Control	
No. 4		
OFF		Deactivated
ON		Activated

#### **n) Overfreeze Detection Control (S2 dip switch 5) [Program Ver. 3.1, Ver. 3.2]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

It is deactivated on the KMD-410 series.

When activated, the thermistor detects the temperature of the evaporator outlet to find overfreeze in a harvest cycle and at the beginning of a freeze cycle. If the difference between the maximum temperature after the water saver timer starts counting and the

temperature at the end of a harvest cycle is 4K or more and if the temperature at the end of a harvest cycle is 48°F (9°C) or less, the harvest cycle is extended for 30 seconds. If the difference between the temperature at the beginning of a freeze cycle and the minimum temperature after 30 seconds in the freeze cycle is 2.5K or more and less than 3.5K, the next harvest cycle is extended for 30 seconds. If the above conditions occur in succession, the number of occurrence times 30 seconds will be added to the harvest cycle time. If the above temperature difference is 3.5K or more, the freeze cycle ends after the minimum freeze cycle time and a harvest cycle starts.

S2 Dip Switch Setting	Overfreeze Detection Control
No. 5	
OFF	Deactivated
ON	Activated

**o) Anti-Slush Control (S2 dip switch 6) [Program Ver. 3.1]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

It is deactivated on the KMD-410 series.

When activated (Ver. 2.0), the thermistor located on the suction line checks for a 50°F (10°C) temperature as the evaporator cools. When 50°F (10°C) is reached, a 3.9 kΩ signal causes the control board to de-energize the pump motor for 10 seconds and energize it for 50 seconds repeatedly. When 34°F (1°C) is reached, a 5.9 kΩ signal causes the control board to de-energize the pump motor for 10 seconds, energize it for 50 seconds, de-energize it again for 10 seconds, then energize it continuously.

S2 Dip Switch Setting	Anti-Slush Control
No. 6	
OFF	Activated (Ver. 2.0)
ON	Deactivated

**p) Anti-Slush Control (S2 dip switch 6) [Program Ver. 3.2]**

Do not adjust. This must be left in the factory default position or the unit will not operate properly.

When activated (Ver. 1.1), the thermistor located on the suction line checks for a 41°F (5°C) temperature as the evaporator cools. When 41°F (5°C) is reached, a 4.8 kΩ signal causes the control board to de-energize the pump motor for 10 seconds.

When activated (Ver. 2.0), the thermistor located on the suction line checks for a 50°F (10°C) temperature as the evaporator cools. When 50°F (10°C) is reached, a 3.9 kΩ signal causes the control board to de-energize the pump motor for 10 seconds and energize it for 50 seconds repeatedly. When 34°F (1°C) is reached, a 5.9 kΩ signal causes the control board to de-energize the pump motor for 10 seconds, energize it for 50 seconds, de-energize it again for 10 seconds, then energize it continuously.

S2 Dip Switch Setting	Anti-Slush Control
No. 6	
OFF	Activated (Ver. 1.1)
ON	Activated (Ver. 2.0)

## **[d] CONTROL BOARD CHECK PROCEDURE**

Before replacing a control board that does not show a visible defect and that you suspect is bad, always conduct the following check procedure. This procedure will help you verify your diagnosis.

- 1) Check the dip switch settings to assure that S1 dip switch 3, 4, 7, 8, 9, & 10 and S2 dip switch 1 through 6 are in the factory default position. S1 dip switch 1, 2, 5, & 6 are cleaning adjustments and the settings are flexible.
- 2) Move the control switch to the "ICE" position and check for proper control voltage. If the "POWER OK" LED is on, the control voltage is good. If the "POWER OK" LED is off, check the control transformer circuit. If no voltage is present, check the power supply circuit.
- 3) The output test button provides a relay sequence test. Make sure the control switch is in the "ICE" position, then press the "OUTPUT TEST" button. The correct lighting sequence should be 5, 6, 7, 8, 9, 4. Some components (e.g., the compressor) will cycle during the test. Each LED flashes three times in 5 seconds. LED 5 continues to flash while LED 6 flashes. Following the output test sequence, the icemaker will resume normal operation beginning with the 1 minute fill cycle.

## **[e] CONTROL BOARD REPLACEMENT**

The dip switches should be adjusted to the factory default settings as outlined in this manual. S2 dip switch 5 must remain off.

## 4. HARVEST CONTROL – THERMISTOR

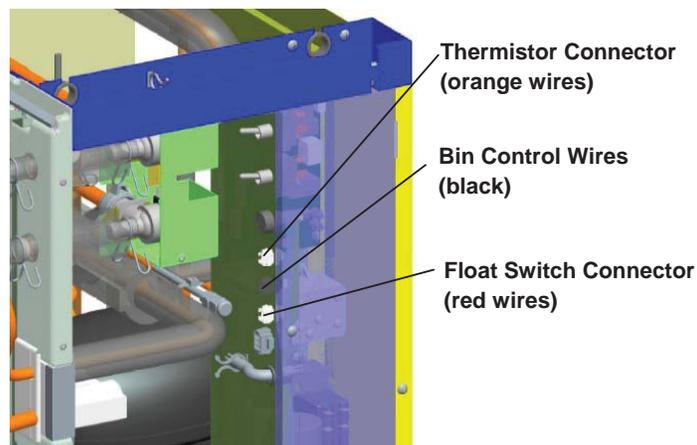
A thermistor (semiconductor) is used as a harvest control sensor, anti-slush sensor, and overfreeze sensor.

The resistance varies depending on the suction line temperatures. The thermistor detects the temperature of the evaporator outlet to start the harvest timer or momentarily stop the pump motor during the freeze cycle, or to extend the harvest cycle time. 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 (°F)	Temperature (°C)	Resistance (kΩ)
0	-18	14.401
10	-12	10.613
32	0	6.000
50	10	3.871
70	21	2.474
90	32	1.633

Check a thermistor for resistance by using the following procedure:

- 1) Disconnect the thermistor (orange wires) at the 2-pin connector on the control box. See Fig. below.
- 2) Remove the thermistor. See "V. 17. 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.



## **5. FLOAT SWITCH**

### **[a] EXPLANATION OF OPERATION**

The float operates 2 switches within the float switch. The lower switch (black and blue wires) is used for low water safety protection, initiating the freeze cycle refill and terminating the freeze cycle. The upper switch (black and red wires) is used to terminate the freeze cycle refill only. Refill will last until the upper float switch closes or the 1 minute countdown timer ends, whichever comes first.

### **[b] CLEANING**

Depending on local water conditions, scale may build up on the float, float switch shaft and inside the housing. Scale on the float or shaft can cause the float to stick causing erratic operation. The float switch should be cleaned and checked before replacing.

First, disconnect the float switch connector from the control box and remove the water tank and pump motor bracket together from the icemaker. Twist the mechanical lock inside of the pump motor bracket and remove the float switch. See "V. 15. FLOAT SWITCH." Remove the retainer clip from the shaft and slide the float off the shaft. Soak the switch assembly in ice machine cleaner. Wipe down the shaft, float, housing with cleaning solution. See "VI. CLEANING AND MAINTENANCE INSTRUCTIONS."

### **[c] FLOAT SWITCH CHECK PROCEDURE**

Before replacing a float switch that you suspect is bad, make sure the float switch has been cleaned. This procedure will help you verify your diagnosis. The float switch has three wires. The black wire is common. The blue wire is for the lower float switch contact and the red wire is for the upper float switch contact.

- 1) Disconnect the black float switch connector from the control box.
- 2) Drain the reservoir water.
- 3) Turn the control switch to "ICE".
- 4) As water fills the reservoir, the float switch contacts should close. Check continuity of the lower float switch contacts using the black and blue wires and the upper float switch contacts using the black and red wires. With the float positioned all the way up, both float switch contacts should be closed. If either float switch contact fails, the assembly should be replaced.
- 5) Turn the control switch to "OFF".
- 6) Drain the reservoir water.
- 7) As water drains, the float switch contacts should open. Check continuity of the upper float switch contacts using the black and red wires and the lower float switch contacts using the black and blue wires. With the float positioned all the way down, both float switch contacts should be open. If either float switch contact fails, the assembly should be replaced.
- 8) Reconnect the black connector to the control box when finished.

## **6. BIN CONTROL**

This machine uses a lever-actuated proximity switch (mechanical bin control) to control the ice level in the storage bin. No adjustment is required.

### **[a] EXPLANATION OF OPERATION**

The bin control is connected to the K1 connector (pins 4 & 5) on the control board. When the bin control is calling for ice (proximity switch closed; "POWER OK" LED on), the control board continues icemaking operations. When the bin control is activated in the bin full position (proximity switch open; "POWER OK" LED flashing), the control board drains and shuts down the unit. However, to prevent incomplete batches of ice from forming on the evaporator, the control board will only shut down the machine during the freeze cycle before the five minute timer expires. The five minute timer starts counting down when the thermistor temperature reaches 2°C. If, during the freeze cycle, ice pushes in the lever after the five minute timer expires, the control board will allow the machine to complete the freeze cycle and the following harvest cycle before shutting down the machine.

### **[b] BIN CONTROL CHECK PROCEDURE**

- 1) Clear any ice away from the bin control.
- 2) Make sure the control switch is in the "ICE" position.
- 3) Check that the "POWER OK" LED on the control board is on.
- 4) Activate the bin control actuator (press the actuator in). Check that the "POWER OK" LED flashes.
- 5) Disconnect the bin control at the 2-pin connector attached to the black wires coming from the K1 connector (pins 4 & 5) on the control board.
- 6) Check for continuity across the bin control leads. When calling for ice, the bin control proximity switch should be closed. If open, replace the bin control. Activate the bin control actuator (press the actuator in), check for continuity across the bin control leads. The bin control proximity switch should be open. If closed, replace the bin control.
- 7) Reconnect the 2-pin connector. Allow the machine to cycle into the freeze cycle. In the first 5 minutes of the freeze cycle, activate the bin control actuator (press the actuator in). The "POWER OK" LED should flash and the machine should turn off. If not, replace the control board.

## **7. SWITCHES**

Two different control switches are used for operation of KMD-410MAH and KMD-410MWH. These switches are referred to as the "control switch" and the "service switch" and are located on the control box.

### **[a] CONTROL SWITCH**

This switch is used to place the machine into one of three modes: "OFF" (center position), "ICE" (upper position), and "SERVICE" (lower position).

### **[b] SERVICE SWITCH**

When the control switch is in the "SERVICE" position, the control switch supplies power to the service switch and the machine is in service mode. The service switch has three positions: "DRAIN," "CIRCULATE," and "WASH." See the information below for details of each function.

Note:

1. When the service switch is activated, power is supplied to the water pump in all three positions.
2. When the control switch is in the "OFF" position or in the "ICE" position, the service switch has no power and can be left in any position.

#### **1) DRAIN**

The KMD-410M\_H series utilizes a pump-out drain system. When the service switch is active and placed in the "DRAIN" position, power is supplied to the pump and drain valve.

