NO. U1HJ-178
ISSUED: FEB. 27, 1990
REVISED: MAR. 16, 1992

HOSHIZAKI AMERICA, INC.

HOSHIZAKI
MODULAR CRESCENT CUBER

MODEL KM-450MAB
KM-450MWB
KM-450MRB

SERVICE MANUAL

FOREWORD

This Service Manual contains the specifications and information in regard to transporting, unpacking, installing, operating and servicing the machine. You are encouraged to read it thoroughly in order to obtain maximum performance. You will find details on the construction, installation and maintenance.

If you encounter any problem not covered in this Service Manual, feel free to contact Hoshizaki America, Inc. We will be happy to provide whatever assistance is necessary.

Keep this Service Manual handy, and read it again when questions arise.

HOSHIZAKI AMERICA, INC.

**618 HIGHWAY 74 SOUTH, PEACHTREE CITY,
GEORGIA 30269 U.S.A.
PHONE: 404-487-2331**

U1HJ1789002

CONTENTS

I. SPECIFICATIONS

1. NAMEPLATE RATING

[a] KM-450MAB (Air-cooled)

See NAMEPLATE for electrical and refrigeration specifications. This nameplate is located on the upper right hand side of rear panel.

Since this nameplate is located on the rear panel of the icemaker, it cannot be read when the back of the icemaker is against a wall or against another piece of kitchen equipment. Therefore, the necessary electrical and refrigeration information is now also on the rating label, which can be easily seen by removing only the front panel of the icemaker.

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

[b] KM-450MWB (Water-cooled)

See NAMEPLATE for electrical and refrigeration specifications. This nameplate is located on the upper right hand side of rear panel.

Since this nameplate is located on the rear panel of the icemaker, it cannot be read when the back of the icemaker is against a wall or against another piece of kitchen equipment. Therefore, the necessary electrical and refrigeration information is now also on the rating label, which can be easily seen by removing only the front panel of the icemaker.

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[c] KM-450MRB (Remote Air-cooled)

See NAMEPLATE for electrical and refrigeration specifications. This nameplate is located on the upper right hand side of rear panel.

Since this nameplate is located on the rear panel of the icemaker, it cannot be read when the back of the icemaker is against a wall or against another piece of kitchen equipment. Therefore, the necessary electrical and refrigeration information is now also on the rating label, which can be easily seen by removing only the front panel of the icemaker.

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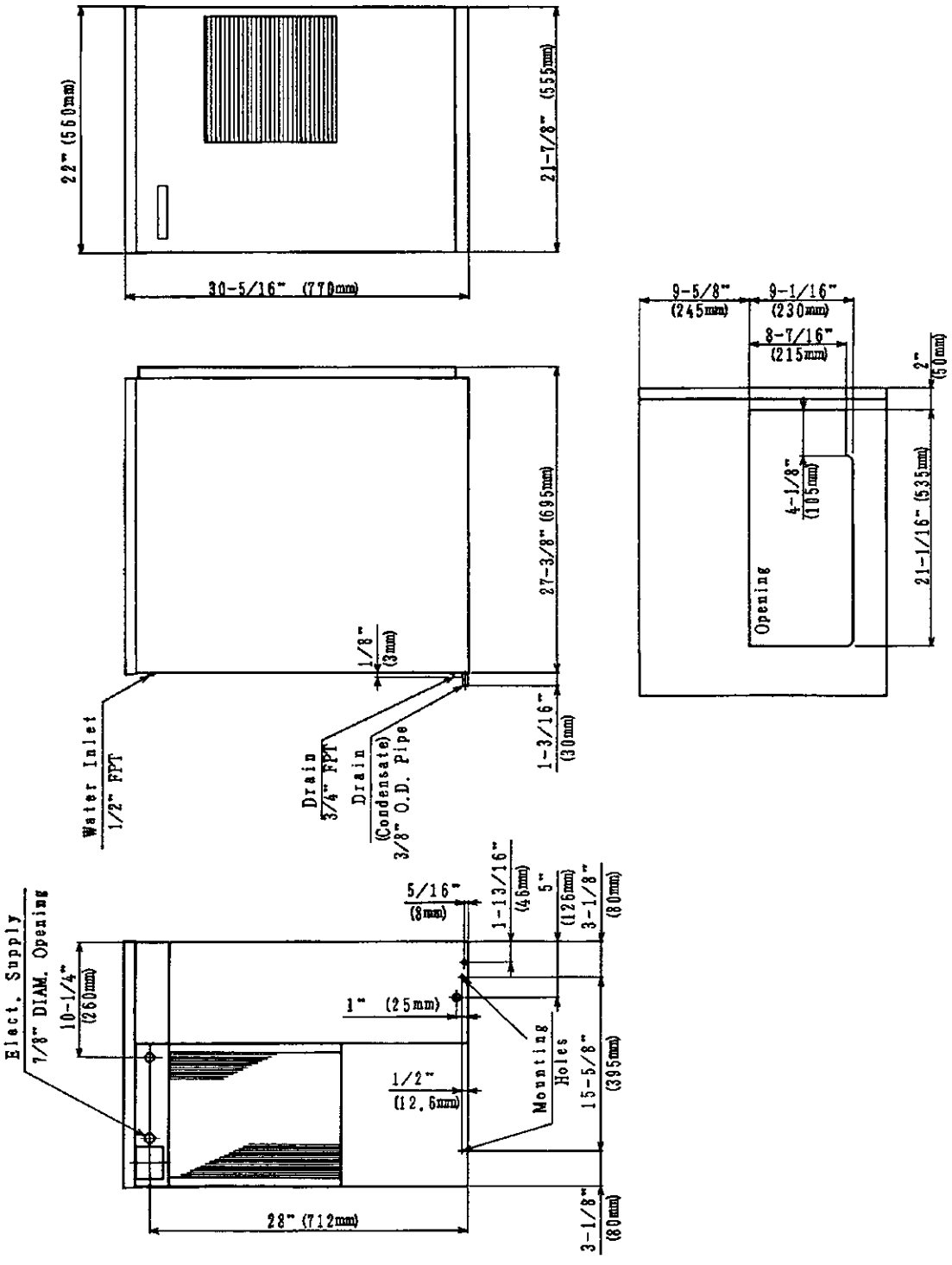
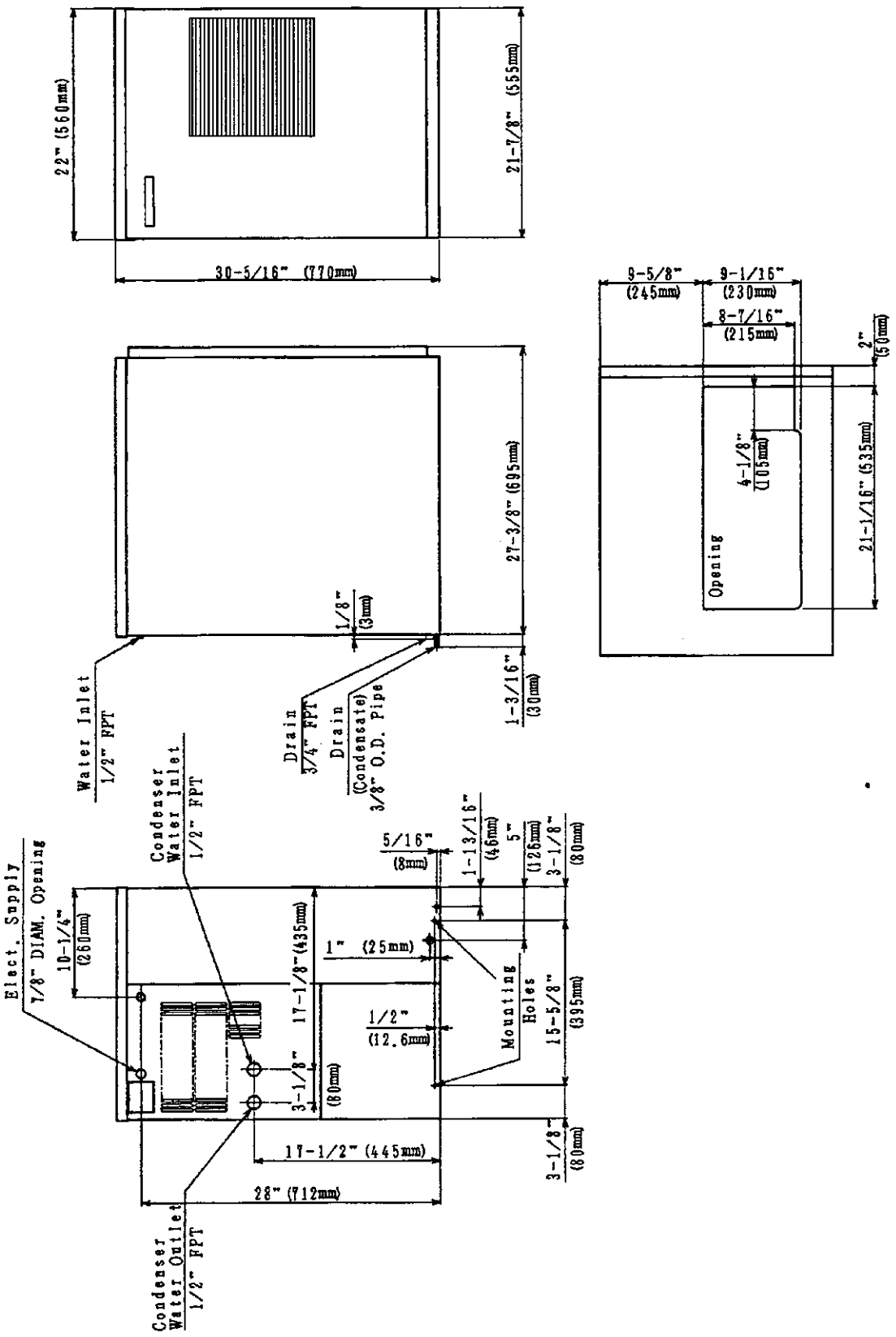
2. DIMENSIONS/CONNECTIONS

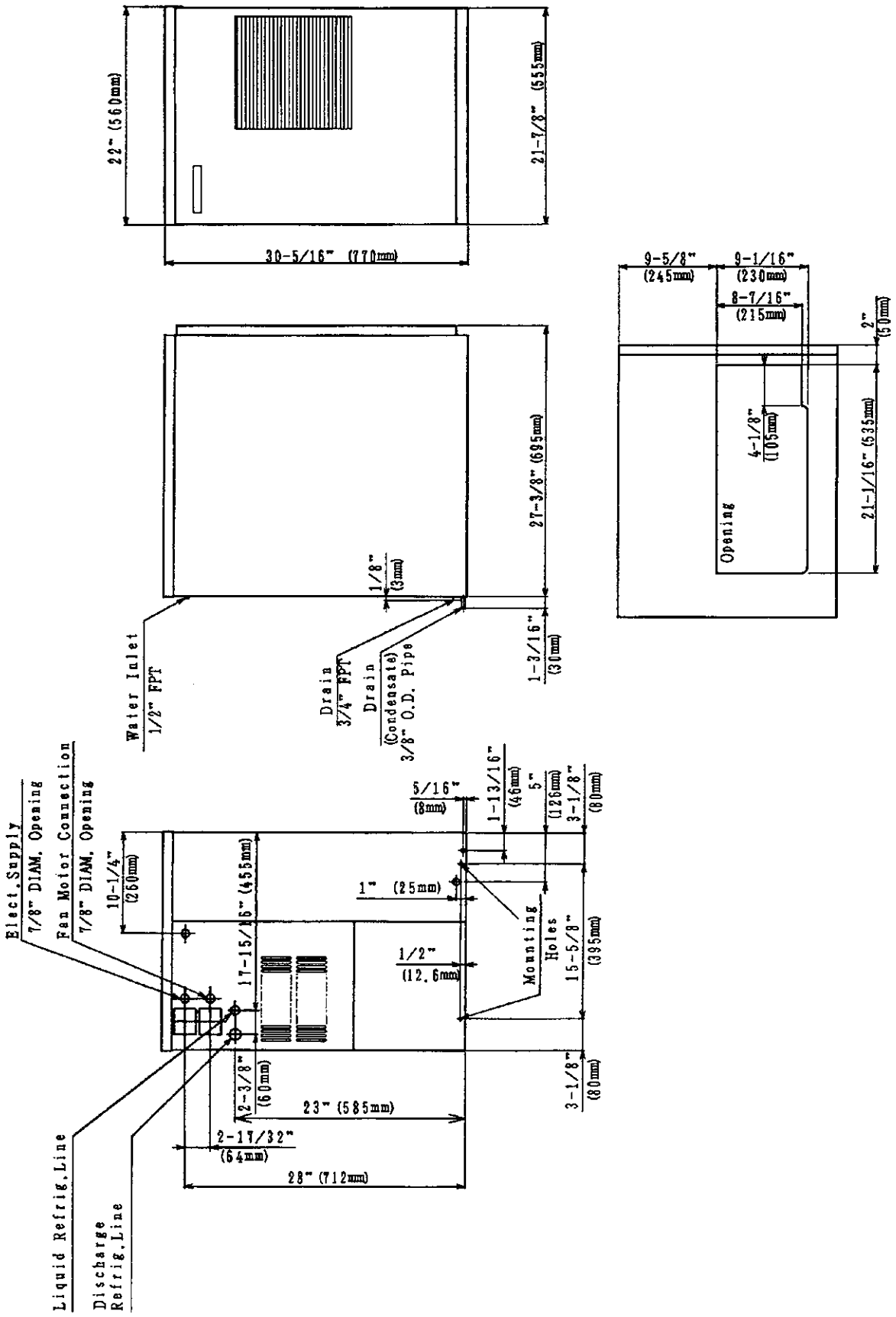
[a] KM-450MAB



[b] KM-450MWB


22" (560mm)
21-7/8" (555mm)
30-5/16" (770mm)
9-5/8" (245mm)
9-1/16" (230mm)
8-7/16" (215mm)
2" (50mm)
4-1/8" (105mm)
Opening
21-1/16" (535mm)
27-3/8" (695mm)
1/8" (3mm)
1-3/16" (30mm)
Water Inlet 1/2" FPT
Drain 3/4" FPT
Drain (Condensate) 3/8" O.D. Pipe
Condenser Water Inlet 1/2" FPT
Elect. Supply 7/8" DIAM. Opening
10-1/4" (260mm)
5/16" (8mm)
1-13/16" (46mm)
5" (126mm)
3-1/8" (80mm)
17-1/8" (435mm)
1" (25mm)
1/2" (12.6mm)
Mounting Holes
15-5/8" (395mm)
3-1/8" (80mm)
17-1/2" (445mm)
28" (712mm)
Condenser Water Outlet 1/2" FPT

[c] KM-450MRB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8-7/16" (215mm)
2" (50mm)
4-1/8" (105mm)
Opening
21-1/16" (535mm)
Elect.Supply 7/8" DIAM. Opening
Fan Motor Connection 7/8" DIAM. Opening
10-1/4" (260mm)
17-15/16" (455mm)
5/16" (8mm)
1-13/16" (46mm)
5" (126mm)
3-1/8" (80mm)
1" (25mm)
1/2" (12.6mm)
Mounting Holes
15-5/8" (395mm)
2-3/8" (60mm)
23" (585mm)
2-17/32" (64mm)
28" (712mm)
Liquid Refrig.Line
Discharge Refrig.Line

3. SPECIFICATIONS

[a] KM-450MAB

AC SUPPLY VOLTAGE	115-120/60/1
AMPERAGE	12 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	*460(209)	410(186)	350(159)
80	420(190)	370(168)	330(150)
90	375(170)	*340(154)	300(136)
100	340(154)	295(133)	260(118)

SHAPE OF ICE	Crescent Cube
ICE PRODUCTION PER CYCLE	10.4 lbs. (4.7 kg) 480 pcs.
APPROXIMATE STORAGE CAPACITY	N/A
ELECTRIC & WATER CONSUMPTION	90° F/ 70° F 70° F/ 50° F
ELECTRIC W (KWH/100 lbs.)	1150 (8.1) 1050 (5.5)
WATER gal./24HR (gal./100 lbs.)	114 (33.5) 198 (43.0)
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)
WEIGHT	Net 150 lbs.(68 kg), Shipping 170 lbs.(77 kg)
CONNECTIONS - ELECTRIC	Permanent Connection
- WATER SUPPLY	Inlet 1/2" FPT
- DRAIN	Outlet 3/4" FPT 3/8" OD Pipe
CUBE CONTROL SYSTEM	Float Switch
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer
ICE MAKING WATER CONTROL	Timer Controlled, Overflow Pipe
COOLING WATER CONTROL	N/A
BIN CONTROL SYSTEM	Thermostat
COMPRESSOR	Hermetic, Model JSL5-0075-CAA
CONDENSER	Air-cooled, Fin and Tube type
EVAPORATOR	Vertical type, Stainless Steel and Copper
REFRIGERANT CONTROL	Thermostatic Expansion Valve
REFRIGERANT CHARGE	R502, 1 lb. 10 oz. (750 g)
DESIGN PRESSURE	High 380 PSIG, Low 206 PSIG
P.C.BOARD CIRCUIT PROTECTION	High Voltage Cut-out Relay
COMPRESSOR PROTECTION	Auto-reset Overload Protector (External)
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch
LOW WATER PROTECTION	Float Switch
ACCESSORIES - SUPPLIED	Check Valve, Elbow, Nipple
- REQUIRED	Ice Storage Bin
OPERATION CONDITIONS	VOLTAGE RANGE 104 - 132 V
	AMBIENT TEMP. 45 - 100° F
	WATER SUPPLY TEMP. 45 - 90° F
	WATER SUPPLY PRESS. 7 - 113 PSIG

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

[b] KM-450MWB

AC SUPPLY VOLTAGE	115-120/60/1
AMPERAGE	10.5 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 ǂmarks

Ambient Temp. (° F)	Water Temp. (° F) 50	70	90
70	ǂ490(222)	425(193)	360(163)
80	485(220)	420(190)	350(159)
90	475(215)	ǂ420(190)	330(150)
100	460(209)	395(179)	330(150)

SHAPE OF ICE	Crescent Cube
ICE PRODUCTION PER CYCLE	10.4 lbs. (4.7 kg) 480 pcs.
APPROXIMATE STORAGE CAPACITY	N/A
ELECTRIC & WATER CONSUMPTION	90° F/ 70° F 70° F/ 50° F
ELECTRIC W (KWH/100 lbs.)	1020 (5.8) 980 (4.8)
WATER gal./24HR (gal./100 lbs.)	1062 (252.9) 816 (166.5)
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)
WEIGHT	Net 146 lbs.(66 kg), Shipping 170 lbs.(77 kg)
CONNECTIONS - ELECTRIC	Permanent Connection
- WATER SUPPLY	Inlet 1/2" FPT Cond. Inlet 1/2" FPT
- DRAIN	Outlet 3/4" FPT 3/8" OD Pipe
	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	Thermostat
COMPRESSOR	Hermetic, Model JSL5-0075-CAA
CONDENSER	Water-cooled, Tube in Tube type
EVAPORATOR	Vertical type, Stainless Steel and Copper
REFRIGERANT CONTROL	Thermostatic Expansion Valve
REFRIGERANT CHARGE	R502, 1 lb. 1 oz. (470 g)
DESIGN PRESSURE	High 290 PSIG, Low 206 PSIG
P.C.BOARD CIRCUIT PROTECTION	High Voltage Cut-out Relay
COMPRESSOR PROTECTION	Auto-reset Overload Protector (External)
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch
LOW WATER PROTECTION	Float Switch
ACCESSORIES - SUPPLIED	Check Valve, Elbow, Nipple
- REQUIRED	Ice Storage Bin
OPERATION CONDITIONS	VOLTAGE RANGE 104 - 132 V
	AMBIENT TEMP. 45 - 100° F
	WATER SUPPLY TEMP. 45 - 90° F
	WATER SUPPLY PRESS. 7 - 113 PSIG

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[c] KM-450MRB

AC SUPPLY VOLTAGE	115-120/60/1
AMPERAGE	12 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	*470(213)	430(195)	380(172)
80	430(195)	400(181)	360(163)
90	400(181)	*370(168)	330(150)
100	360(163)	330(150)	290(132)

SHAPE OF ICE	Crescent Cube
ICE PRODUCTION PER CYCLE	10.4 lbs. (4.7 kg) 480 pcs.
APPROXIMATE STORAGE CAPACITY	N/A
ELECTRIC & WATER CONSUMPTION	90° F/ 70° F 70° F/ 50° F
ELECTRIC W (KWH/100 lbs.)	1140 (7.4) 1080 (5.5)
WATER gal./24HR (gal./100 lbs.)	141 (38.1) 210 (44.7)
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)
WEIGHT	Net 143 lbs.(65 kg), Shipping 170 lbs.(77 kg)
CONNECTIONS - ELECTRIC	Permanent Connection
- WATER SUPPLY	Inlet 1/2" FPT
- DRAIN	Outlet 3/4" FPT 3/8" OD Pipe
CUBE CONTROL SYSTEM	Float Switch
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer
ICE MAKING WATER CONTROL	Timer Controlled, Overflow Pipe
COOLING WATER CONTROL	N/A
BIN CONTROL SYSTEM	Thermostat
COMPRESSOR	Hermetic, Model JSL5-0075-CAA
CONDENSER	Air-cooled remote, Condenser Unit URC-4A recommended
EVAPORATOR	Vertical type, Stainless Steel and Copper
REFRIGERANT CONTROL	Thermostatic Expansion Valve
REFRIGERANT CHARGE	R502, 5 lbs. 5 oz. (2400 g)
	(Ice maker 3 lbs. 8 oz. Cond. unit 1 lb. 13 oz.)
	High 330 PSIG, Low 206 PSIG
P.C.BOARD CIRCUIT PROTECTION	High Voltage Cut-out Relay
COMPRESSOR PROTECTION	Auto-reset Overload Protector (External)
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch
LOW WATER PROTECTION	Float Switch
ACCESSORIES - SUPPLIED	Check Valve, Elbow, Nipple
- REQUIRED	Ice Storage Bin
OPERATION CONDITIONS	VOLTAGE RANGE 104 - 132 V
	AMBIENT TEMP. 45 - 100° F
	WATER SUPPLY TEMP. 45 - 90° F
	WATER SUPPLY PRESS. 7 - 113 PSIG

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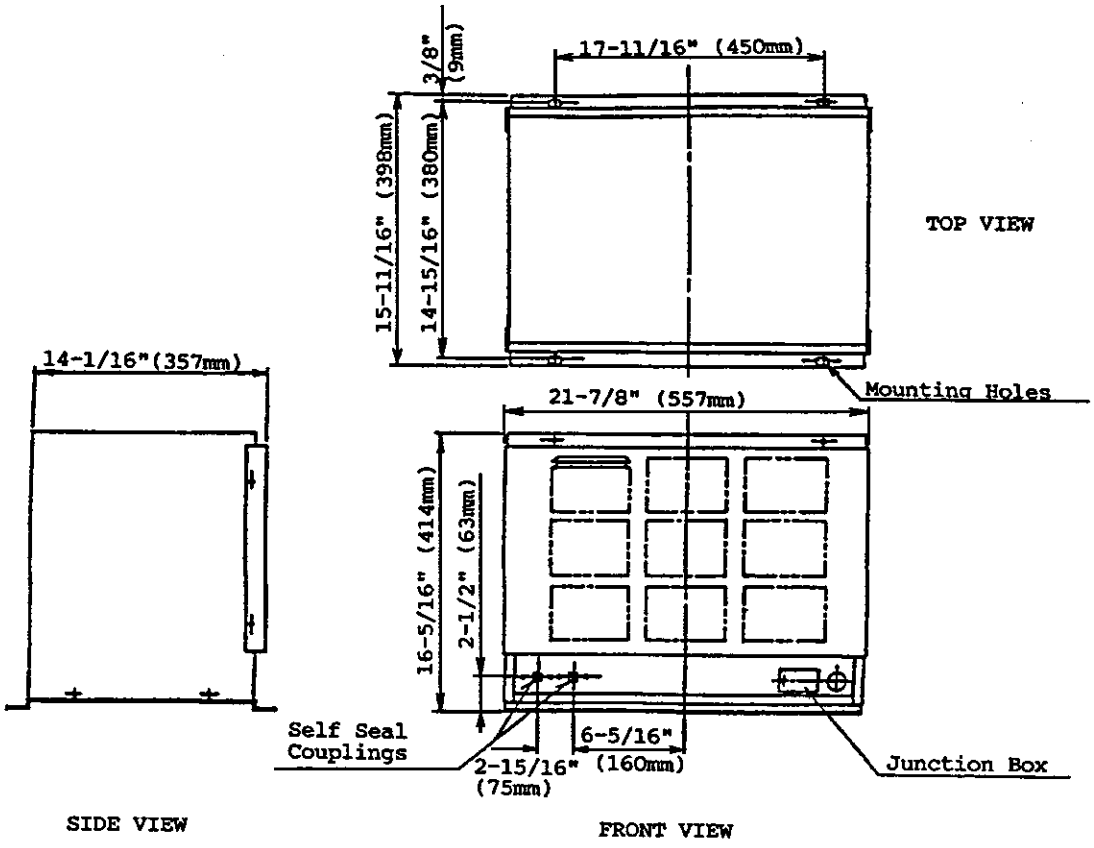
4. CONDENSER UNIT MODEL URC-4A