#### **2) CIRCULATE**

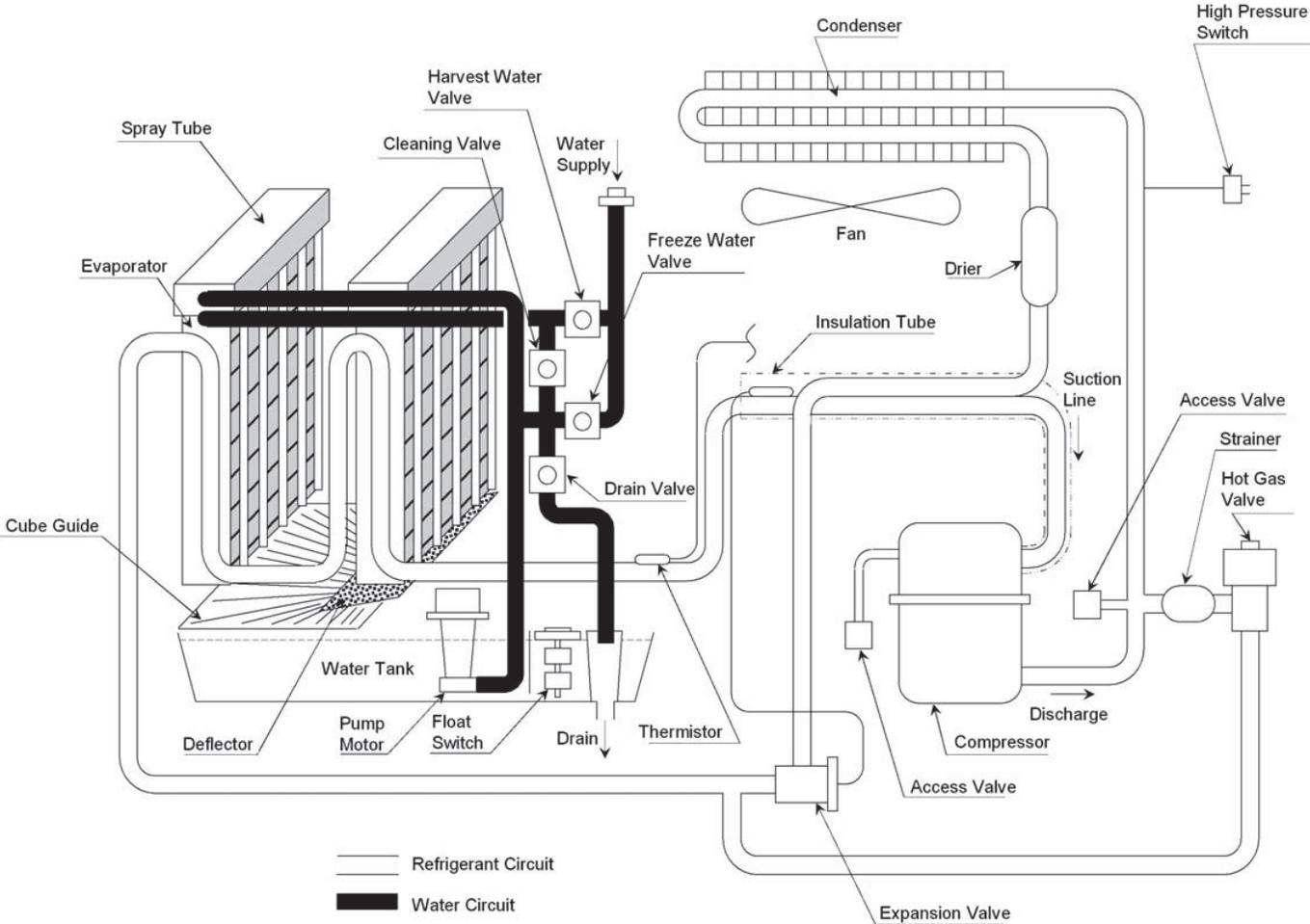
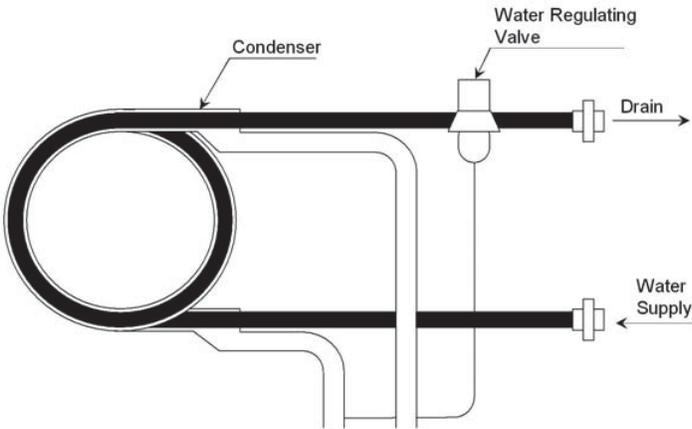
When the service switch is active and placed in the "CIRCULATE" position, power is supplied to the pump only. This operation can be used to circulate cleaner for extended periods of time over the outside surface of the evaporator.

#### **3) WASH**

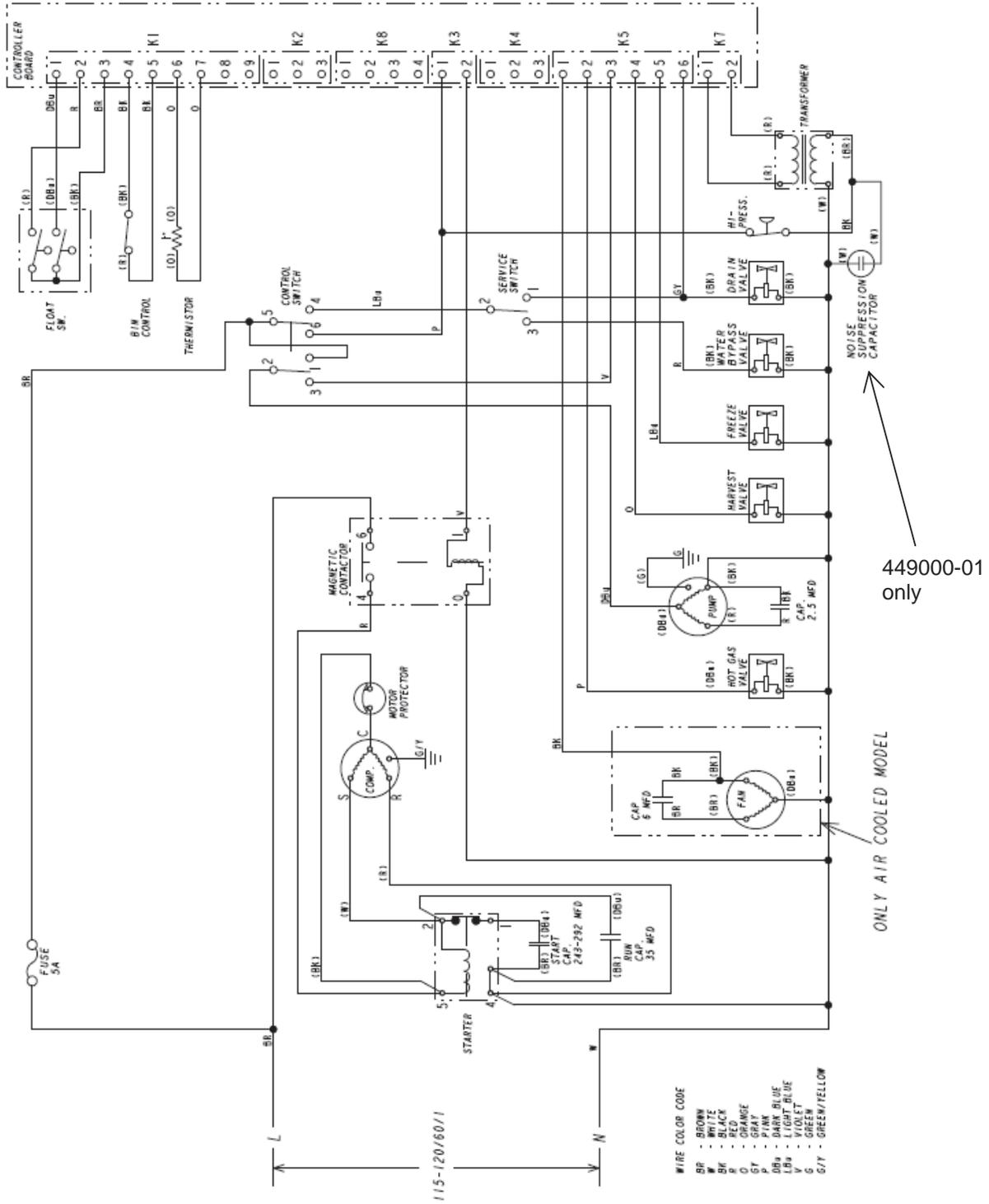
The KMD-410M\_H series utilizes a solenoid operated wash (bypass) valve. When the service switch is active and placed in the "WASH" position, power is supplied to the pump and wash valve. This operation is used to circulate cleaner and sanitizer over both the inside and outside of the evaporator.

### III. TECHNICAL INFORMATION

#### 1. WATER CIRCUIT AND REFRIGERANT CIRCUIT

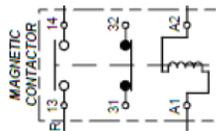


## 2. WIRING DIAGRAM



\* The magnetic contactor wiring depends on the contactor model.