SPECIFICATIONS

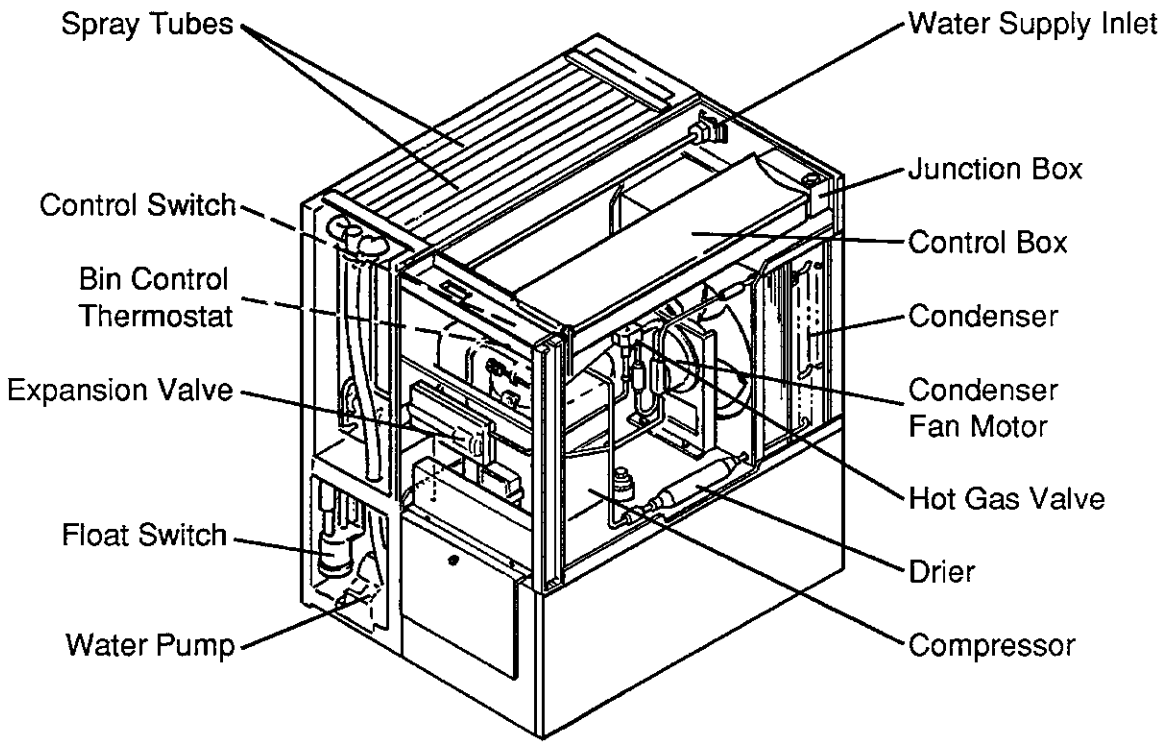
MODEL: CONDENSER UNIT
URC-4A

EXTERIOR	Galvanized Steel
DIMENSIONS (H x D x W)	16-5/16" x 15-11/16" x 21-7/8" (414mm x 398 x 557)
REFRIGERANT CHARGE	R502 1 lb. 12 oz. (800 g)
WEIGHT	Net 37 lbs. (17 kg) Shipping 44 lbs. (20 kg)
CONNECTIONS	
REFRIGERATION	Self Seal Couplings (Aeroquip)
ELECTRICAL	Junction Box - Fan Motor
HEAD PRESSURE CONTROL	Condensing Pressure Regulator
AMBIENT CONDITION	Min. -20°F - Max. +122°F (-29°C to +50°C) Full weather

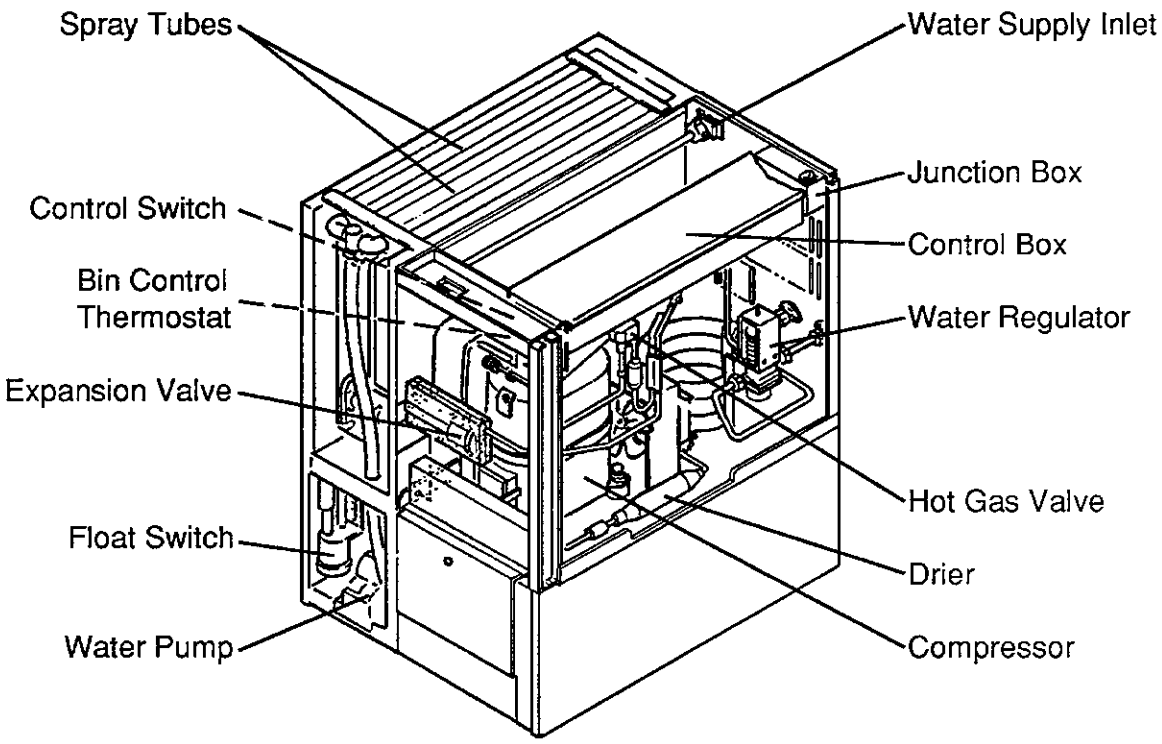
II. GENERAL INFORMATION

1. CONSTRUCTION

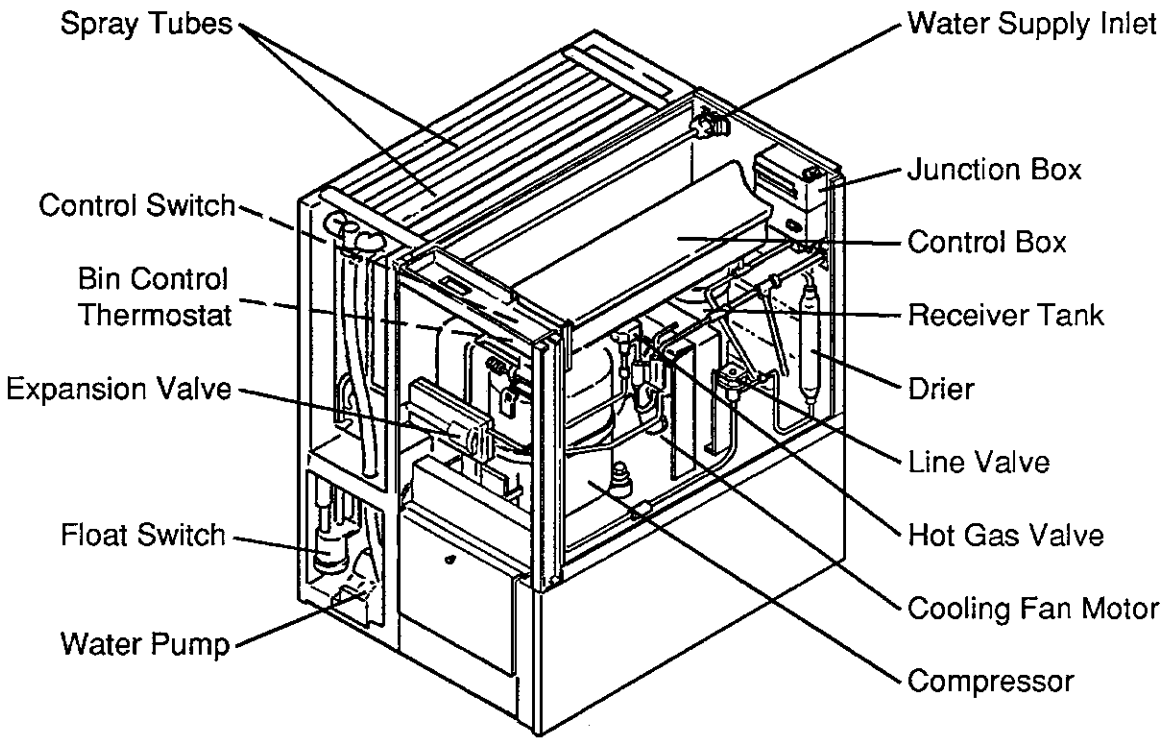
[a] KM-450MAB



[b] KM-450MWB


Spray Tubes
Water Supply Inlet
Junction Box
Control Switch
Control Box
Bin Control
Thermostat
Water Regulator
Expansion Valve
Hot Gas Valve
Float Switch
Drier
Water Pump
Compressor

[c] KM-450MRB


Spray Tubes
Water Supply Inlet
Junction Box
Control Switch
Control Box
Bin Control
Thermostat
Receiver Tank
Expansion Valve
Drier
Line Valve
Float Switch
Hot Gas Valve
Cooling Fan Motor
Water Pump
Compressor

2. CONTROLLER BOARD

[a] SOLID-STATE CONTROL

1) A HOSHIZAKI EXCLUSIVE solid-state control is employed in KM-450M series, modular crescent cubers.

2) A Printed Circuit Board (hereafter called "Controller Board") includes a stable and high quality control system.

3) All models are pretested and factory-adjusted.

[b] CONTROLLER BOARD

CAUTION

1. FRAGILE, handle very carefully.

2. A controller board contains integrated circuits, which are SUSCEPTIBLE TO FAILURE DUE TO STATIC DISCHARGE. It is especially important to touch the metal part of the unit when handling or replacing the board.

3. Do not touch the electronic devices on the board or at the back of the board to prevent damage to the board.

4. Do not change wiring and connections. Especially, never misconnect K3, K5 and K6, because the same connector is used for the Thermistor, Float Switch and Jumper.

5. Do not fix the electronic devices or parts on the board in the field. Always replace the whole board assembly when it goes bad.

6. Do not short out power supply to test for voltage.

A controller board, Part Code 2U0103-02, is used for KM-450M series. See "[c] SEQUENCE."

Note: (1) Maximum Water Supply Period - 6 minutes

Water Solenoid Valve opening, in the Defrost (Harvest) Cycle, is limited by maximum period. The Water Valve cannot remain open longer than the maximum period. The Water Valve can close in less than the maximum period if the defrost cycle is completed.

(2) Defrost Timer

The defrost cycle starts when the Float Switch opens and completes the freeze cycle. But the Defrost Timer does not start counting till the Thermistor senses 48°F at the Evaporator outlet. The period from the end of the freeze cycle up to the point of the Thermistor's sensing varies depending on the ambient and water temperatures.

(3) High Temperature Safety - 127 ± 7°F

The temperature of suction line in the refrigerant circuit is limited by the High Temperature Safety.
During the defrost cycle the Evaporator temperature rises. The Thermistor senses 48°F and starts the Defrost Timer. After the Defrost Timer counts down to zero, the normal freeze cycle begins. If the Evaporator temperature continues to rise, the Thermistor will sense the rise in temperature and at 127 ± 7°F the Thermistor operates the High Temperature Safety.
This High Temperature Safety shuts down the circuit and the icemaker automatically stops. To reset the safety, turn the power off and back on again.
This High Temperature Safety protects the unit from excessive temperature.

(4) Low Water Safety

If the Pump Motor is operated without water, the mechanical seal can fail. To prevent this type of failure, the Controller Board checks the position of the Float Switch at the end of the initial one minute water fill cycle and at the end of each defrost cycle.
If the Float Switch is in the up position (electrical circuit closed), the Controller Board changes to the ice making cycle. If the Float Switch is in the down position (electrical circuit open), the Controller Board changes to a one minute water fill cycle before starting the ice making cycle. This method allows for a Low Water Safety shut down to protect the Water Pump from mechanical seal failure.
For water-cooled model, if the water is shut off, the unit is protected by the High Pressure Switch.

(5) High Voltage Cut-out

The maximum allowable supply voltage of this icemaker is limited by the High Voltage Cut-out.
If miswiring (especially on single phase 3 wire models) causes excessive voltage on the Controller Board, the High Voltage Cut-out shuts down the circuit in 3 seconds and the icemaker automatically stops. When the proper supply voltage is resumed, the icemaker automatically starts running again.

Connector K1
Pin #1 thru #10

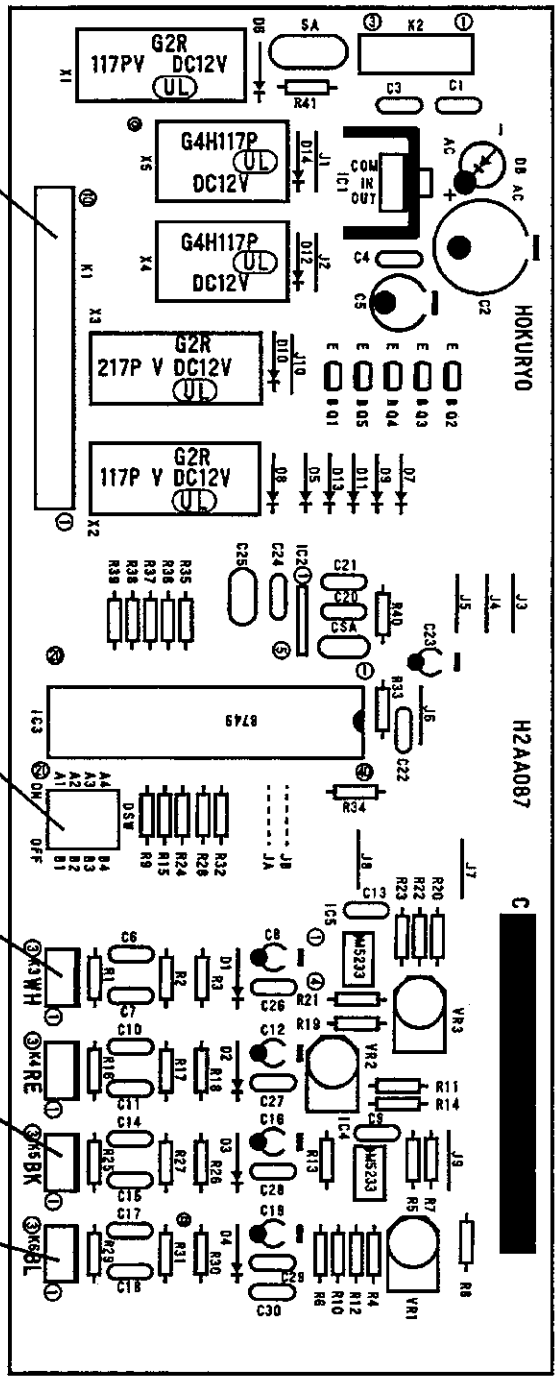
#1	Power (line, Bin Control)
#2	Hot Gas Valve
#3	Fan Motor, Line Valve (Remote Air -cooled)
#4	Pump Motor (icemaking)
#5	Pump Motor (drain)
#6	Water Valve
#7, 8	Open
#9	Magnetic Contactor
#10	Power (neutral)

* Dip Switch
Defrost Timer &
Drain Timer

Connector K3
Defrost Control
(Thermistor)

Connector K5
Float Switch

** Connector K6
Jumper Lead



Note: * Defrost Timer (Dip Switch No. 1 & 2) is adjustable,
Min. 1 minute to Max. 3 minutes.
Drain Timer (Dip Switch No. 3 & 4) is adjustable, Min. zero to Max.
20 seconds. Do not adjust it.