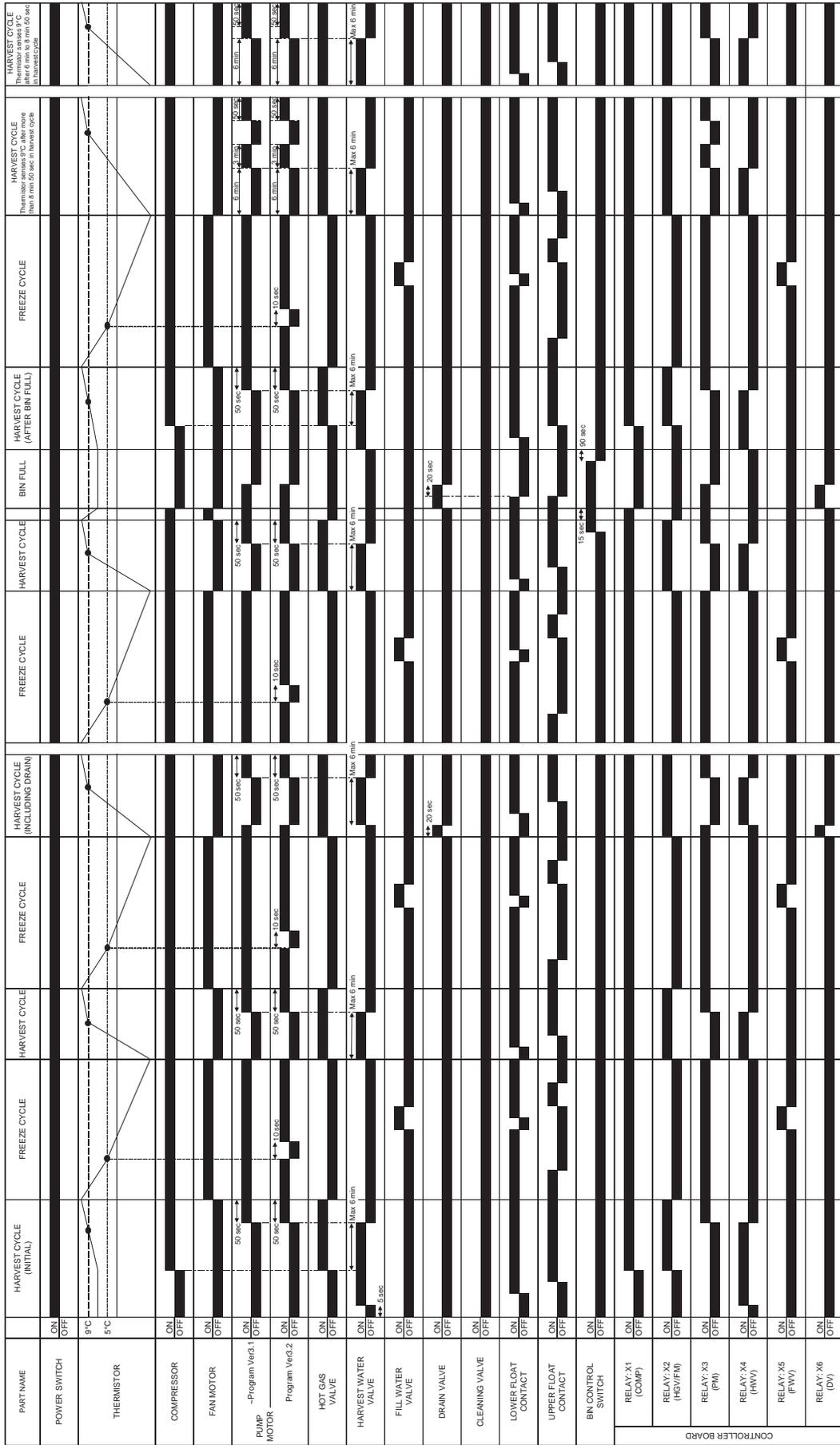
428393-01  
VC20-1a1b



449000-01  
G7L-1A-TUB

See above

### 3. TIMING CHART



## 4. PERFORMANCE DATA

### [a] KMD-410MAH

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (°F/°C)	WATER TEMP. (°F/°C)					
		50/10		70/21		90/32	
	70/21	<b>415</b>	<u>188</u>	388	<u>176</u>	354	<u>160</u>
	80/27	395	<u>179</u>	353	<u>160</u>	320	<u>145</u>
	90/32	388	<u>176</u>	<b>324</b>	<u>147</u>	289	<u>131</u>
lbs./day    kg./day	100/38	382	<u>173</u>	316	<u>143</u>	257	<u>117</u>
APPROXIMATE ELECTRIC CONSUMPTION	70/21	<b>710</b>		731		753	
	80/27	726		758		776	
	90/32	731		<b>780</b>		801	
watts	100/38	733		785		820	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	<b>148</b>	<u>0.56</u>	126	<u>0.48</u>	114	<u>0.43</u>
	80/27	131	<u>0.50</u>	97	<u>0.37</u>	95	<u>0.36</u>
	90/32	126	<u>0.48</u>	<b>73</b>	<u>0.28</u>	67	<u>0.25</u>
gal./day    m <sup>3</sup> /day	100/38	101	<u>0.38</u>	72	<u>0.27</u>	61	<u>0.23</u>
FREEZING CYCLE TIME	70/21	<b>27</b>		29		32	
	80/27	28		31		34	
	90/32	29		<b>34</b>		37	
min.	100/38	29		34		40	
HARVEST CYCLE TIME	70/21	<b>3.0</b>		2.7		2.6	
	80/27	2.8		2.3		2.4	
	90/32	2.7		<b>2.0</b>		2.0	
min.	100/38	2.4		2.0		2.0	
HEAD PRESSURE	70/21	<b>216</b>	<u>15.2</u>	237	<u>16.7</u>	261	<u>18.4</u>
	80/27	232	<u>16.3</u>	265	<u>18.6</u>	287	<u>20.2</u>
	90/32	237	<u>16.7</u>	<b>288</b>	<u>20.2</u>	311	<u>21.9</u>
PSIG    kg/cm <sup>2</sup> G	100/38	240	<u>16.9</u>	293	<u>20.6</u>	333	<u>23.4</u>
SUCTION PRESSURE	70/21	<b>45</b>	<u>3.2</u>	48	<u>3.3</u>	52	<u>3.6</u>
	80/27	47	<u>3.3</u>	51	<u>3.6</u>	55	<u>3.9</u>
	90/32	48	<u>3.3</u>	<b>54</b>	<u>3.8</u>	58	<u>4.1</u>
PSIG    kg/cm <sup>2</sup> G	100/38	49	<u>3.4</u>	55	<u>3.9</u>	62	<u>4.4</u>

TOTAL HEAT OF REJECTION FROM CONDENSER      6,000 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] KMD-410MWH**

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (°F/°C)	WATER TEMP. (°F/°C)					
		50/10		70/21		90/32	
	70/21	<b>440</b>	<u>200</u>	423	<u>192</u>	392	<u>178</u>
	80/27	427	<u>194</u>	401	<u>182</u>	364	<u>165</u>
	90/32	423	<u>192</u>	<b>382</b>	<u>173</u>	347	<u>157</u>
lbs./day <u>kg./day</u>	100/38	414	<u>188</u>	373	<u>169</u>	315	<u>143</u>
APPROXIMATE ELECTRIC CONSUMPTION	70/21	<b>670</b>		673		682	
	80/27	672		677		688	
	90/32	673		<b>680</b>		690	
watts	100/38	676		682		700	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	<b>120</b>	<u>0.45</u>	111	<u>0.42</u>	102	<u>0.39</u>
	80/27	113	<u>0.43</u>	99	<u>0.37</u>	92	<u>0.35</u>
	90/32	111	<u>0.42</u>	<b>89</b>	<u>0.34</u>	81	<u>0.31</u>
gal./day <u>m<sup>3</sup>/day</u>	100/38	98	<u>0.37</u>	87	<u>0.33</u>	74	<u>0.28</u>
FREEZING CYCLE TIME	70/21	<b>25</b>		26		28	
	80/27	25		27		30	
	90/32	26		<b>29</b>		31	
min.	100/38	26		29		33	
HARVEST CYCLE TIME	70/21	<b>2.3</b>		2.2		2.2	
	80/27	2.2		2.1		2.1	
	90/32	2.2		<b>2.0</b>		2.0	
min.	100/38	2.1		2.0		2.0	
HEAD PRESSURE	70/21	<b>239</b>	<u>16.8</u>	240	<u>16.8</u>	243	<u>17.1</u>
	80/27	239	<u>16.8</u>	240	<u>16.9</u>	246	<u>17.3</u>
	90/32	240	<u>16.8</u>	<b>241</b>	<u>16.9</u>	246	<u>17.3</u>
PSIG <u>kg/cm<sup>2</sup>G</u>	100/38	241	<u>17.0</u>	242	<u>17.0</u>	250	<u>17.6</u>
SUCTION PRESSURE	70/21	<b>43</b>	<u>3.0</u>	44	<u>3.1</u>	48	<u>3.4</u>
	80/27	44	<u>3.1</u>	46	<u>3.3</u>	51	<u>3.6</u>
	90/32	44	<u>3.1</u>	<b>48</b>	<u>3.4</u>	52	<u>3.7</u>
PSIG <u>kg/cm<sup>2</sup>G</u>	100/38	46	<u>3.2</u>	49	<u>3.4</u>	56	<u>3.9</u>

TOTAL HEAT OF REJECTION FROM CONDENSER      6,300 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.

## IV. SERVICE DIAGNOSIS

### 1. 10-MINUTE DIAGNOSTIC PROCEDURE

The 10 minute check out procedure is basically a sequence check which can be used at unit start-up or for system diagnosis. Using this check out procedure will allow you to diagnose electrical system and component failures in approximately 10 minutes under normal operating conditions of 21°C or warmer air and 10°C or warmer water temperatures. Before conducting a 10 minute checkout, check for correct installation, proper voltage per unit nameplate and adequate water supply. As you go through the procedure, check to assure the components energize and de-energize correctly. If not, those components and controls are suspect.

- 1) Turn power off and access the control box. Clear any ice from the bin control actuator located in the bin.
- 2) Turn power on and place the control switch in the "ICE" position. A 5 second delay occurs. The "POWER OK" LED on the control board comes on. If the "POWER OK" LED is flashing (indicating a full bin), check the bin control. See "II. 6. [b] BIN CONTROL CHECK PROCEDURE."
- 3) One Minute Fill Cycle – The harvest water valve is energized. After 1 minute, the control board checks the float switch. If the lower float switch is closed, the unit cycles to harvest. If closed, continue to step 4. If the lower float switch is open, the unit repeats the 1 minute fill cycle until water enters and the lower float switch closes (low water safety protection during initial start up and at the end of each harvest). **Diagnosis:** If the water valve does not open, check for no supply voltage at water valve terminals, bad coil, or plugged screen or external filter (no water flow). If unit fails to start harvest, check for open float switch or bad 1 minute timer in board.
- 4) Initial Harvest Cycle – The harvest water valve remains energized, contactor coil energizes to start the compressor (and fan motor on a remote condenser unit), and the hot gas valve energizes. The evaporator warms and the thermistor senses 48 °F (9°C). The control board then receives the thermistor's 3.9 kΩ signal and turns operation of harvest over to the harvest timer. The timer completes counting (1 to 3 minutes). The unit then cycles to freeze. **Diagnosis:** Check if compressor is running, hot gas valve is open, harvest water valve still open. Average harvest cycle at factory setting is 2 to 4 minutes. How long does initial harvest last? 1.5 minutes after initial harvest begins, touch the compressor discharge line. Is it hot? If not, check refrigerant pressures and compressor operation. If it is hot, touch the inlet line to the evaporator. Is it hot? If it is hot and the freeze cycle is not starting, check the harvest timer adjustment, the thermistor for open circuit, the discharge line temperature, compressor efficiency, and if the hot gas valve is fully open.
- 5) Freeze Cycle – The compressor remains energized, pump motor, (line valve if applicable), and fan motor energize. The harvest water valve and hot gas valve de-energize. The unit is held in freeze by a 5 minute short cycle protection timer which starts after the thermistor temperature reaches 2°C. After this period, the freeze cycle operation is transferred to the float switch for freeze termination. The lower float switch activates (open) 2 times during the course of a freeze cycle; the first is for refill, the second is for freeze termination. After the second lower float switch activation, the control board terminates freeze and initiates harvest.

- a. Lower Float Switch 1st Activation: Refill** – The refill can occur at any time during the freeze cycle (1 refill per cycle). As ice builds the water level drops in the reservoir and the lower float switch activates (opens). LED 5 comes on and the control board energizes the fill water valve. The fill water valve remains energized until the upper float switch closes or the 1 minute fill timer terminates, whichever comes first.
- b. Lower Float Switch 2nd Activation:** The unit is held in freeze by a 5 minute short cycle protection timer which starts after the thermistor temperature reaches 2°C. After the 1st lower float switch activation and refill, ice continues to form and the water level drops in the reservoir. When the lower float switch activates (opens) a second time, the freeze cycle terminates (freeze can only be terminated on the second activation of the lower float switch and after the minimum freeze period). **Diagnosis:** During the minimum freeze period, confirm that the evaporator temperature drops, compressor, fan motors and pump motor are energized and that the hot gas valves, harvest water valve and fill water valve (except during refill) are de-energized and not bypassing. Make sure the expansion valves are operating properly and, in cold conditions. Make sure that the drain water valve is not leaking by (water flowing down the potable drain). Check for proper unit pressures, or an inoperative compressor. Disconnect the 3-pin float switch connector from the control box. 15 seconds after disconnecting the 3-pin float switch connector, LED 5 comes on and refill begins. Connect the 3-pin float switch connector back on the control box. When the refill is finished (LED 5 goes off), disconnect the 3-pin float switch connector again. If 5 or more minutes have elapsed in the freeze cycle, the unit should switch out of the freeze cycle. After the unit switches out of freeze, reconnect the 3-pin float switch connector to the control box. If the unit remains in freeze with the float switch disconnected, replace the board. To check the float switch, see "II. 5. [c] FLOAT SWITCH CHECK PROCEDURE."

Note: Normal freeze cycle will last 20 to 40 minutes depending on model and conditions. Cycle times and pressures should follow performance data provided in this manual.

- 6) Drain Cycle – The compressor remains energized, the hot gas valve energizes, the fan motor de-energizes. The drain valve and pump motor energize, allowing water to drain from the tank for 20 seconds. This removes contaminants from the water tank. **Diagnosis:** If the drain valve does not open, check the circuit. Check for proper voltage. If water does not drain out, check and clean the tubing at the drain valve and then check and clean the valve assembly.

- 7) Normal Harvest Cycle – same as the initial harvest cycle – Return to step 4.

Note: Unit continues to cycle until bin control is satisfied or power is turned off. (The drain cycle can be adjusted to occur every cycle, or every 2, 5, or 10 cycles. The factory default is every 10 cycles.) The unit always restarts at the 1 minute fill cycle.

## 2. DIAGNOSTIC CHARTS

### [a] NO ICE PRODUCTION

Problem	Possible Cause	Remedy	
[1] The icemaker will not start.	a) Power Supply	1. Off, blown fuse, or tripped breaker.	1. Turn on, replace, or reset.
		2. Loose connection.	2. Tighten.
		3. Bad contacts.	3. Check for continuity and replace.
		4. Not within specifications.	4. Refer to nameplate and correct.
	b) Water Supply	1. Water supply off or pressure too low.	1. Check and get recommended pressure.
	c) Fuse (Control Box)	1. Blown.	1. Check for short circuit and replace.
	d) Control Switch	1. "OFF" or "SERVICE" position.	1. Move to "ICE" position.
		2. Bad contacts.	2. Check for continuity and replace.
	e) Bin Control	1. Tripped with bin filled with ice.	1. Remove ice.
		2. Defective.	2. See "II. 6. [b] Bin Control Check Procedure."
	f) High Pressure Control	1. Bad contacts.	1. Check for continuity and replace.
		2. Dirty air filter or condenser.	2. Clean.
		3. Ambient or condenser water temperature too warm.	3. Reduce temperature.
		4. Refrigerant overcharged.	4. Recharge.
		5. Fan not operating. (except water-cooled model)	5. See chart [a] [7].
		6. Refrigerant line or components plugged.	6. Clean and replace drier.
		7. Condenser water pressure too low or off. (water-cooled model)	7. Check and get recommended pressure.
	g) Transformer	1. Coil winding opened or shorted.	1. Replace.

Problem	Possible Cause	Remedy
[1] The icemaker will not start. (continued)	h) Wiring to Control Board	1. Loose connections or open. 1. Check for continuity and replace.
	i) Thermistor	1. Leads shorted or opened and high temperature or harvest backup timer safety operates. (1 beep or 2 beep alarm) 1. See "II. 4. Harvest Control - Thermistor."
	j) Hot Gas Valve	1. Continues to open in freeze cycle and freeze timer safety operates. (3 beep alarm) 1. Check for hot gas valve stuck open and replace.
	k) Harvest Water Valve	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) Control Board	1. Defective or in alarm. 1. See "II. 3. [d] Control Board Check Procedure."	
[2] Water continues to be supplied, and the icemaker will not start.	a) Float Switch	1. Connector disconnected. 1. Reconnect.
		2. Defective switch. 2. Check and replace.
		3. Float does not move freely. 3. Clean or replace.
	b) Control Board	1. Defective. 1. See "II. 3. [d] Control Board Check Procedure."
[3] Compressor will not start or stops operating.	a) Magnetic Contactor	1. Bad contacts. 1. Check for continuity and replace.
		2. Coil winding opened. 2. Replace.
	b) Start Capacitor or Run Capacitor	1. Defective. 1. Replace.
	c) Internal Overload Protector Open (check 1 through 3 to the right and d through f below)	1. Loose terminal. 1. Tighten or replace.
		2. Voltage. 2. Check and correct.
		3. Dirty condenser. 3. Clean.
	d) Starter	1. Bad contacts. 1. Check and replace.
		2. Coil winding opened. 2. Replace.
	e) Compressor	1. Power supply not within specifications. 1. Refer to nameplate and correct.
		2. Wiring to compressor. 2. Check for loose connection or open, and replace.

<b>Problem</b>	<b>Possible Cause</b>		<b>Remedy</b>
[3] Compressor will not start or stops operating. (continued)	e) Compressor (continued)	3. Defective.	3. Replace.
		4. Protector tripped.	4. Reduce temperature.
	f) Control Board	1. No power to contactor.	1. See "II. 3. [d] Control Board Check Procedure."
[4] Water continues to be supplied in freeze cycle.	a) Water Pressure	1. Too high.	1. Reduce.
	b) Fill or Harvest Water Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker off.
	c) Control Board	1. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
[5] Water pump will not start.	a) 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.
	b) Control Board	1. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
c) Control Switch	1. Bad contacts.	1. Replace.	
[6] Freeze cycle time is too short.	a) Drain Valve	1. Leaking by.	1. Clean or replace.
	b) Float Switch	1. Dirty or erratic operation.	1. Clean or replace.
	c) Control Board	1. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
[7] Fan motor will not start, or is not operating. (except water-cooled model)	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) Control Board	1. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
[8] All components run, but no ice is produced.	a) Refrigerant	1. Low charge.	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 Valve	1. Continues to open in freeze cycle.	1. Check and replace.
	d) Line Valve (if applicable)	1. Continues to close in freeze cycle.	1. Check and replace.

Problem	Possible Cause		Remedy
[8] All components run, but no ice is produced. (continued)	e) Fill or Harvest Water Valve	1. Water valve is wide open during freeze.	1. Check for water leaks with icemaker off.
	f) Expansion Valve	1. Operating erratically.	1. Check and replace.
	g) Headmaster (C.P.R.) (remote air-cooled model only)	1. Not operating properly and liquid line temperature too warm.	1. Replace headmaster.
	h) Water Supply Line (water-cooled model only)	1. Condenser water pressure too low or off and high pressure control opens and closes frequently.	1. Check and get recommended pressure.
	i) Water Regulating Valve (water-cooled model only)	1. Set too high.	1. Adjust or replace. See "V. 9. Adjustment of Water Regulating Valve."

### [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) Fill or Harvest Water Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker off.
	c) Control Board	1. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
	d) Water Pump	1. RPM too slow.	1. Check and replace.
	e) Spray Tubes	1. Clogged.	1. Unclog.
	f) Evaporator	1. Scaled up.	1. Clean.
[2] All ice formed on evaporator does not fall into bin in harvest cycle.	g) Expansion Valve	1. Operating erratically.	1. Check and replace.
	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	1. Dirty/Restricted.	1. Replace filter.
	d) Harvest Water 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) Line Valve (if applicable)	1. Continues to open in harvest cycle.	1. Check operation in harvest cycle and replace.
g) Thermistor	1. Out of position or loose attachment.	1. See "V. 17. Thermistor."	
h) Control Board	1. Harvest timer is set too short.	1. See "II. 3. [c] Controls and Adjustments, b) Harvest Timer."	

Problem	Possible Cause		Remedy
[2] All ice formed on evaporator does not fall into bin in harvest cycle. (continued)	h) Control Board (continued)	2. Defective.	1. See "II. 3. [d] Control Board Check Procedure."
	i) Water Regulating Valve (water-cooled model only)	1. Leaking by in harvest.	1. Check and replace.
[3] Other.	a) Spray Tubes	1. Clogged.	1. Clean.
		2. Out of position.	2. Place in position.
	b) Water System	1. Dirty.	1. Clean.
		2. Water supply line too small; requires 3/8" OD line dedicated per machine.	2. Increase water line size.
		3. Water filter flow rate too small.	3. Replace with filter that has larger flow rate.
	c) Refrigerant	1. Low charge.	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 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) Ice Cube Guide	1. Out of position and ice trapped.	1. Place in position.	

### [c] LOW ICE PRODUCTION

Problem	Possible Cause	Remedy
[1] Freeze cycle time is long.	a) See chart [b] [1] and check float switch, fill and harvest water valves, control board, water pump, spray tubes, evaporator, and expansion valve.	
	b) See chart [a] [1] and check dirty air filter or condenser, ambient or water temperature, refrigerant charge, water pressure, and condenser water regulating valve (water-cooled model only).	
	c) Check pump, hot gas valve, headmaster (C.P.R.) (remote air-cooled model only), expansion valve, refrigeration check valve, and compressor.	
[2] Harvest cycle time is long.	a) See chart [b] [2] and check evaporator, water supply line, harvest water valve, ambient and/or water temperature, line valve (if applicable), thermistor, control board, and hot gas valve.	

### [d] ABNORMAL ICE

Problem	Possible Cause	Remedy
[1] Small cubes.	a) Ice Cube Guide, Water Tank, Deflector	1. Out of position. Circulated water falls into dispenser unit/ storage bin.
	b) See chart 1.[5] and check water supply line, inlet water valve, water system, pump motor, and control board.	1. Place in position.

[1] Small cubes. (continued)	c) Drain Valve	1. Dirty.	1. Clean.
[2] Cloudy or irregular cubes.	a) See chart [b] [1] & [3] and check float switch, fill and harvest water valves, control 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	1. Defective.	1. See "II. 6. [b] Bin Control Check Procedure."	
[2] Abnormal noise.	a) Pump Motor	1. Bearings worn out.	1. Replace.	
		b) Fan Motor (except water-cooled model)	1. Bearings worn out.	1. Replace.
			2. Fan blade deformed.	2. Replace.
	c) Compressor	3. Fan blade does not move freely.	3. Replace.	
		d) Refrigerant Lines	1. Bearings worn out or cylinder valve broken.	1. Replace.
			2. Mounting pad out of position.	2. Reinstall.
[3] Ice in dispenser unit/storage bin often melts.	a) Drain Line(s)	1. Plugged.	1. Clean.	
	b) Icemaker and Dispenser Unit/Storage Bin	1. Drains not run separately.	1. Separate the drain lines.	
	c) Ice Cube Guide, Water Tank, Deflector	1. Out of position. Circulated water falls into dispenser unit/storage bin.	1. Place in position.	

## **V. REMOVAL AND REPLACEMENT**

### **1. SERVICE FOR REFRIGERANT LINES**

#### **[a] SERVICE INFORMATION**

##### **1) Allowable Compressor Opening Time and Prevention of Lubricant Mixture [R404A]**

The compressor must not be opened more than 15 minutes in replacement or service. Do not mix lubricants of different compressors even if both are charged with the same refrigerant, except when they use the same lubricant.

##### **2) Treatment for Refrigerant Leak [R404A]**

If a refrigerant leak occurs in the low side of an ice maker, air may be drawn in. Even if the low side pressure is higher than the atmospheric pressure in normal operation, a continuous refrigerant leak will eventually lower the low side pressure below the atmospheric pressure and will cause air suction. Air contains a large amount of moisture, and ester oil easily absorbs a lot of moisture. If an ice maker charged with R404A has possibly drawn in air, the drier must be replaced. Be sure to use a drier designed for R404A.

##### **3) Handling of Handy Flux [R404A]**

Repair of the refrigerant circuit requires brazing. It is no problem to use the same handy flux that has been used for the current refrigerants. However, its entrance into the refrigerant circuit should be avoided as much as possible.

##### **4) Oil for Processing of Copper Tubing [R404A]**

When processing the copper tubing for service, wipe off oil, if any used, by using alcohol or the like. Do not use too much oil or let it into the tubing, as wax contained in the oil will clog the capillary tubing.

##### **5) Service Parts for R404A**

Some parts used for refrigerants other than R404A are similar to those for R404A. But never use any parts unless they are specified for R404A because their endurance against the refrigerant have not been evaluated. Also, for R404A, do not use any parts that have been used for other refrigerants. Otherwise, wax and chlorine remaining on the parts may adversely affect R404A.

##### **6) Replacement Copper Tubing [R404A]**

The copper tubes currently in use are suitable for R404A. But do not use them if oily inside. The residual oil in copper tubes should be as little as possible. (Low residual oil type copper tubes are used in the shipped units.)

## **7) Evacuation, Vacuum Pump and Refrigerant Charge [R404A]**

Never allow the oil in the vacuum pump to flow backward. The vacuum level and vacuum pump may be the same as those for the current refrigerants. However, the rubber hose and gauge manifold to be used for evacuation and refrigerant charge should be exclusively for R404A.

## **8) Refrigerant Leak Check**

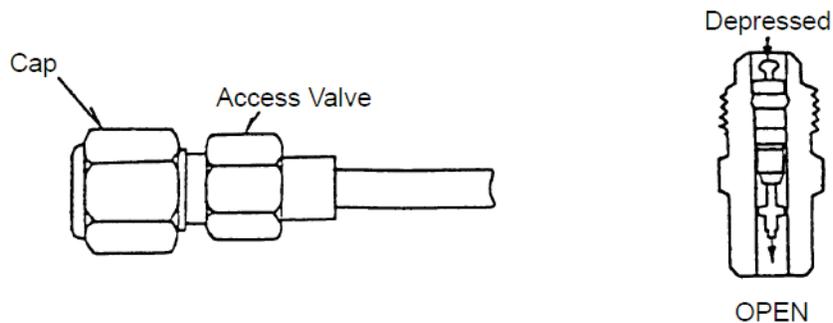
Refrigerant leaks can be detected by charging the unit with a little refrigerant, raising the pressure with nitrogen and using an electronic detector. Do not use air or oxygen instead of nitrogen for this purpose, or rise in pressure as well as in temperature may cause R404A to suddenly react with oxygen and explode. Be sure to use nitrogen to prevent explosion.

## **[b] REFRIGERANT RECOVERY**

The icemaker unit is provided with refrigerant access valves. 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.

## **[c] EVACUATION AND RECHARGE**

- 1) Attach a vacuum pump to the system. Be sure to connect charging hoses to both high and low-side access valves.
- 2) Turn on the vacuum pump. Open the service manifold valves. Never allow the oil in the vacuum pump to flow backwards.
- 3) Allow the vacuum pump to pull down to a 760 mmHg 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. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge.
- 6) A liquid charge is recommended for charging an R-404A system. Invert the service cylinder and place it on scales. Open the high-side valve on the service manifold.
- 7) Allow the system to charge with liquid until the proper charge weight is met.
- 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 service manifold valves and disconnect the service manifold hoses.
- 10) Cap the access valves to prevent a possible leak.



## 2. BRAZING

### DANGER

1. Refrigerant R404A itself is not explosive or poisonous. However, when exposed to high temperatures (open flames), R404A can be decomposed to form hydrofluoric acid and carbonyl fluoride both of which are hazardous.
2. Always recover the refrigerant and store it in a proper container. Do not discharge the refrigerant into the atmosphere.
3. Do not use silver alloy or copper alloy containing Arsenic.
4. Do not use R404A 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 bin are clear coated. Sandpaper the brazing connections before unbrazing the components. Use a good abrasive cloth to remove the coating.