** On all models, Jumper Lead is required. See "[e] CHECKING CONTROLLER BOARD."

Fig. 1 Controller Board

[c] SEQUENCE

1st Cycle

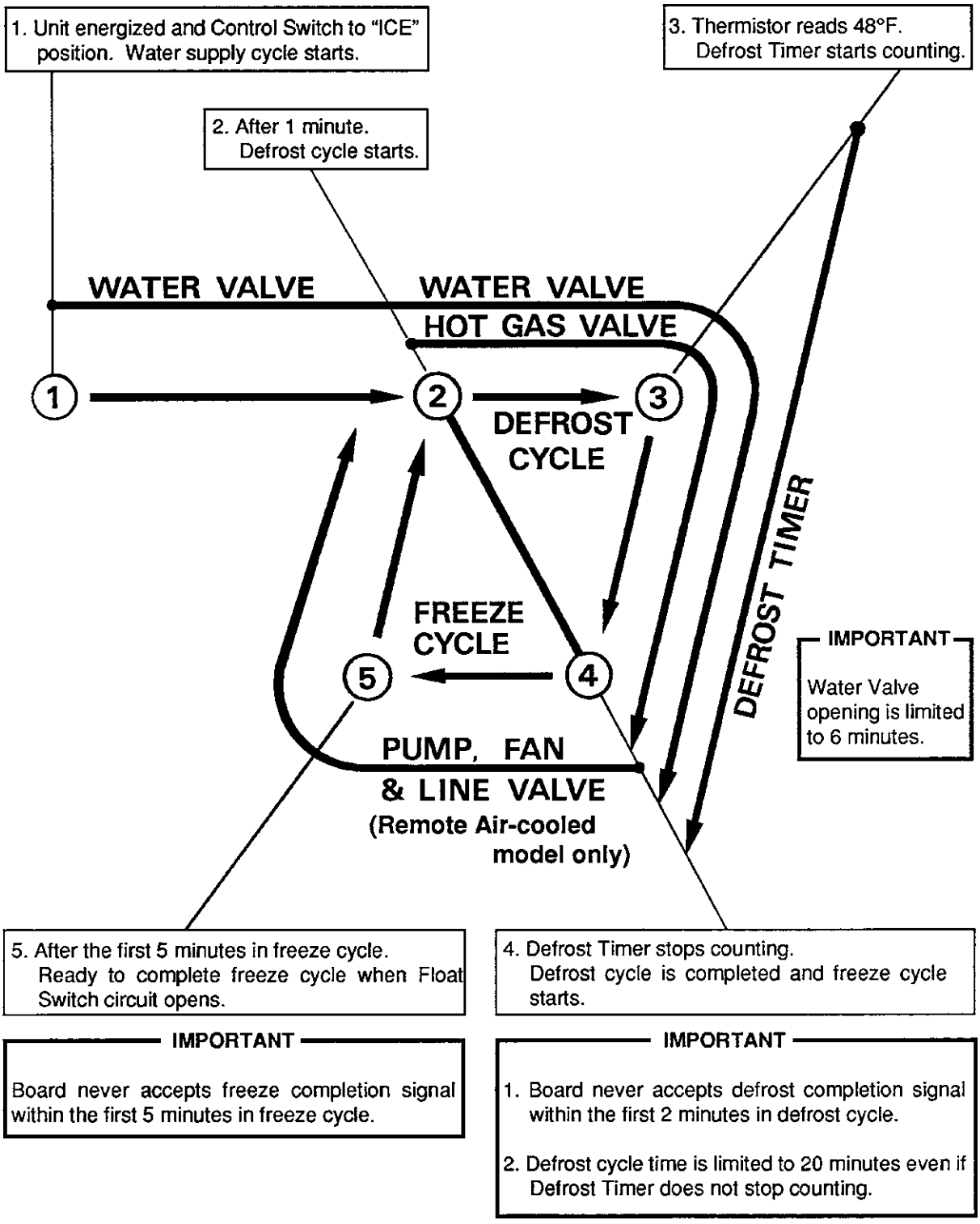


Fig. 2 Sequence - 1st Cycle

2nd Cycle and after with pump drain

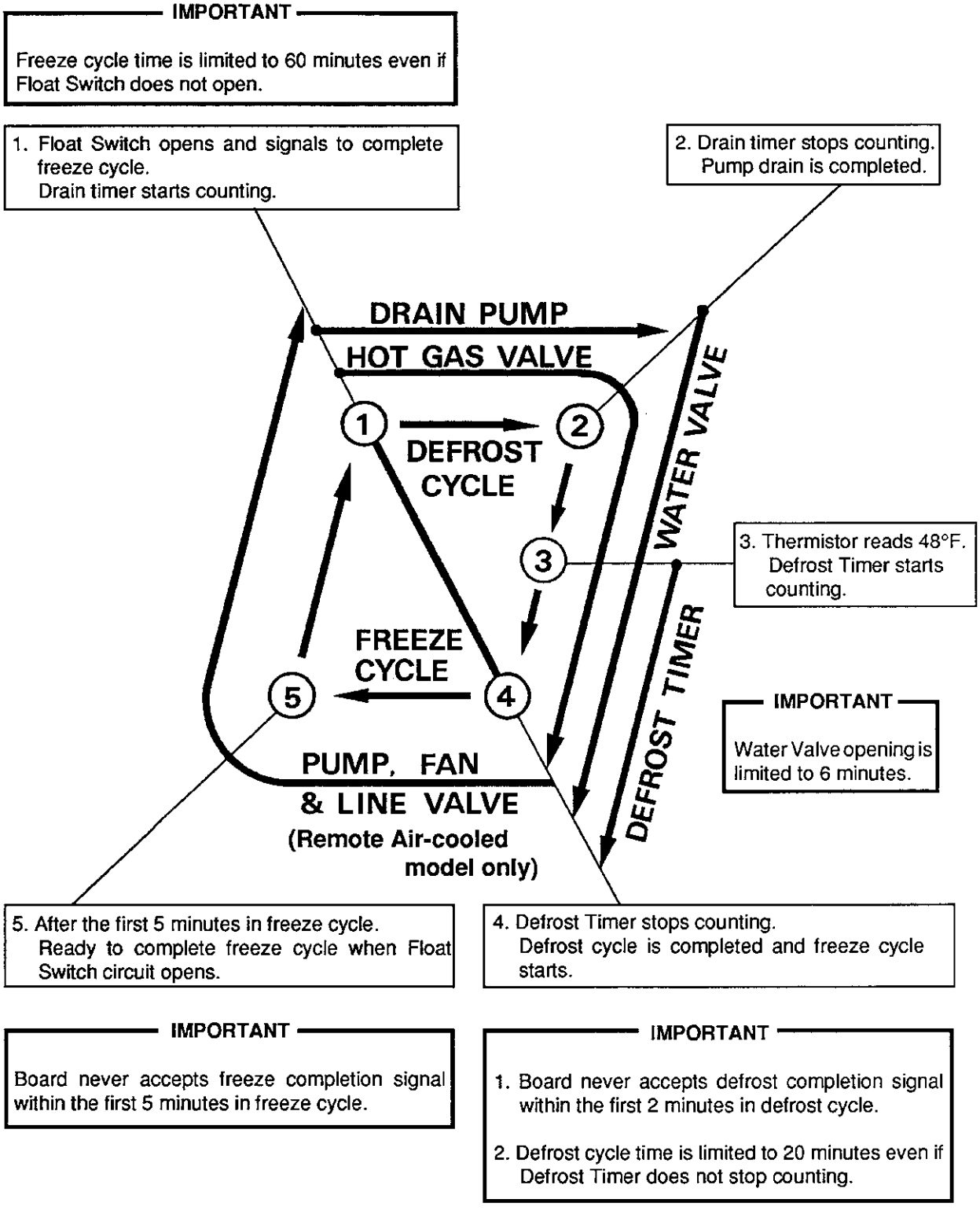


Fig. 3 Sequence - 2nd Cycle and after with pump drain

2nd Cycle and after with no pump drain

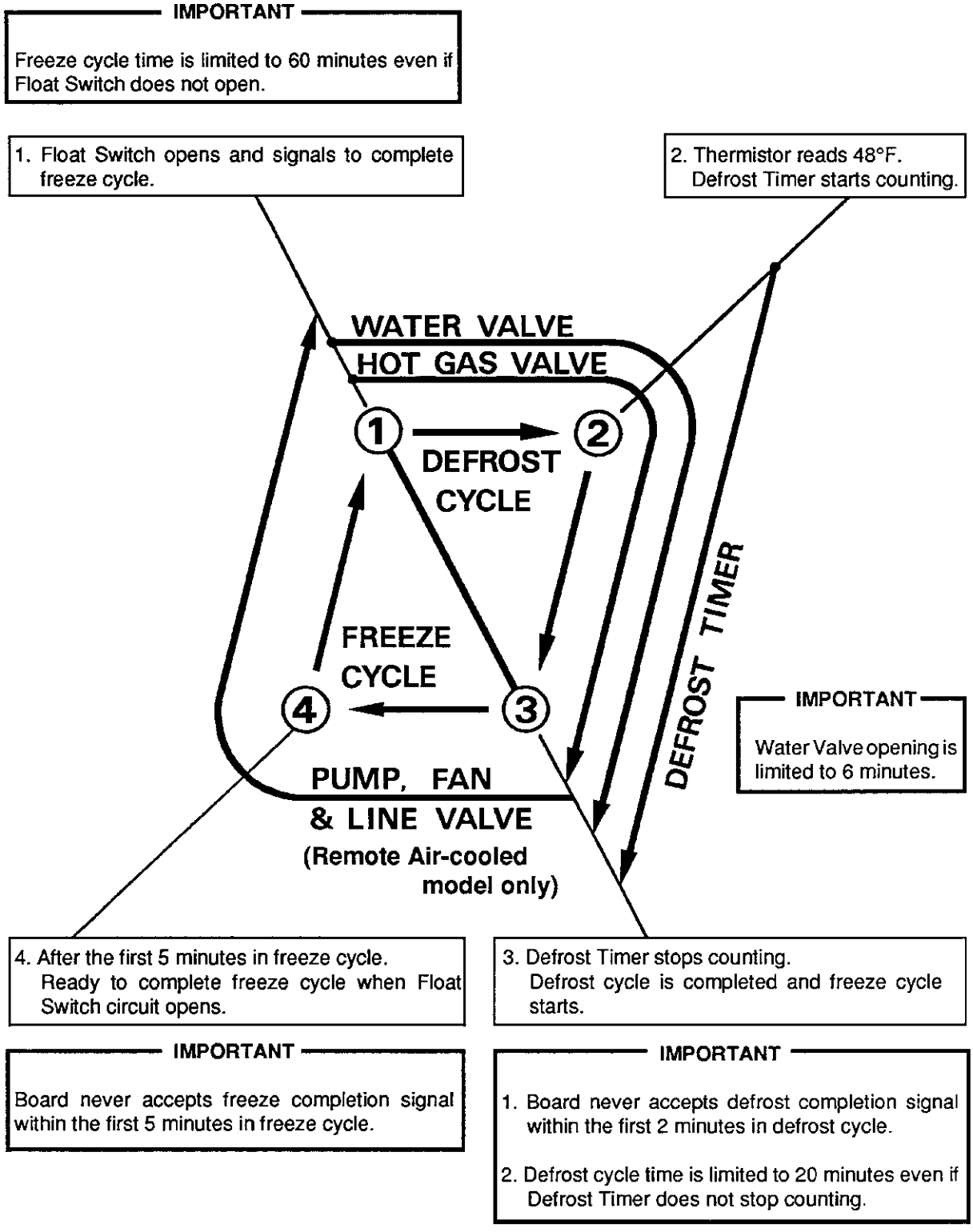


Fig. 4 Sequence - 2nd Cycle and after with no pump drain

[d] CONTROLS AND ADJUSTMENT

1) Defrost Control

A thermistor (Semiconductor) is used for a defrost control sensor, whose resistance varies depending on the Suction Line temperatures. The Thermistor detects the temperature of the Evaporator outlet to start the Defrost Timer. No adjustment is required. If necessary, check for resistance between Thermistor leads, and visually check the Thermistor mounting, located on the Suction Line next to the Evaporator outlet.

Temperature (°F)	Resistance (kΩ)
0	14.401
10	10.613
32	6.000
50	3.871
70	2.474
90	1.633

Check a thermistor for resistance by using the following procedures.

(i) Disconnect the connector K3 on the board.

(ii) Remove the Thermistor. See "VII. 10. REMOVAL AND REPLACEMENT OF THERMISTOR."

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

(iv) 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.

2) Defrost Timer

No adjustment is required under normal use, as the Defrost Timer is adjusted to the suitable position. However, if necessary when all the ice formed on the Evaporator does not fall into the bin in the harvest cycle, adjust the Defrost Timer to longer position by setting the Dip Switch (No. 1 & 2) on the Controller Board.

SETTING		TIME
Dip Switch No. 1	Dip Switch No. 2	
OFF	OFF	60 second
ON	OFF	90 second
OFF	ON	120 second
ON	ON	180 second

Note: When shipped, the Defrost Timer is adjusted to 60 second.

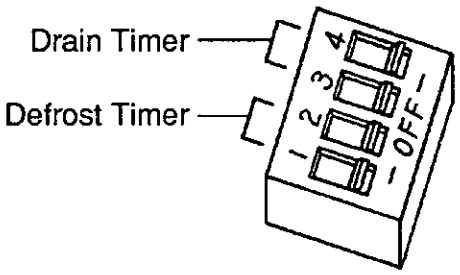


Fig. 6 Dip Switch for Defrost and Drain Timer

3) Drain Timer

The Drain Timer is factory-adjusted to 10 second position, and no adjustment is required.

SETTING		TIME	FLOAT SWITCH POSITION
Dip Switch No. 3	Dip Switch No. 4		
OFF	OFF	10 second	ANY

4) Bin Control

CAUTION

When the ambient temperature is below 45°F, the Bin Control Thermostat operates to stop the icemaker even if the Ice Storage Bin is empty. When the Thermostat is set in the prohibited range, the icemaker operates continuously even if the Ice Storage Bin is filled with ice. Setting in the prohibited range might cause severe damage to the icemaker resulting in failure.

No adjustment is required under normal use, as the Bin Control is factory-adjusted. Adjust it, if necessary, so that the icemaker stops automatically in approximately 6 to 10 seconds after ice contacts the Bin Control Thermostat Bulb, which is attached to a bracket on the left side wall near the bin opening.

[e] CHECKING CONTROLLER BOARD

1) Visually check the sequence with the icemaker operating.

2) Visually check the Controller Board by using the following procedures.

(i) Adjust the Defrost Timer to minimum position.
Disconnect the Thermistor from the Controller Board.
Connect a 1.5 kΩ - 3.5 kΩ resistor to the Connector K3 (pins #1 and #2), and energize the unit.

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

(ii) After the above step (i), disconnect the Float Switch leads from the Controller Board within the first 5 minutes of the freeze cycle.

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

(iii) After the above step (i), disconnect the Float Switch leads from the Controller Board after the first 5 minutes of the freeze cycle.

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

(iv) Adjust the Defrost Timer to minimum position. Disconnect the Thermistor from the Controller Board, and energize the unit.
After the 1 minute water supply cycle, the defrost cycle starts.
Connect a 1.5 kΩ - 3.5 kΩ resistor to the Connector K3 (pins #1 and #2) after the first 2 minutes of the defrost cycle.

The unit should start the freeze cycle after 1 minute ± 5 second from the resistor connection.

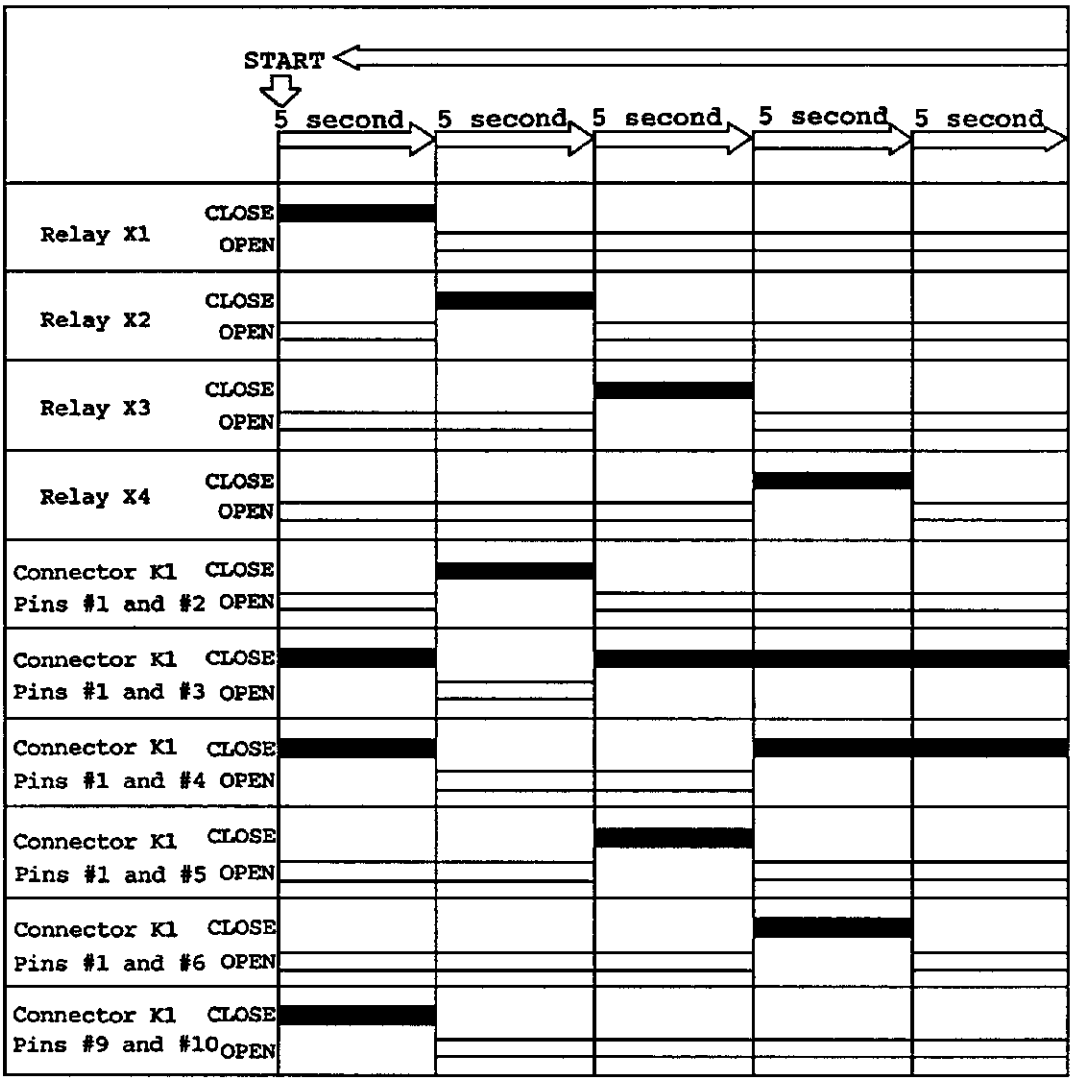
3) Check the Controller Board by using test program of the Controller Board.