## 3. COMPRESSOR

### WARNING

The Compressor Terminal Cover must be refitted in its correct position. Otherwise, operation under high temperature and high humidity conditions may cause electric shock, fire, or corrosion to shorten the service life.

### 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.
- 2) Remove the panels and water tank. See "V. 14. WATER TANK."

- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the terminal cover on the compressor and disconnect the compressor wiring.
- 5) Remove the hold-down bolts, washers, and rubber grommets.
- 6) Remove the discharge and suction pipes.
- 7) Remove the compressor. Unpack the new compressor package.
- 8) Attach the rubber grommets of the prior compressor.
- 9) Place the compressor in position and secure it using the bolts and washers.
- 10) Remove the drier, then place the new drier in position.
- 11) Remove plugs from the suction, discharge, and process pipes.
- 12) Braze all fittings while purging with nitrogen gas flowing at a pressure of 20 to 30 kPa.
- 13) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (970 kPa). DO NOT use R-404A as a mixture with pressurized air for leak testing.
- 14) Evacuate the system, and charge it with refrigerant. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge.
- 15) Connect the terminals and replace the terminal cover in its correct position.
- 16) Replace the panels and water tank in their correct positions.
- 17) Turn on the power supply.

Note: Hoshizaki recommends that compressor starting electrics are always replaced at the same time as the compressor.

#### 4. 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.
- 2) Remove the panels.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the drier holder, if any, and pull the drier toward you for easy service.

- 5) Remove the drier using brazing equipment.
- 6) Braze the new drier, with the arrow on the drier in the direction of the refrigerant flow. Use nitrogen gas at a pressure of 20 to 30 kPa when brazing tubings. Braze in an access valve using a tee if necessary.
- 7) Check for leaks using nitrogen gas (970 kPa) and soap bubbles.
- 8) Evacuate the system and charge it with refrigerant (see "V. 1. [c] EVACUATION AND RECHARGE").
- 9) Refit the panels in their correct positions.
- 10) Turn on the power supply.

Note: Always use a drier of the correct capacity and refrigerant type.

## 5. HOT GAS VALVE

### CAUTION

To ensure optimum performance, use a copper tube of the same diameter and length for replacement of the hot gas circuit.

### 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.
- 2) Remove the panels.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Disconnect the hot gas valve leads.
- 5) Remove the screw and the solenoid coil.
- 6) Remove the valve and drier using brazing equipment.
- 7) Braze the new hot gas valve with nitrogen gas flowing at a pressure of 20 to 30 kPa.

### 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 275°F (135°C).

- 8) Install the new drier (see "V. 4. DRIER").
- 9) Check for leaks using nitrogen gas (970 kPa) and soap bubbles.
- 10) Evacuate the system and charge it with refrigerant (see "V. 1. [c] EVACUATION AND RECHARGE").
- 11) Attach the solenoid coil to the valve body, and secure it with the screw.
- 12) Connect the lead wires.
- 13) Refit the panels in their correct positions.
- 14) Turn on the power supply.

## 6. EXPANSION VALVE

### IMPORTANT

The water in the refrigeration circuit may exceed the capacity of the Drier and freeze in 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.
- 2) Remove the panels.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the insulation and the expansion valve bulb on the suction line.
- 5) Remove the expansion valve cover and disconnect the expansion valve. Place the new expansion valve in position.
- 6) Remove the drier, then place the new drier in position.
- 7) Braze all fittings while purging with nitrogen gas flowing at a pressure of 20 to 30 kPa.

### 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 239°F (115°C).

- 8) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (970 kPa). DO NOT use R-404A as a mixture with pressurized air for leak testing.

- 9) Evacuate the system, and charge it with refrigerant. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge.
- 10) Attach the expansion valve bulb to the suction line in the same location as the previous bulb. The bulb should be at the 12 o'clock position on the tube. Be sure to secure the bulb with the clamp and holder and to insulate it.
- 11) Place the expansion valve cover in position.
- 12) Replace the panels in their correct positions.
- 13) Turn on the power supply.

## 7. 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.
- 2) Remove the panels and the front and top insulation.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the spray tubes. Remove the insulation at the "U" shaped notch where the refrigeration tubing passes through the molded chassis.
- 5) Disconnect the evaporator tubing.
- 6) Remove the pop rivets securing the evaporator, then lift out the evaporator.
- 7) Install the new evaporator.
- 8) Remove the drier, then place the new drier in position.
- 9) Braze all fittings while purging with nitrogen gas flowing at a pressure of 20 to 30 kPa.
- 10) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (970 kPa). DO NOT use R-404A as a mixture with pressurized air for leak testing.
- 11) Evacuate the system, and charge it with refrigerant. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge.
- 12) Replace the removed parts in the reverse order of which they were removed.
- 13) Replace the insulation and the panels in their correct positions.

14) Turn on the power supply.

## 8. WATER REGULATING VALVE – WATER-COOLED MODEL ONLY

### 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.

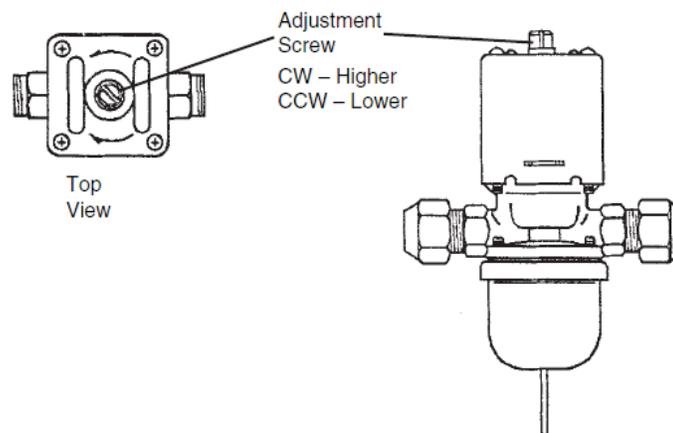
- 1) Turn off the power supply.
- 2) Remove the panels.
- 3) Close the condenser water supply line shut-off valve, then open the condenser water supply line drain valve.
- 4) Attach a compressed air or carbon dioxide supply to the condenser water supply line drain valve.
- 5) Open the water regulating valve by using a screwdriver to pry up on the spring retainer underneath the spring. While holding the valve open, blow out the condenser using the compressed air or carbon dioxide supply until water stops coming out.
- 6) Recover the refrigerant and store it in an approved container.
- 7) Disconnect the capillary tube at the condenser outlet.
- 8) Disconnect the flare-connections of the valve.
- 9) Remove the screws and the valve from the bracket.
- 10) Install the new valve.
- 11) Remove the drier, then place the new drier in position.
- 12) Braze all fittings while purging with nitrogen gas flowing at a pressure of 20 to 30 kPa..
- 13) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (970 kPa). DO NOT use R-404A as a mixture with pressurized air for leak testing.
- 14) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge.
- 15) Connect the flare-connections.
- 16) Close the condenser water supply line drain valve, then open the condenser water supply line shut-off valve.

- 17) Check for water leaks.
- 18) Replace the panels in their correct positions.
- 19) Turn on the power supply.

## 9. ADJUSTMENT OF WATER REGULATING VALVE – WATER-COOLED MODEL ONLY

The water regulating valve (also called "water regulator") is factory-adjusted. No adjustment is required under normal use. Adjust the water regulator, if necessary, using the following procedures.

- 1) Prepare a thermometer to check the condenser drain temperature. Attach a pressure gauge to the high-side line of the system.
- 2) Five minutes after a freeze cycle starts, confirm that the thermometer reads 104°F (40°C) to 115°F (46°C). If it does not, rotate the adjustment screw by using a flat blade screwdriver until the temperature is in the proper range. See Fig. below. Next, check that the reference pressure is in the range indicated in the Head Pressure table in the Performance Data section. If it is not in the proper range, verify the refrigerant charge.
- 3) Check that the condenser drain temperature is stable.

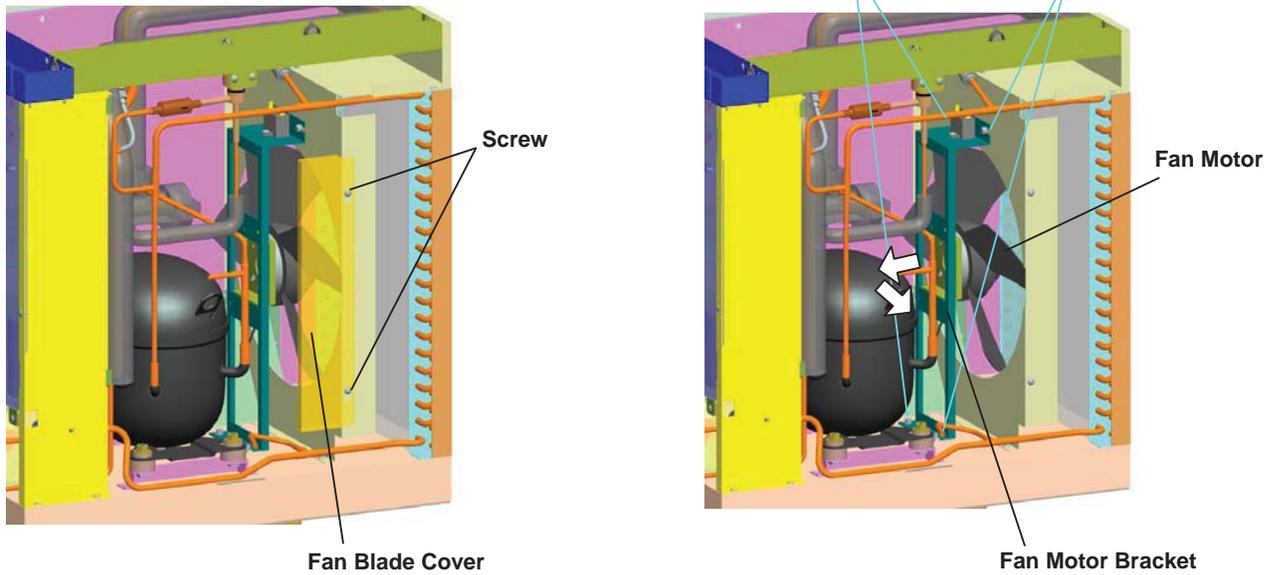


## 10. FAN MOTOR

- 1) Turn off the power supply.
- 2) Remove the panels.
- 3) Loosen the two screws securing the fan blade cover, then remove it.
- 4) Disconnect the connector of the fan motor lead.
- 5) Loosen the far side of the two screws and remove the near side of the two screws securing the fan motor bracket and slide out towards you. To prevent deformation, do not hit the fan on the condenser or other parts.
- 6) Install the new fan motor in the reverse order of the removal procedure.

7) Replace the panels in their correct positions.

8) Turn on the power supply.



## 11. PUMP MOTOR

1) Turn off the power supply.

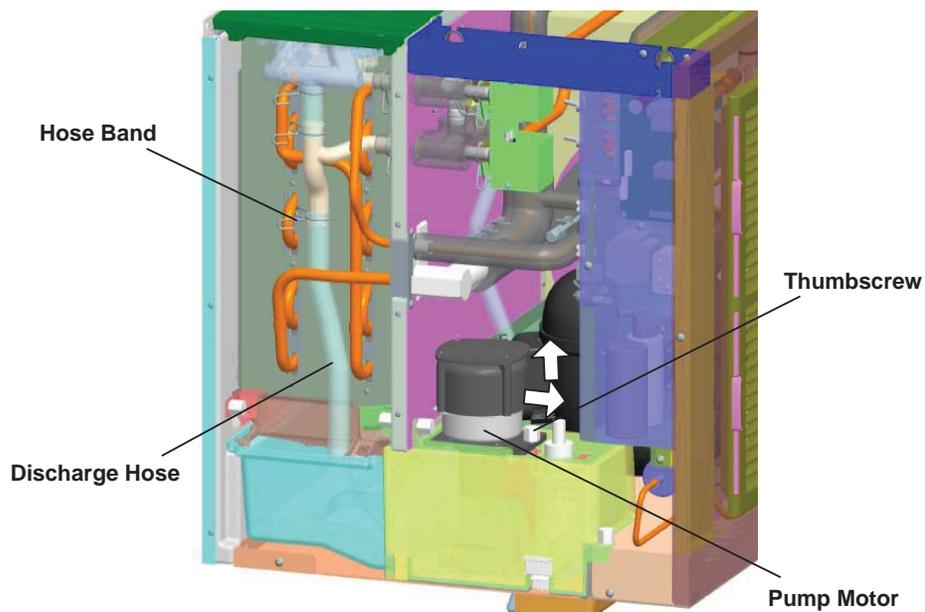
2) Remove the panels and front insulation.

3) Disconnect the connector of the pump motor lead.

4) Remove the thumbscrew securing the pump motor.

5) Remove the hose band connecting the discharge hose.

6) Slide the pump motor at right slightly and lift it up towards you.



- 7) Remove the hose band connecting the discharge outlet and pull off the rubber hose.
- 8) Install the new motor in the reverse order of the removal procedure.
- 9) Replace the panels and front insulation in their correct positions.
- 10) Turn on the power supply.

## **12. WATER VALVE**

- 1) Turn off the power supply.
- 2) If replacing the harvest and/or fill water valve, close the icemaker water supply line shut-off valve. Open the icemaker water supply line drain valve.
- 3) Remove the panels.
- 4) Disconnect the tubing attached to the valve. If replacing the harvest and/or fill water valve, loosen the fitting nut. Be careful not to lose the washer.
- 5) Disconnect the terminals from the valve.
- 6) Remove the bracket and valve from the unit.
- 7) Install the new valve. Replace the removed parts in the reverse order of which they were removed. If replacing the harvest and/or fill water valve, make sure the washer is in place in the fitting nut.
- 8) If replacing the harvest and/or fill water valve, close the icemaker water supply line drain valve. Open the icemaker water supply line shut-off valve.
- 9) Turn on the power supply.
- 10) Check for leaks.
- 11) Replace the panels in their correct positions.

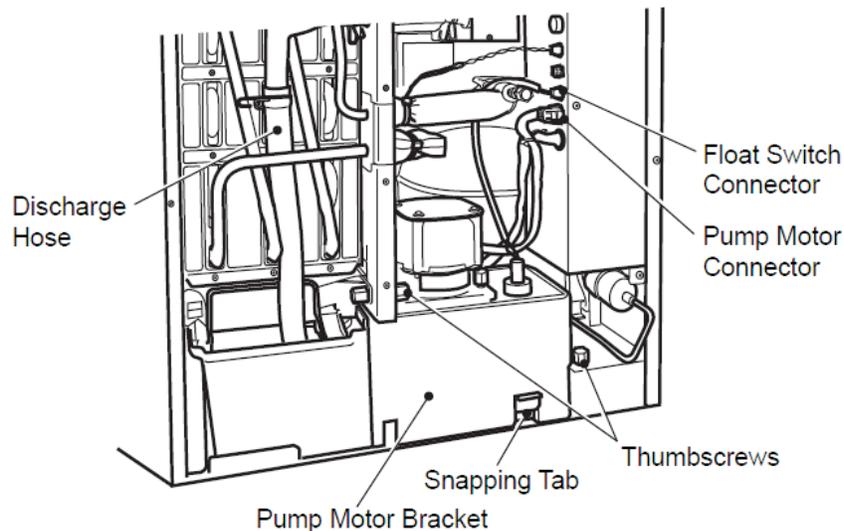
## **13. DRAIN VALVE, CLEANING VALVE**

- 1) Turn off the power supply.
- 2) Close the water supply tap.
- 3) Remove the panels.
- 4) Disconnect the connector of the drain valve/cleaning valve lead.
- 5) Remove the hose clamps at the inlet and outlet sides.
- 6) Remove the rubber hoses at the inlet and outlet sides.

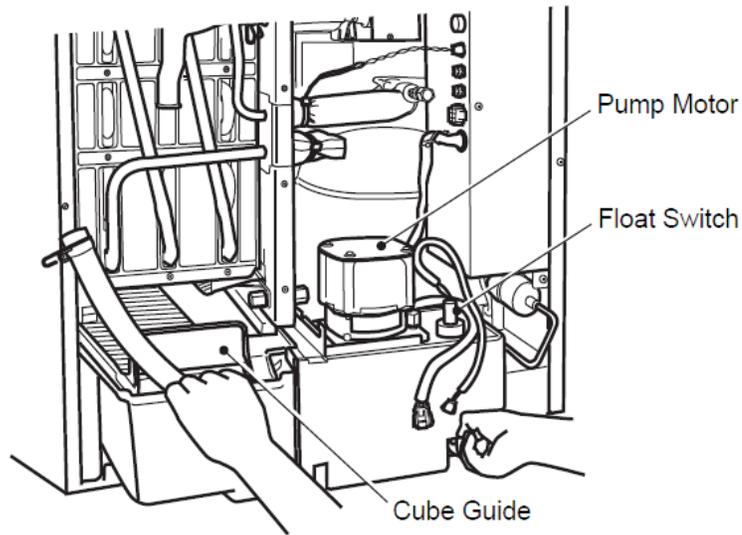
- 7) Remove the two mounting screws.
- 8) Install the new valve in the reverse order of the removal procedure.
- 9) Open the water supply tap.
- 10) Plug in the icemaker or connect the power source.
- 11) Check for leaks.
- 12) Refit the panels in their correct positions.

## 14. WATER TANK

- 1) Remove the front panel, then remove the front insulation
- 2) Loosen the two thumbscrews securing the pump motor bracket



- 3) Move the control switch to the "SERVICE" position. Move the service switch to the "DRAIN" position.
- 4) Let the icemaker run for 2 minutes.
- 5) Move the control switch to the "OFF" position.
- 6) Turn off the power supply.
- 7) Disconnect the pump motor and float switch connector from the side of the control box.
- 8) Keep pushing up the snapping tab at the right side of the pump motor bracket.
- 9) Pull out the water tank, cube guide, pump motor bracket, pump motor and float switch together.



10) Install the new water tank in the reverse order of the removal procedure.

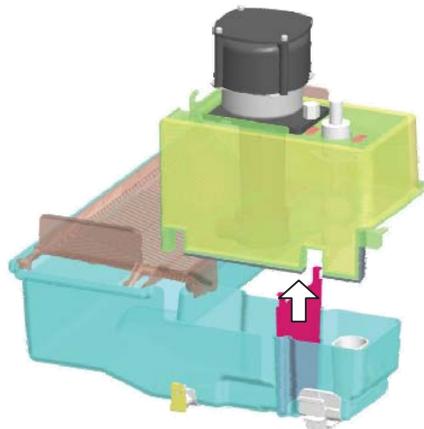
11) Refit the panels in their correct positions.

12) Turn on the power supply.

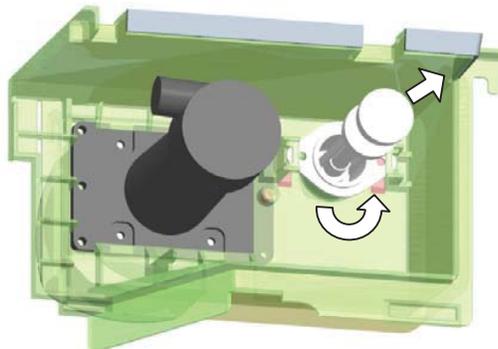
## 15. FLOAT SWITCH

1) Remove the pump motor bracket. See "V. 14. WATER TANK."

2) Pull up the pump motor bracket from the water tank.



3) Flip over the pump motor bracket assembly, then twist off the float switch and pull out towards you.



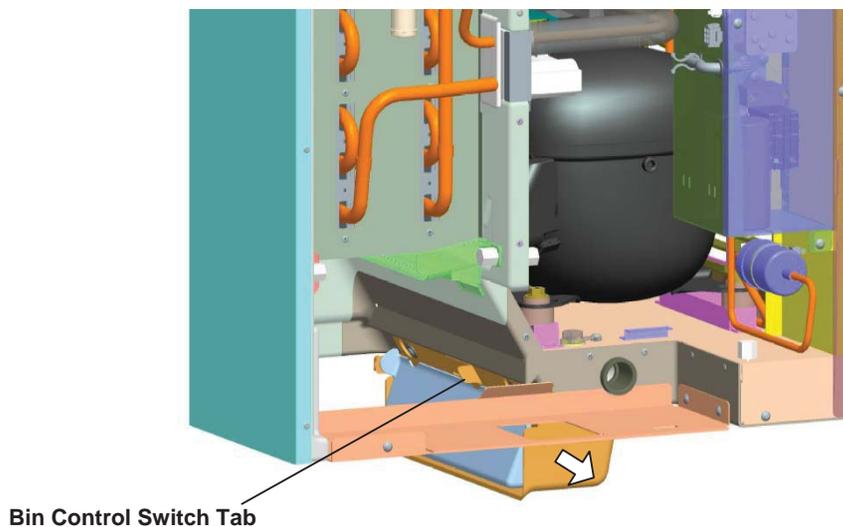
- 4) Install the new float switch in the reverse order of the removal procedure.
- 5) Refit the panels in their correct positions.
- 6) Turn on the power supply.

## 16. BIN CONTROL SWITCH

### CAUTION

Do not drop or impact the bin control switch. The reed switch inside may be damaged.

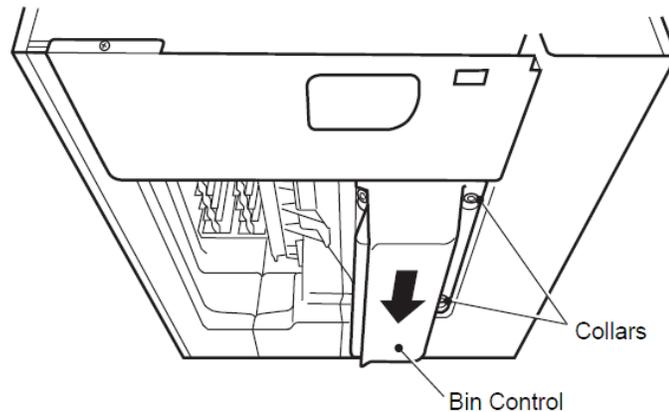
- 1) Remove the water tank. See "V. 14. WATER TANK."
- 2) Disconnect the connector of the bin control switch lead (black).
- 3) Pull out the bin control switch tab outside and slide the bin control switch towards you.



- 4) Take out the bin control.
- 5) Install the new bin control switch.
- 6) Pass the bin control connector through the hole from the bottom to the top of the unit.
- 7) While pulling up the bin control lead, hook the bin control on the right side interior wall. Then push the bin control up against the bottom of the unit, and slide to the back until it snaps in place. Make sure the slotted holes at the right side of the bin control are securely placed on the collars at the bottom of the unit.

## CAUTION

Make sure the bin control is securely in place. Otherwise, ice may get between gaps and damage the bin control.



- 8) Connect the bin control connector to the side of the control box.
- 9) Replace the water tank, cube guide, pump motor bracket, pump motor and float switch in their correct positions until they snap in place.

## CAUTION

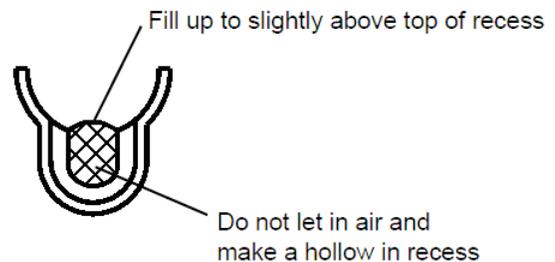
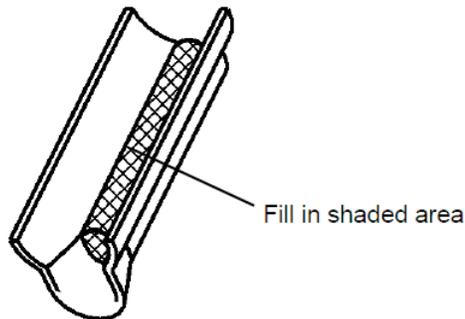
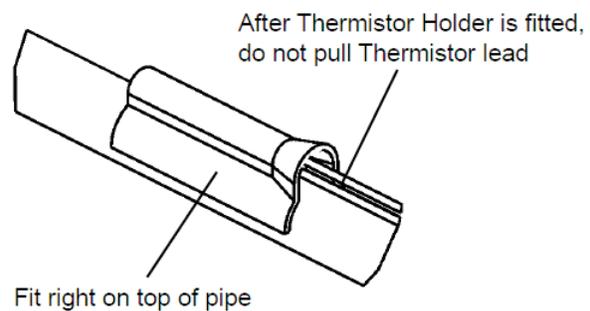
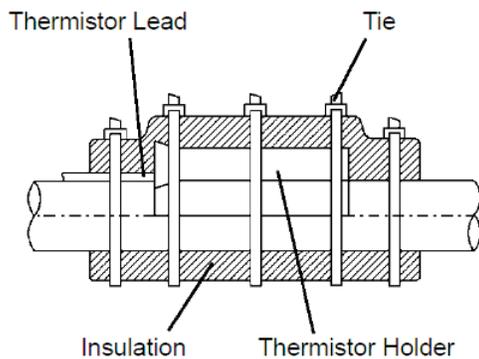
Be sure to let the discharge hose pass behind the copper tube and connect it securely in position. Otherwise, the discharge hose may be caught in the front insulation, leading to improper results.