(i) Disconnect the Connectors K1 and K6 from the Controller Board. Set the Dip Switch No. 1 and 2 on the Controller Board to the "OFF" position, and energize the unit.

(ii) The current flows to each Relay (from X1 to X4) one after another for 5 seconds, and then the contacts close. See the following table, and check "OPEN" and "CLOSE" of Pins of the Connector K1 at each step.

(iii) If the checks are completed, turn off the icemaker, plug the Connectors K1 and K6 into the Controller Board as before, and set the Dip Switch as before.

* TEST PROGRAM OF CONTROLLER BOARD



III. INSTALLATION AND OPERATING INSTRUCTION

1. CHECKS BEFORE INSTALLATION

WARNING

Remove shipping carton, tapes and packing. If packing material is left in the icemaker, it will not work properly.

1) Remove the panels to prevent damage when installing the icemaker. See "2. HOW TO REMOVE PANELS."

2) Remove the package containing the accessories.

3) Remove the protective plastic film from the panels. If the icemaker is exposed to the sun or to heat, remove the film after the icemaker cools.

4) Check that the refrigerant lines do not rub or touch lines or other surfaces, and that the fan blade moves freely.

5) Check that the Compressor is snug on all mounting pads.

6) See NAMEPLATE on the Rear Panel, and check that your voltage supplied corresponds with the voltage specified on the Nameplate.

7) On remote air-cooled models, a remote condenser unit is needed. The recommended remote condenser unit is HOSHIZAKI CONDENSER UNIT, MODEL URC-4A.

2. HOW TO REMOVE PANELS - See Fig. 7

a) Front Panel .....Remove the screw.
Lift up and pull toward you.

b) Top Panel .....Lift up slightly its front, push away, and then lift off.

c) Side Panel (R).....Remove the screw.
Pull slightly toward you, and lift off.

d) Insulation Panel ...Lift up slightly, and pull toward you.

e) Base Cover .....Lift up slightly, and pull toward you.

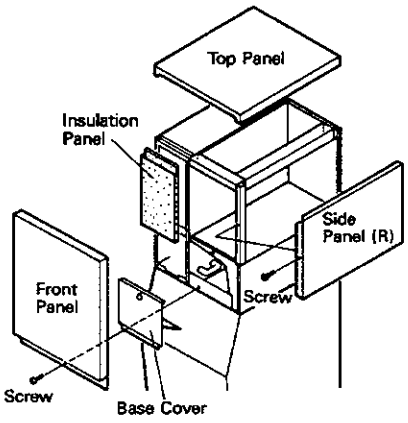


Fig. 7

3. LOCATION

WARNING

This icemaker is not designed for unsheltered outdoor installations. Normal operating ambient temperature should be within +45°F to +100°F; Normal operating water temperature should be within +45°F to +90°F. Operation of the icemaker, for extended periods, outside of these normal temperature ranges may affect production capacity

For best operating results:

* Icemaker should not be located next to ovens, grills or other high heat producing equipment.

* Location should provide a firm and level foundation for the equipment.

* Allow 6" clearance at rear, sides and top for proper air circulation and ease of maintenance and/or service should they be required.

4. SET UP

1) Unpack the storage Bin, and attach the four adjustable legs provided (bin accessory) to the bottom of the storage bin.

2) Position the Storage Bin in the selected permanent position.

3) Place the icemaker on the top of the Storage Bin.

4) Secure the icemaker to the Storage Bin, by using the two mounting bracket and the four bolts provided. See Fig. 8

5) Level the icemaker/Storage Bin, in both the left-to-right and front-to-rear directions. Adjust the Ice Bin Legs to make the icemaker level.

6) Replace the panels in their correct position.

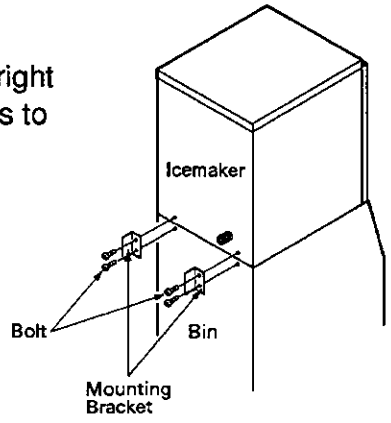


Fig. 8

5. ELECTRICAL CONNECTION

WARNING

1. Electrical connection must be made in accordance with the installations on a "WARNING" tag, provided with the pig tail leads in the Junction Box.

2. This icemaker requires a ground that meets the national and local electrical code requirements. To prevent possible electrical shock to individuals or extensive damage to the equipment, install a proper ground wire to the icemaker.

* A WHITE lead must be connected to the neutral conductor of the power source. Miswiring results in severe damage to the icemaker. See Fig. 9.

* This icemaker must have a separate power supply or receptacle of proper capacity. See NAMEPLATE.

* Usually an electrical permit and services of a licensed electrician are required.

WARNING

ELECTRICAL CONNECTION

A white lead must be connected
to the neutral conductor of
the power source.
Miswiring results in severe
damage to the icemaker.
(See below Fig.)

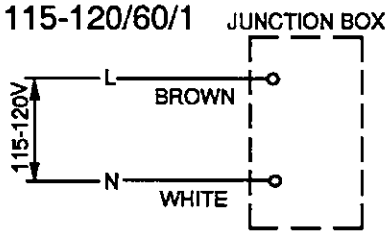


Fig. 9

6. INSTALLTION OF REMOTE CONDENSER UNIT

[a] CHECKS BEFORE INSTALLATION

1) Unpack and remove shipping carton, tapes and packing.

2) Check that the refrigerant lines do not rub or touch lines or other surfaces, and that the fan blade moves freely.

[b] LOCATION

The condenser unit must be positioned in a permanent site under the following guidelines.

* A firm and flat site. Use of a roof curb is preferred.

* A dry and well ventilated area with 24" clearance on both front and rear for ease of maintenance and service should they be required.

* Normal condenser ambient temperature: -20°F to +122°F. Temperatures not within this operating range may affect the production capacity of the icemaker.

* The normal refrigerant line length is 66 ft. Should an installation require a longer line length, please call 1-800-233-1940 for recommendations.

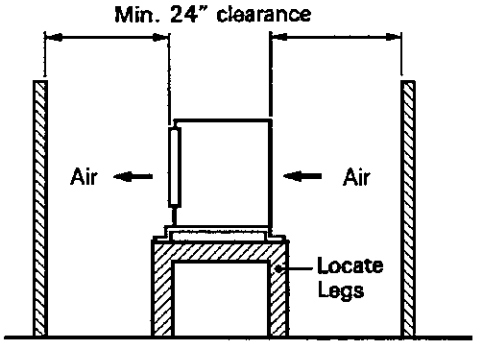


Fig. 10

Note: If the recommended guidelines of the installation are exceeded, the icemaker performance may be reduced.

[c] SET UP

1) Secure the Legs to the condenser unit with eight M8 x 16 mm Hexagon Bolts and M8 Nuts as shown in the illustration. (See Fig. 11.)

   Note: Locate the Legs symmetrically.

2) The Legs have eight mounting holes. Secure the Legs with eight bolts (not included).

3) Install enough length of two copper tubings provided with Aeroquip couplings between the icemaker and the condenser unit. The two copper tubings should be insulated separately. (See Fig. 12.)

   * Precharged tubing kits, available as optional equipment from HOSHIZAKI AMERICA are recommended.

4) Line sets fabricated in the field should be evacuated through the charging ports on the Aeroquip couplings and charged with R-502 refrigerant vapor to a pressure of 15 - 30 PSIG.

   Note: Factory fabricated tubing kits are precharged and do not need to be evacuated.

5) Remove the plastic caps protecting the couplings. Attach the two refrigerant lines to the male couplings on the icemaker and the remote condenser unit. Each refrigerant line must be connected as follows:

   Icemaker discharge refrigerant line - 3/8" OD tubing to "DIS" of condenser unit

   Icemaker liquid refrigerant line - 1/4" OD tubing to "LIQ" of condenser unit

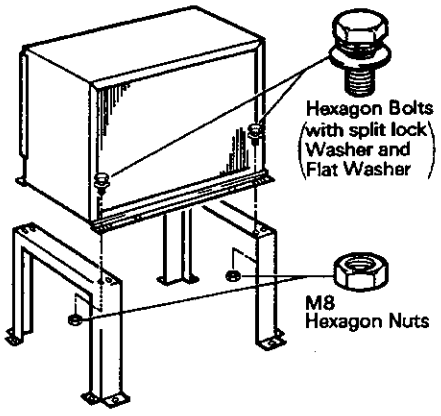


Fig. 11

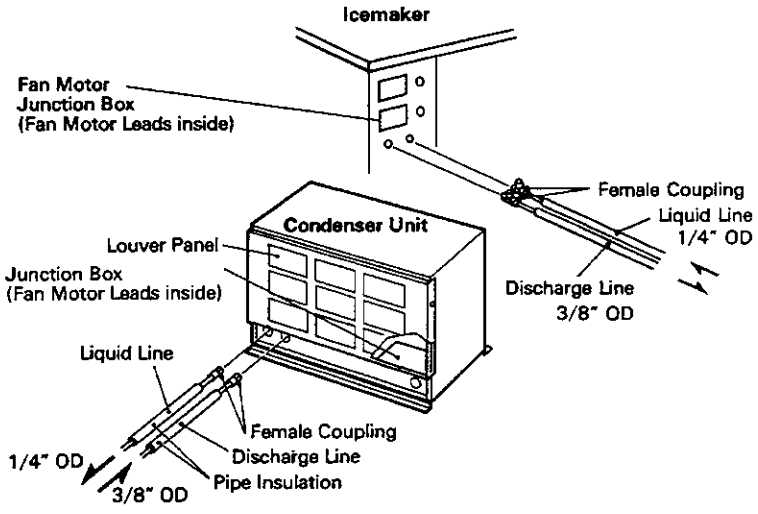


Fig. 12

[d] ELECTRICAL CONNECTION

WARNING

This remote condenser unit requires a ground that meets the national and local electrical code requirements. To prevent possible electrical shock to individuals or extensive damage to equipment, install a proper ground wire to the condenser unit.

1. This condenser unit must be connected to the Fan Motor Junction Box on the icemaker.

2. Usually an electrical permit and services of a licensed electrician are required.

1) Remove the Panel.

2) Remove the Junction Box Cover.

3) Connect the Fan Motor leads in the Junction Box of the remote condenser unit to the Fan Motor leads in the Junction Box of the HOSHIZAKI remote air-cooled icemaker.

4) Install a ground wire from the icemaker to the remote condenser unit.

5) Replace the Junction Box Cover and the Louver Panel in their correct position.

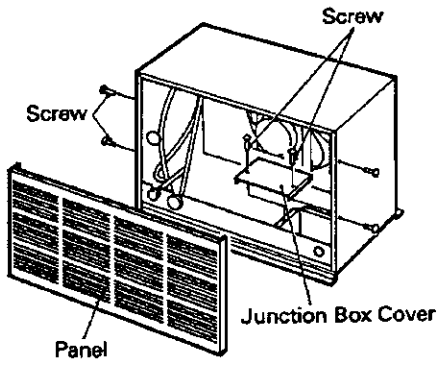


Fig. 13

[e] STACKING CONDENSER UNIT

1) Secure the lower condenser unit to the Legs with eight bolts (not included).

2) Attach the upper condenser unit on the top of the lower.

3) Secure the upper condenser unit with the four screws provided.

4) Install refrigerant lines, and make electrical connection for each Fan Motor as shown in Items [c] and [d].

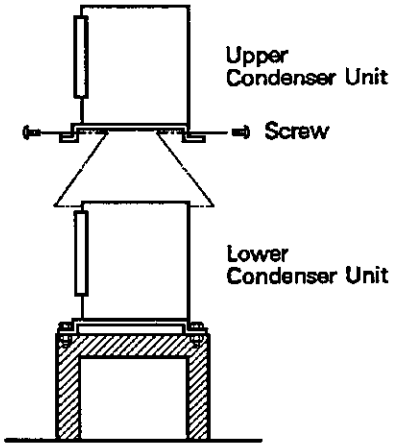


Fig. 14

7. WATER SUPPLY AND DRAIN CONNECTIONS - See Fig. 15

WARNING

To prevent damage to the pump assembly, do not operate the icemaker when the water supply is OFF, or if the pressure is below 7 PSIG. Do not run the icemaker until the proper water pressure is reached.