- 10) Secure the pump motor bracket with the two thumbscrews.
- 11) Reconnect the pump motor connector and float switch connector.
- 12) Replace the front insulation and front panel in their correct positions.
- 13) Turn on the power supply.

## 17. THERMISTOR

- 1) Turn off the power supply.
- 2) Remove the panels.
- 3) Disconnect the connector of the thermistor lead (orange).

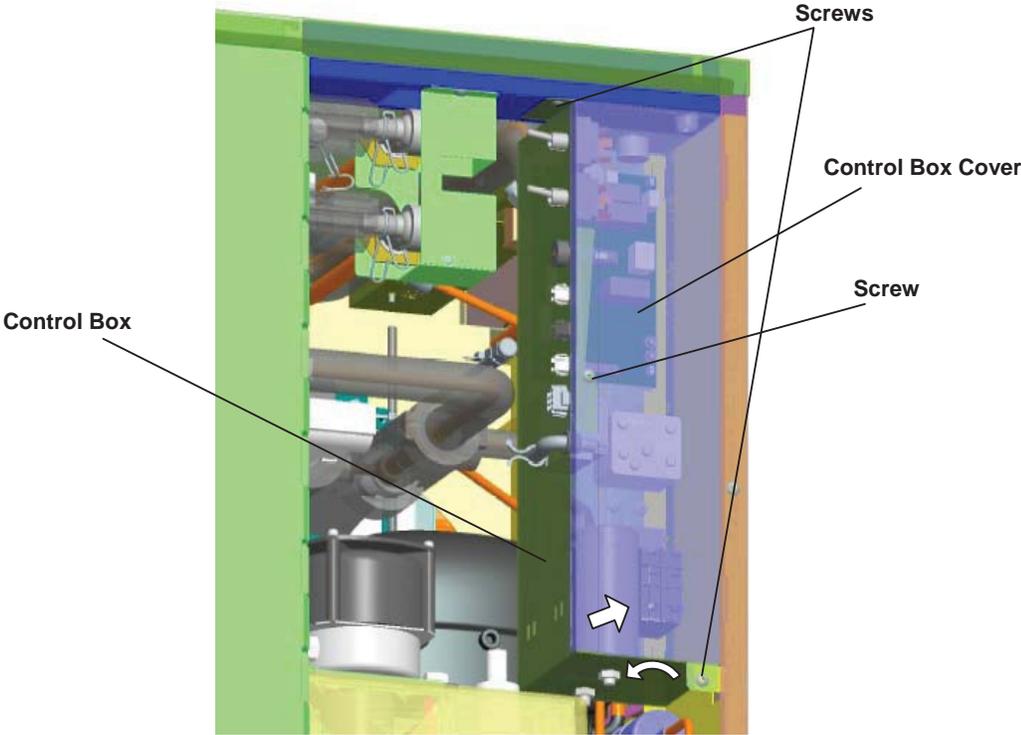
- 4) Remove the ties, insulation, thermistor holder, and thermistor in this order.
- 5) Remove the old sealant from the thermistor holder and suction pipe.
- 6) Wipe off any moisture or condensation from the suction pipe surfaces.
- 7) Press a tube of the sealant KE 60RTV, manufactured by Shin-Etsu Silicones, to the recess of the thermistor holder. Slowly squeeze the sealant out of the tube and spread it smoothly in the recess. Do not use any sealant other than the above.
- 8) Attach the new thermistor in position on the suction pipe and press down the thermistor holder over the thermistor. Be careful not to damage the thermistor lead. Cover the parts with the insulation and secure them with the ties. Keep the thermistor inside the thermistor holder. After the thermistor holder is fitted, do not pull the thermistor lead to move the thermistor.
- 9) Refit the removed parts in the reverse order of the removal procedure.
- 10) Turn on the power supply.



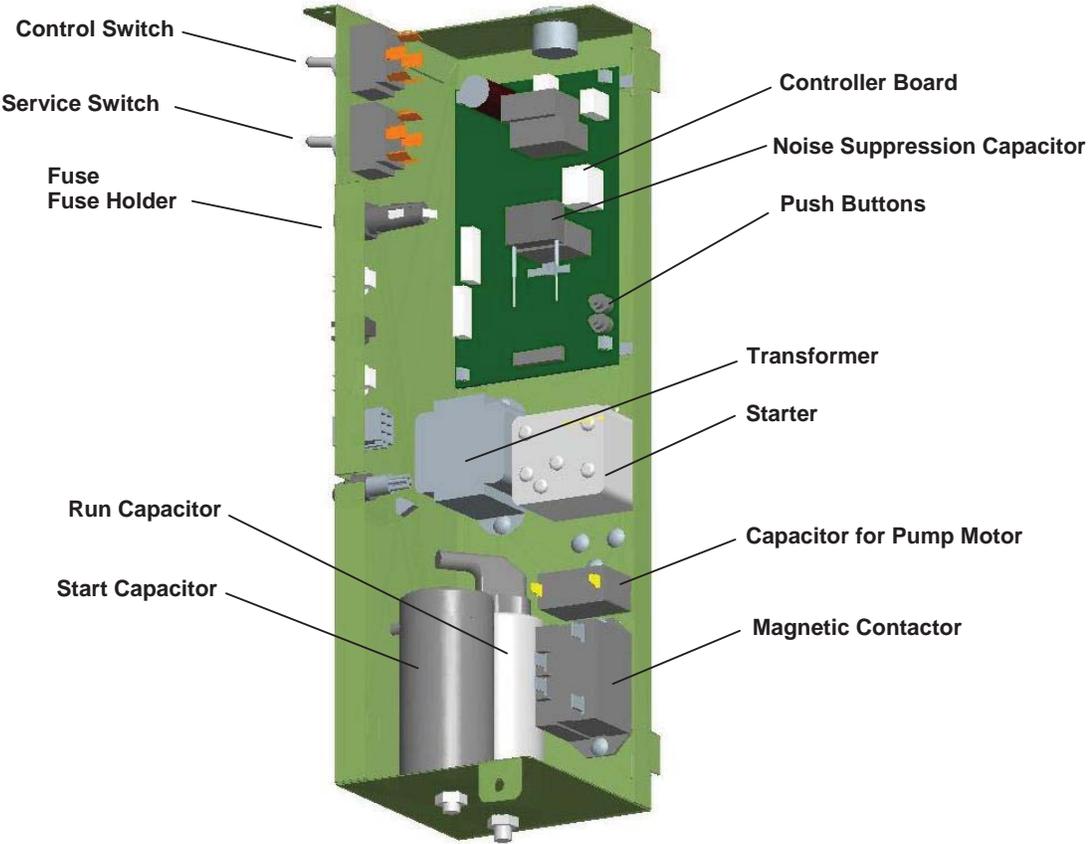
## 18. CONTROL BOX

- 1) Turn off the power supply.
- 2) Remove the front panel.
- 3) Remove the one mounting screw, and pull the control box cover.
- 4) Remove the two mounting screws, and pivot the control box to the left side slightly and pull the control box towards you if needed.

5) Refit the removed parts in the reverse order of the removal procedure.



Note: After replacing the components inside the control box, connect and tie the wires properly in their correct position. Especially make sure that the harness does not press the push buttons on the control board.



### **[a] CONTROL & SERVICE SWITCH**

- 1) Disconnect the tab terminals and remove the nut securing the power switch.
- 2) Install the new switch in the reverse order of the removal procedure.
- 3) To prevent miswiring, check the terminal numbers and lead wire colors with the wiring label.

### **[b] FUSE**

- 1) Use a phillips head screwdriver to remove the fuse holder cap and take out the fuse.
- 2) Install the new fuse in the reverse order of the removal procedure.

### **[c] FUSE HOLDER**

- 1) Disconnect the tab terminal and remove the nut securing the fuse holder.
- 2) Install the new fuse holder in the reverse order of the removal procedure.

### **[d] CONTROL BOARD**

- 1) Disconnect all the connectors.
- 2) Remove the four board supports secured to the control box to release the control board.
- 3) Install the new control board in the reverse order of the removal procedure.
- 4) Check the dip switch for proper setting.
- 5) When reconnecting the connectors, do not push them too hard. The control board may be damaged.

### **[e] MAGNETIC CONTACTOR**

- 1) Disconnect the tab terminals, remove the mounting screw or pull the tub of bracket to release the magnetic contactor, and lift off the magnetic contactor.
- 2) Install the new magnetic contactor in the reverse order of the removal procedure.

### **[f] CONTROL BOARD TRANSFORMER**

- 1) Disconnect the connectors and closed end connectors connecting the control board. (The tie securing the harness may be removed. But be careful not to break the lead wires.)
- 2) Remove the mounting screws.
- 3) Install the new transformer in the reverse order of the removal procedure.

### **[g] STARTER**

- 1) Disconnect the terminals, remove the mounting screw.
- 2) Install the new starter in the reverse order of the removal procedure.
- 3) To prevent miswiring, check the terminal numbers and lead wire colors with the wiring label.

### **[h] RUN CAPACITOR**

- 1) Disconnect the terminals on the starter and remove the nut securing the run capacitor.
- 2) Install the new run capacitor in the reverse order of the removal procedure.
- 3) To prevent miswiring, check the terminal numbers and lead wire colors with the wiring label.

### **[i] START CAPACITOR**

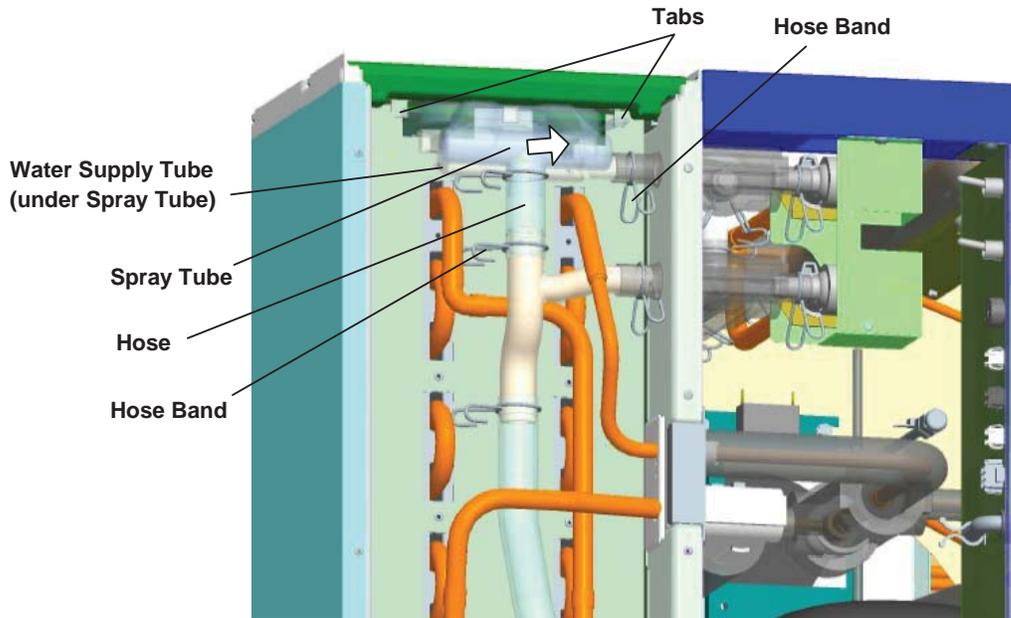
- 1) Disconnect the terminals on the starter and remove the nut securing the run capacitor.
- 2) Install the new run capacitor in the reverse order of the removal procedure.
- 3) To prevent miswiring, check the terminal numbers and lead wire colors with the wiring label.

### **[j] CAPACITOR FOR PUMP MOTOR**

- 1) Disconnect the tab terminals, remove the screw.
- 2) Install the new capacitor in the reverse order of the removal procedure.

## **19. SPRAY TUBE, WATER SUPPLY TUBE, SPRAY GUIDE**

- 1) Turn off the power supply.
- 2) Remove the panels and front insulation.
- 3) Remove the hose band connecting the hose.
- 4) Push the tabs on both sides of the spray tube to release the spray tube.
- 5) Pull the spray tube towards you.



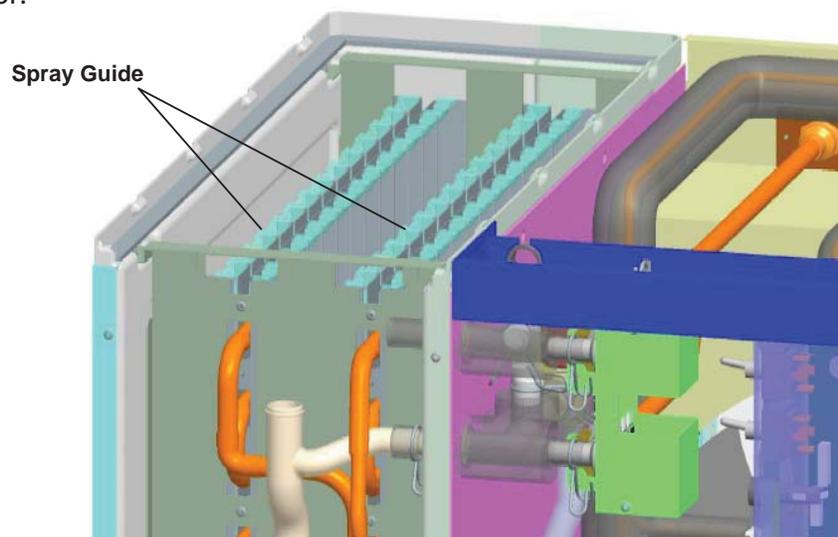
6) The spray tube is easily cleanable by removing the black rubber caps on the ends.

7) Remove the hose band connecting the water supply tube.

8) Pull the water supply tube towards you.

9) Remove the top insulation.

10) The spray guide is located under the water supply tube. Pull off the spray guide from the evaporator.



11) Refit the removed parts in the reverse order of the removal procedure. Check for water leaks.

### IMPORTANT

Fit the spray guide securely and tightly on the evaporator fin. Otherwise, cloudy or irregular ice cubes or performance reduction may be caused.

## 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.

### 1. CLEANING

#### 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. Carefully follow any instructions provided with the bottles of cleaning and sanitizing solution.
4. Always wear liquid-proof gloves to prevent the cleaning and sanitizing solutions from coming into contact with skin.
5. To prevent damage to the water pump, do not leave the control switch in the "SERVICE" position for extended periods of time when the water tank is empty.

#### [a] CLEANING PROCEDURE

1) Dilute approximately 9.5 fl. oz. (281 ml) of recommended cleaner Hoshizaki "Scale Away" or "LIME-A-WAY" (Economics Laboratory, Inc.) with 1.8 gallon (6.8 lit.) of water.

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

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

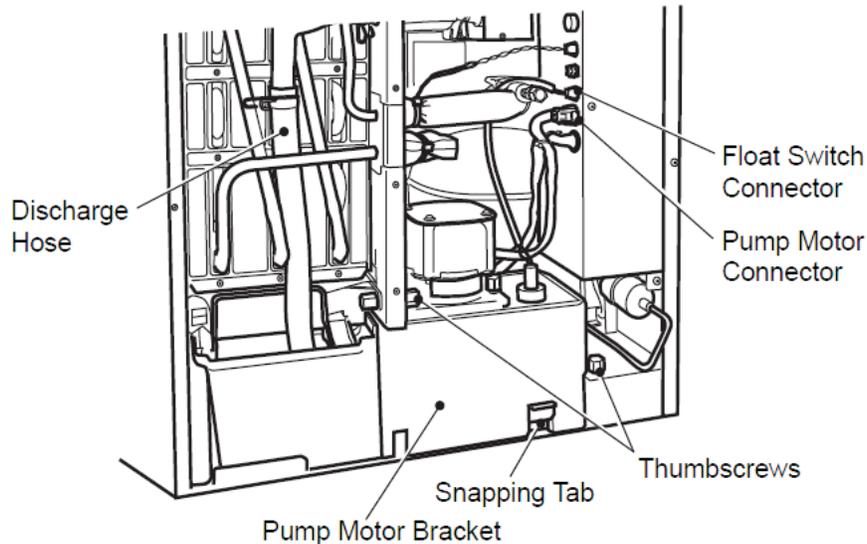
3) Turn off the power supply.

4) Remove the front panel and move the control switch to the "SERVICE" position. Move the service switch to the "DRAIN" position.

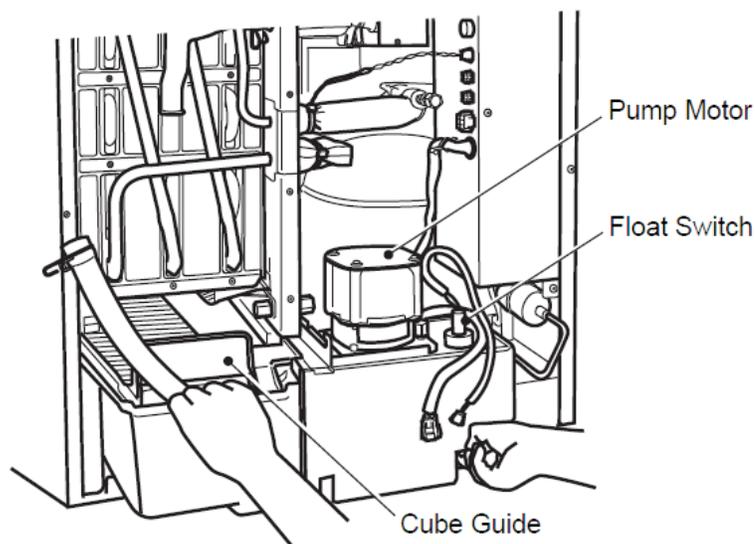
5) Replace the front panel in its correct position and turn on the power supply for 2 minutes.

6) Turn off the power supply.

- 7) Remove the front panel then remove the front insulation (the large insulation panel in front of the evaporator) by lifting up the panel slightly and pulling it towards you.
- 8) In bad or severe water conditions, clean the float switch as described below. Otherwise, continue to step 9.
  - a. Loosen the two thumbscrews securing the pump motor bracket.



- b. Disconnect the discharge hose.
  - c. Disconnect the pump motor connector and the float switch connector from the side of the control box.
  - d. Keep pushing up the snapping tab at the right side of the pump motor bracket.
  - e. Pull out the water tank, cube guide, pump motor bracket, pump motor and float switch together.



- f. Remove the pump motor bracket securing the pump motor and the float switch. Remove the float switch from the pump motor bracket.

- g. Wipe down the float switch housing, shaft and float with cleaning solution. Rinse the parts thoroughly with clean water.
- h. Replace the float switch in its correct position.
- i. Replace the removed parts in the reverse order of which they were removed.
- 9) Pour the cleaning solution into the water tank.
- 10) Move the service switch to the "WASH" position.
- 11) Replace the front insulation and the front panel in their correct positions.
- 12) Turn on the power supply to start the washing process.
- 13) Turn off the power supply after 30 minutes.
- 14) Remove the front panel.
- 15) Move the service switch to the "DRAIN" position.
- 16) Replace the front panel in its correct position and turn on the power supply for 2 minutes.
- 17) Turn off the power supply and remove the front panel.
- 18) Move the control switch to the "ICE" position.
- 19) Replace the front panel in its correct position.
- 20) Turn on the power supply to fill the water tank with water.
- 21) Turn off the power supply after 3 minutes.
- 22) Remove the front panel.
- 23) Move the control switch to the "SERVICE" position. Move the service switch to the "WASH" position.
- 24) Replace the front panel in its correct position.
- 25) Turn on the power supply to rinse off the cleaning solution.
- 26) Turn off the power supply after 5 minutes.
- 27) Remove the front panel.
- 28) Move the service switch to the "DRAIN" position.
- 29) Replace the front panel in its correct position and turn on the power supply for 2 minutes.
- 30) Turn off the power supply.

31) Remove the front panel.

32) Repeat steps 18 through 31 three more times to rinse thoroughly.

Note: If you do not sanitize the icemaker, go to step 14 in "Sanitizing Procedure."

### **[b] SANITIZING PROCEDURE – FOLLOWING CLEANING PROCEDURE**

1) Dilute a 5.25% sodium hypochlorite solution (chlorine bleach) with water (add approximately 0.9 fl. oz. (27 ml) to 1.8 gal. (6.8 lit.) of water).

2) Remove the front insulation.

3) Pour the sanitizing solution into the water tank.

4) Move the service switch to the "WASH" position.

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

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

7) Turn off the power supply after 15 minutes.

8) Remove the front panel.

9) Move the service switch to the "DRAIN" position.

10) Replace the front panel in its correct position and turn on the power supply for 2 minutes.

11) Turn off the power supply.

12) Remove the front panel.

13) Repeat steps 18 through 31 in "[a] CLEANING PROCEDURE" two times to rinse thoroughly.

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

15) Replace the front panel in its correct position.

16) Clean the storage bin/dispenser unit liner using a neutral cleaner. Rinse thoroughly after cleaning.

17) Turn on the power supply to start the automatic icemaking process.

## **2. MAINTENANCE**

### **IMPORTANT**

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

### **[a] STAINLESS STEEL EXTERIOR**

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

### **[b] STORAGE BIN AND SCOOP**

- \* Wash your hands before removing ice. Use the plastic scoop provided (bin accessory).
- \* The storage bin/dispenser unit is for ice use only. Do not store anything else in the storage bin/dispenser unit.
- \* Clean the scoop and the storage bin/dispenser unit liner using a neutral cleaner. Rinse thoroughly after cleaning.

### **[c] AIR FILTERS (AIR-COOLED MODEL ONLY)**

Plastic mesh air filters remove dirt and dust from the air, and keep the condenser from getting clogged. As the filters get clogged, the icemaker's performance will be reduced. Check the filters at least twice a month. When clogged, use warm water and a neutral cleaner to wash the filters.

### **[d] CONDENSER (AIR-COOLED MODEL ONLY)**

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.

## **3. PREPARING THE ICEMAKER FOR LONG STORAGE**

### **CAUTION**

1. When shutting off the icemaker for an extended time, drain out all water from the water line and remove the ice from the storage bin/dispenser unit. The storage bin/dispenser unit 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.
2. To prevent damage to the water pump, do not leave the control switch in the "SERVICE" position for extended periods of time when the water tank is empty.

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. On water-cooled model only, first remove the water from the water-cooled condenser:**

- 1) Turn off the power supply and 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) Replace the front panel in its correct position and turn on the power supply.
- 6) Allow 5 minutes for the icemaker to fill with water and the water pump to start operating.
- 7) Close the condenser water supply line shut-off valve.
- 8) Open the condenser water supply line drain valve.
- 9) Allow the line to drain by gravity.
- 10) Attach compressed air or carbon dioxide supply to the condenser water supply line drain valve.
- 11) Blow the condenser out using compressed air or carbon dioxide until water stops coming out.
- 12) Close the condenser water supply line drain valve.

**2. Remove the water from the icemaker water supply line:**

- 1) Turn off the power supply and remove the front panel.
- 2) Move the control switch on the control box to the "OFF" position.
- 3) Close the icemaker water supply line shut-off valve and open the icemaker water supply line drain valve.
- 4) Allow the line to drain by gravity.
- 5) Attach compressed air or carbon dioxide supply to the icemaker water supply line drain valve.
- 6) Move the control switch to the "ICE" position.
- 7) Replace the front panel in its correct position and turn on the power supply.
- 8) Blow the icemaker water supply line out using compressed air or carbon dioxide.

**3. Drain the water tank:**

- 1) Turn off the power supply and remove the front panel.
- 2) Move the control switch to the "SERVICE" position and move the service switch to the "DRAIN" position.
- 3) Replace the front panel in its correct position and turn on the power supply for 2 minutes.

- 4) Turn off the power supply and remove the front panel.
- 5) Move the control switch to the "OFF" position.
- 6) Replace the front panel in its correct position.
- 7) Remove all ice from the storage bin/dispenser unit, and clean the storage bin/dispenser unit.
- 8) Close the icemaker water supply line drain valve.