IMPORTANT

On all models, be sure to install the enclosed check valve at the water supply inlet, with the arrow on the valve in the direction of the water flow.

* Water supply inlet is 1/2" female pipe thread (FPT).

Note: On water-cooled model, two water supply inlets are provided. One is for the ice making water inlet, and the other is for the cooling water inlet.

* A water supply line shut-off valve and drain valve should be installed. A minimum of 3/8" OD copper tubing is recommended for the water supply lines.

Note: An optional strainer should be installed next to the water supply inlet in the water supply line. HOSHIZAKI recommends optional strainer Part Code 311166A01.

* Water supply pressure should be a minimum of 7 PSIG and a maximum of 113 PSIG. If the pressure exceeds 113 PSIG, the use of a pressure reducing valve is required.

* Drain outlet for icemaker dump is 3/4" FPT. The icemaker drain and the condenser drain piping connections must be made separately from the bin drain.

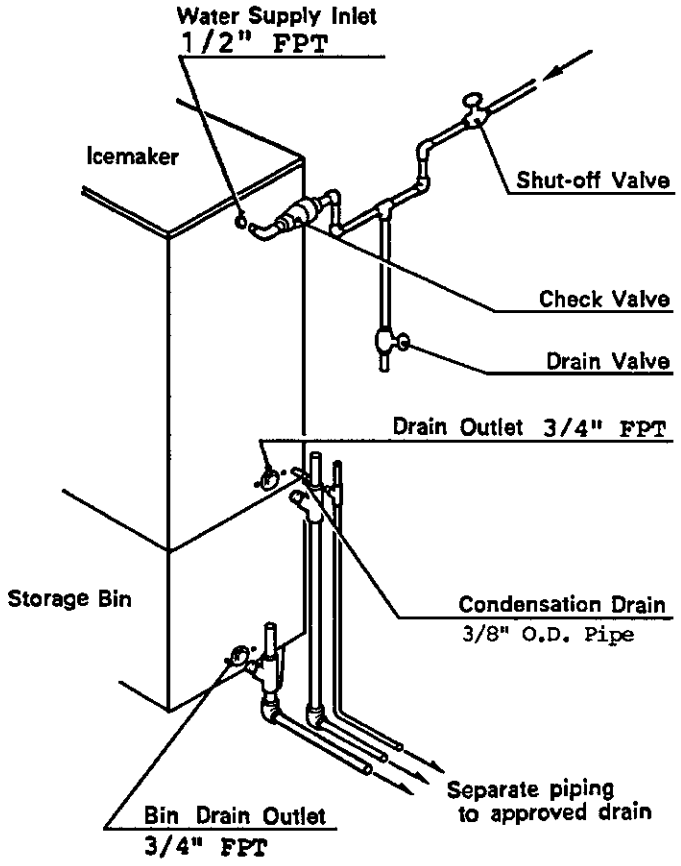
Note: On water-cooled model, a 1/2" FPT is provided for the condenser drain outlet.

* The drains must have 1/4" fall per foot on horizontal runs to get a good flow.

* A plumbing permit and services of a licensed plumber may be required in some areas.

* In some areas, a back flow preventer may be required in the cooling water circuit.

KM-450MAB
KM-450MRB



KM-450MWB

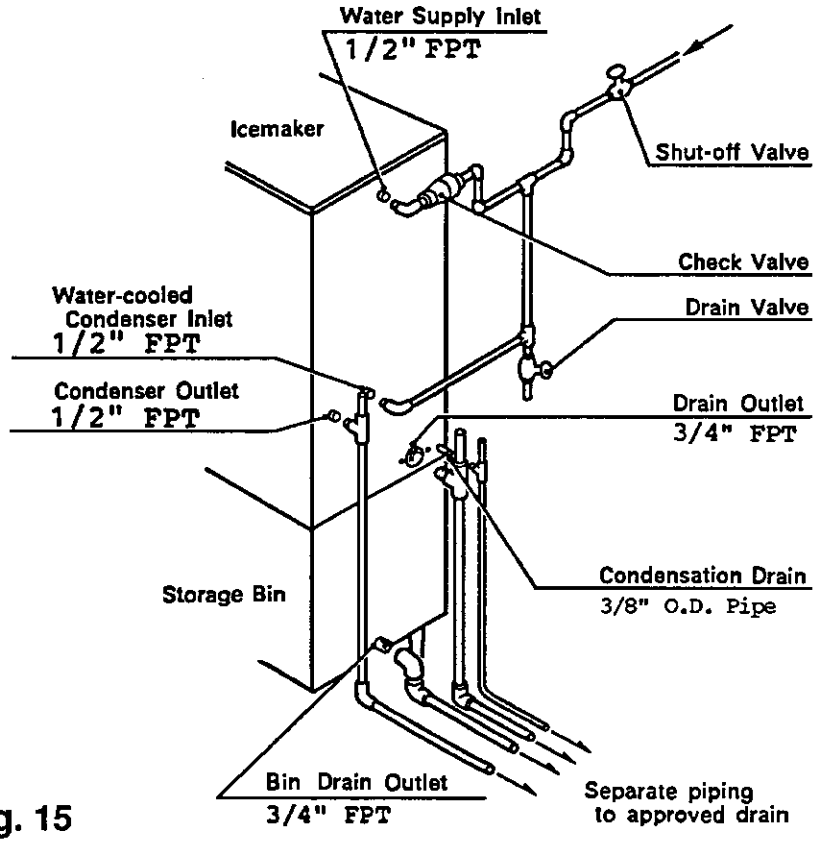


Fig. 15

8. FINAL CHECK LIST

1) Is the icemaker level?

2) Is the icemaker in a site where the ambient temperature is within +45°F to +100°F and the water temperature within +45°F to +90°F all year around?

3) Is there at least 6" clearance at sides, rear and top of the icemaker for maintenance or service?

4) Have all shipping tape(s), packing and cartons been removed from the icemaker?

5) Have all electrical and piping connections been made?

6) Has the power supply voltage been checked or tested against the nameplate rating? And has a proper ground been installed in the icemaker?

7) Are the Water Supply Line Shut-off Valve, Drain Valve and Check Valve installed? Has the water supply pressure been checked to ensure a minimum of 7 PSIG and a maximum of 113 PSIG?

Note: The icemaker may stop running when the water supply is OFF, or if the pressure is below 7 PSIG. When the proper water pressure is reached, the icemaker automatically starts running again.

8) Have the compressor hold-down bolts and refrigerant lines been checked against vibration and possible failure?

9) Has the Bin Control Switch been checked for correct operation? When the icemaker is running, hold an ice cube in contact with the Bulb. The icemaker should stop within 10 seconds.

10) Has the end user been given the instruction manual, and instructed on how to operate the icemaker and the importance of the recommended periodic maintenance?

11) Has the end user been given the name and telephone number of an authorized service agent?

9. START UP

WARNING

1. All parts are factory-adjusted. Improper adjustments may result in failure.
2. If the unit is turned off, wait for at least 3 minutes before restarting the icemaker to prevent damage to the Compressor.

1) Open the Water Supply Line Shut-off Valve.

2) Remove the Front Panel.

3) Move the Toggle WASH-OFF-ICE Control Switch, on the Control Box, to the "ICE" position.

4) Replace the Front Panel in its correct position.

5) Turn on the power supply, and start the washing process for 10 minutes.

6) Turn off the power supply, and remove the Front Panel and the Base Cover.

7) Remove one end of the Pump Tubing, and drain the Water Tank.

8) Replace the Pump Tubing in its correct position.

9) Clean the Storage Bin.

10) Replace the Base Cover and the Front Panel in their correct position.

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

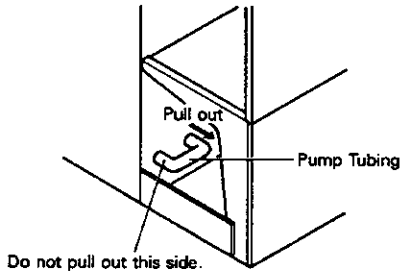


Fig. 16

10. PREPARING THE ICEMAKER FOR LONG STORAGE

WARNING

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. The Storage Bin should be cleaned and dried. Drain the icemaker to prevent damage to the water supply line at sub-freezing temperatures, using air or carbon dioxide. Shut off the icemaker until the proper ambient temperature is resumed.

* When the icemaker is not used for two or three days, just move the Toggle WASH-OFF-ICE Control Switch to the "OFF" position, unless the icemaker will be at sub-freezing temperatures.

1) Turn off the power supply.

2) Remove the Front Panel.

3) Move the Toggle WASH-OFF-ICE Control Switch, on the Control Box, to the "OFF" position.

4) Close the Water Supply Line Shut-off Valve, and remove the Base Cover.

5) Remove one end of the Pump Tubing, and drain the Water Tank.

6) Remove the Pump Tubing and the Base Cover in their correct position.

7) Remove all ice from the Storage Bin, and clean the Storage Bin.

8) Replace the Front Panel in its correct position.

Note: When shutting off the icemaker at sub-freezing temperatures, run the icemaker, with the Water Supply Line Shut-off Valve closed and the Drain Valve opened, and blow out the water inlet line, by using air pressure. See Fig. 17.

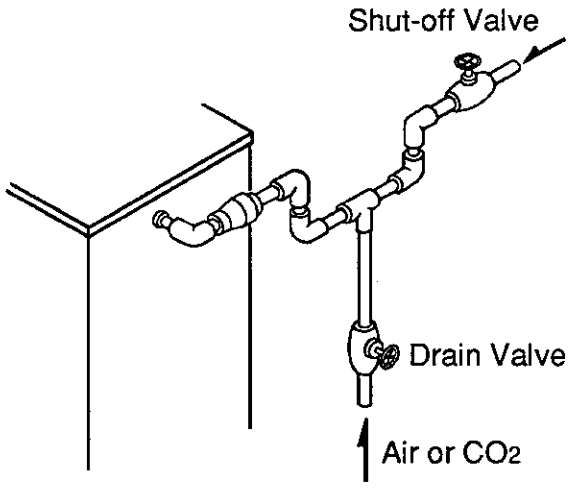


Fig. 17

IV. MAINTENANCE AND CLEANING INSTRUCTIONS

1. CLEANING INSTRUCTIONS

WARNING

1. HOSHIZAKI recommends cleaning this unit at least once a year. More frequent cleaning, however, may be required in some existing water conditions.

2. To prevent injury to individuals and damage to the icemaker, do not use ammonia type cleaners.

3. Always wear liquid-proof gloves for safe handling of the cleaning and sanitizing solution. This will prevent irritation in case the solution contacts with skin.

[a] CLEANING PROCEDURE

* STANDARD

1) Dilute approximately 16 fl. oz. of recommended cleaner ("LIME-A-WAY," Economics Laboratory, Inc.) with 3 gal. of water.

2) Turn off the power supply and close the Water Supply Line Shut-off Valve.

3) Remove the Front Panel, the Insulation Panel and the Base Cover.

4) Remove all ice from the icemaker and the Storage Bin.

5) Remove one end of the Pump Tubing, and drain the Water Tank. See Fig. 16.

6) Replace the Pump Tubing in its correct position.

7) Pour the cleaning solution into the Water Tank.

8) Move the Toggle WASH-OFF-ICE Control Switch, on the Control Box, to the "WASH" position.

9) Replace the Insulation Panel and the Front Panel in their correct position.

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

11) Turn off the power supply in 30 minutes.

12) Remove the Front Panel.

13) Remove one end of the Pump Tubing, and drain the Water Tank. Replace the Pump Tubing in its correct position after the icemaker has been drained.

14) Open the Water Supply Line Shut-off Valve.

15) Move the Toggle WASH-OFF-ICE Control Switch to the "ICE" position.

16) Replace the Front Panel in its correct position.

17) Turn on the power supply, and start the rinse process.

18) Turn off the power supply in 10 minutes.

19) Remove the Front Panel.

20) Remove one end of the Pump Tubing, and drain the Water Tank. Replace the Pump Tubing in its correct position after the icemaker has been drained. Replace the Front Panel in its correct position.

21) Repeat the above steps 17) through 20) three more times to rinse thoroughly.

Note: Replace the Base Cover when you don't proceed to [b] SANITIZING PROCEDURE.

* ALTERNATE

1) Turn off the power supply, and close the Water Supply Line Shut-off Valve.

2) Dilute approximately 16 fl. oz. of cleaner ("LIME-A-WAY", Economics Laboratory, Inc. recommended) with 3 gal. of water.

3) Remove the Front Panel, the Insulation Panel and the Base Cover.

4) Remove the Water Pump Discharge Tubing at tee. Prepare and use a bucket to receive water through the Pump Tubing.
Move the Toggle WASH-OFF-ICE Control Switch, on the front of the Control Box, to the "WASH" position, and then turn on the power supply. In about 2 minutes, the Pump Motor starts to rotate, discharging water in the Water

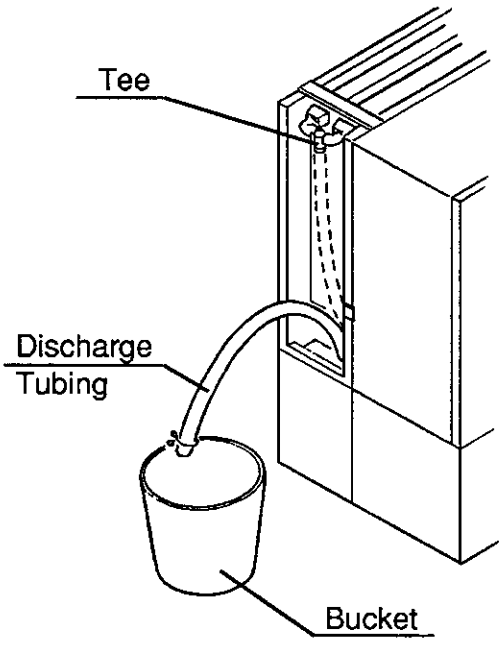


Fig. 18

Tank. And then move the Toggle WASH-OFF-ICE Control Switch to the "OFF" position, and place the Pump Discharge Tubing in position.

5) Pour the cleaning solution into the Water Tank.

6) Place the Insulation Panel in position.

7) Move the Toggle WASH-OFF-ICE Control Switch, on the front of the Control Box, to the "WASH" position.

8) Turn off the icemaker in 30 minutes.

9) Drain the Water Tank using step 4).

10) Open the Water Supply Line Shut-off Valve.

11) Move the Toggle WASH-OFF-ICE Control Switch to the "ICE" position.

12) Turn on the icemaker, and start the rince process. Turn off the icemaker in 10 minutes, and drain the Water Tank using step 4).

13) Repeat the above step 12) three more times to rinse thoroughly.

[b] SANITIZING PROCEDURE - Following Cleaning Procedure

1) Dilute approximately 24 fl. oz. of a 5.25 % Sodium Hypochlorite solution with 3 gal. of water.

2) Turn off the power supply and close the Water Supply Line Shut-off Valve.

3) Remove the Front Panel and the Insulation Panel.

4) Pour the sanitizing solution into the Water Tank.

5) Move the Toggle WASH-OFF-ICE Control Switch to the "WASH" position.

6) Replace the Insulation Panel in its correct position.

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

8) Turn off the power supply in 15 minutes.

9) Remove one end of the Pump Tubing, and drain the Water Tank. Replace the Pump Tubing in its correct position after the icemaker has been drained.

10) Open the Water Supply Line Shut-off Valve.

11) Move the Toggle WASH-OFF-ICE Control Switch to the "ICE" position.

12) Replace the Front Panel in its correct position.

13) Repeat the above steps 17) through 20) in "[a] CLEANING PROCEDURE" two more times to rinse thoroughly.

    Note: Place the Base Cover in its correct position before replacing the Front Panel.

14) Clean the Storage Bin by using clear water.

15) Turn on the power supply, and 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.

1) Stainless Steel Exterior

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

2) Storage Bin and Scoop

* Wash your hands before removing ice. Use the plastic scoop provided (Accessory).

* The Storage Bin is for ice use only. Do not store anything else in the bin.

* Keep the scoop clean. Clean it by using a neutral cleaner and rinse thoroughly.

* Clean the bin liner by using a neutral cleaner. Rinse thoroughly after cleaning.

3) Air Filter (Air-cooled model only)

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

4) Condenser (Except water-cooled model)

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

V. TECHNICAL INFORMATION

1. WATER CIRCUIT AND REFRIGERANT CIRCUIT

[a] KM-450MAB (Air-cooled)

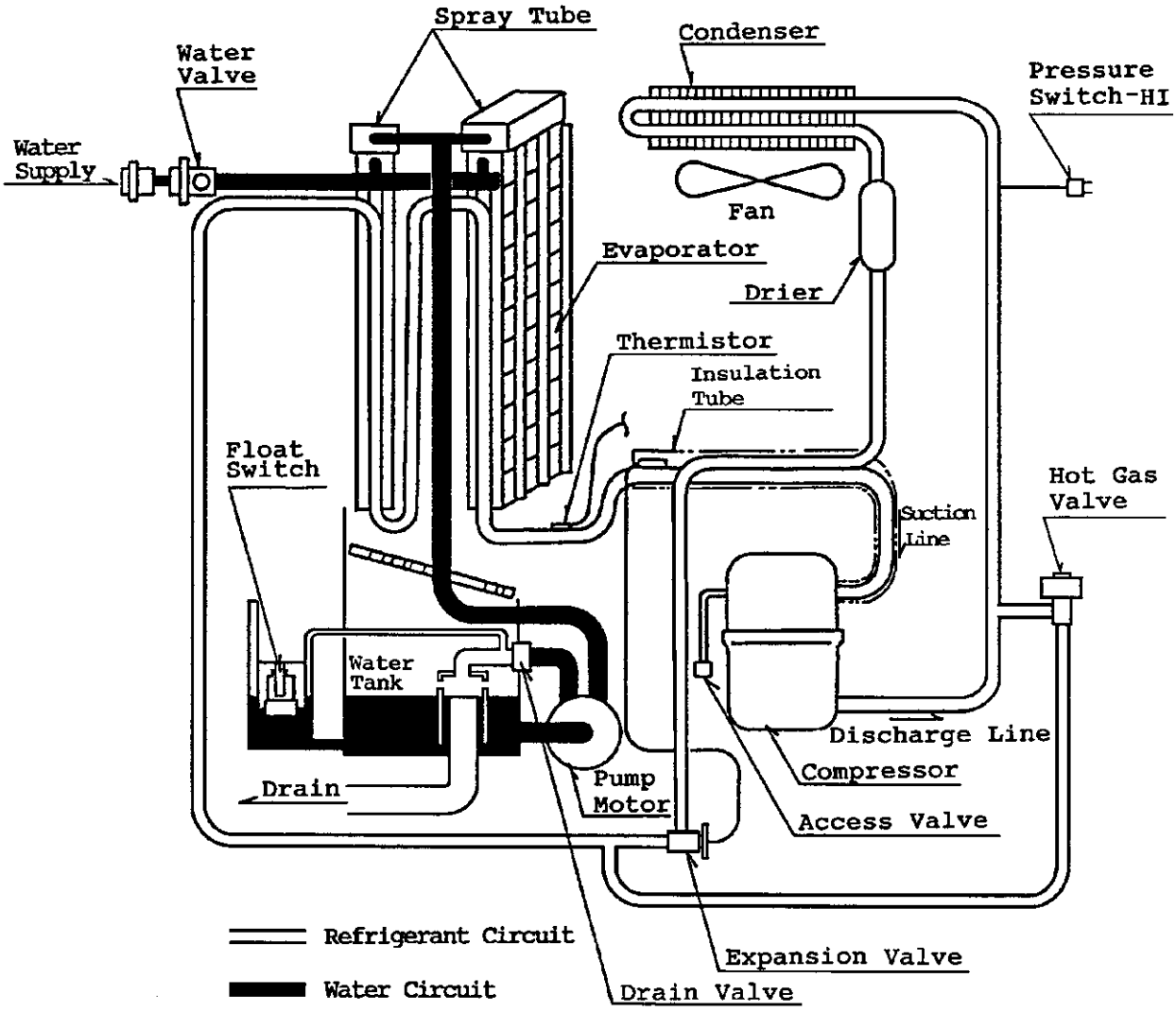


Fig. 19 Water and Refrigerant Circuit - KM-450MAB

[b] KM-450MWB (Water-cooled)

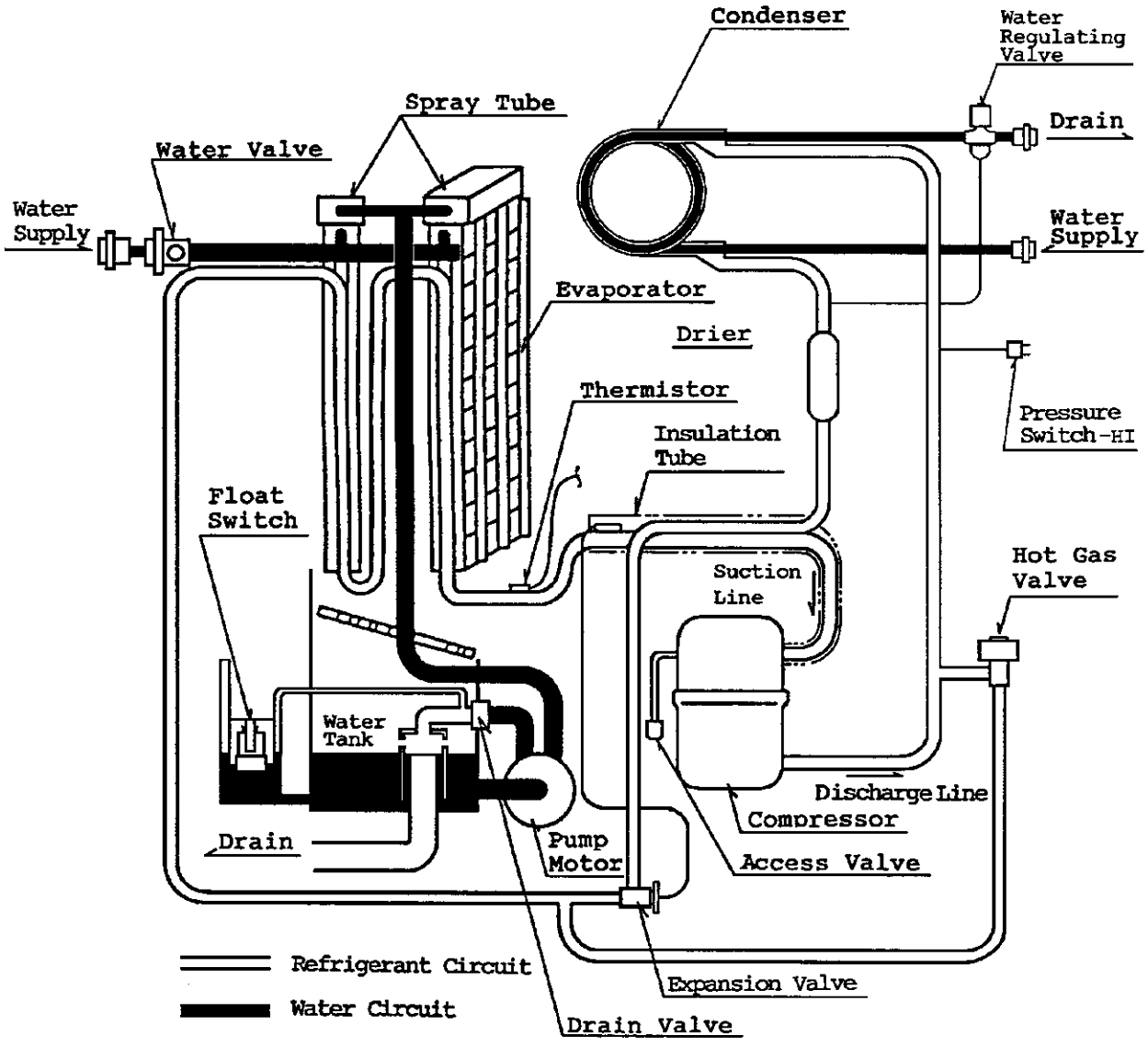


Fig. 20 Water and Refrigerant Circuit - KM-450MWB

[c] KM-450MRB (Remote Air-cooled)

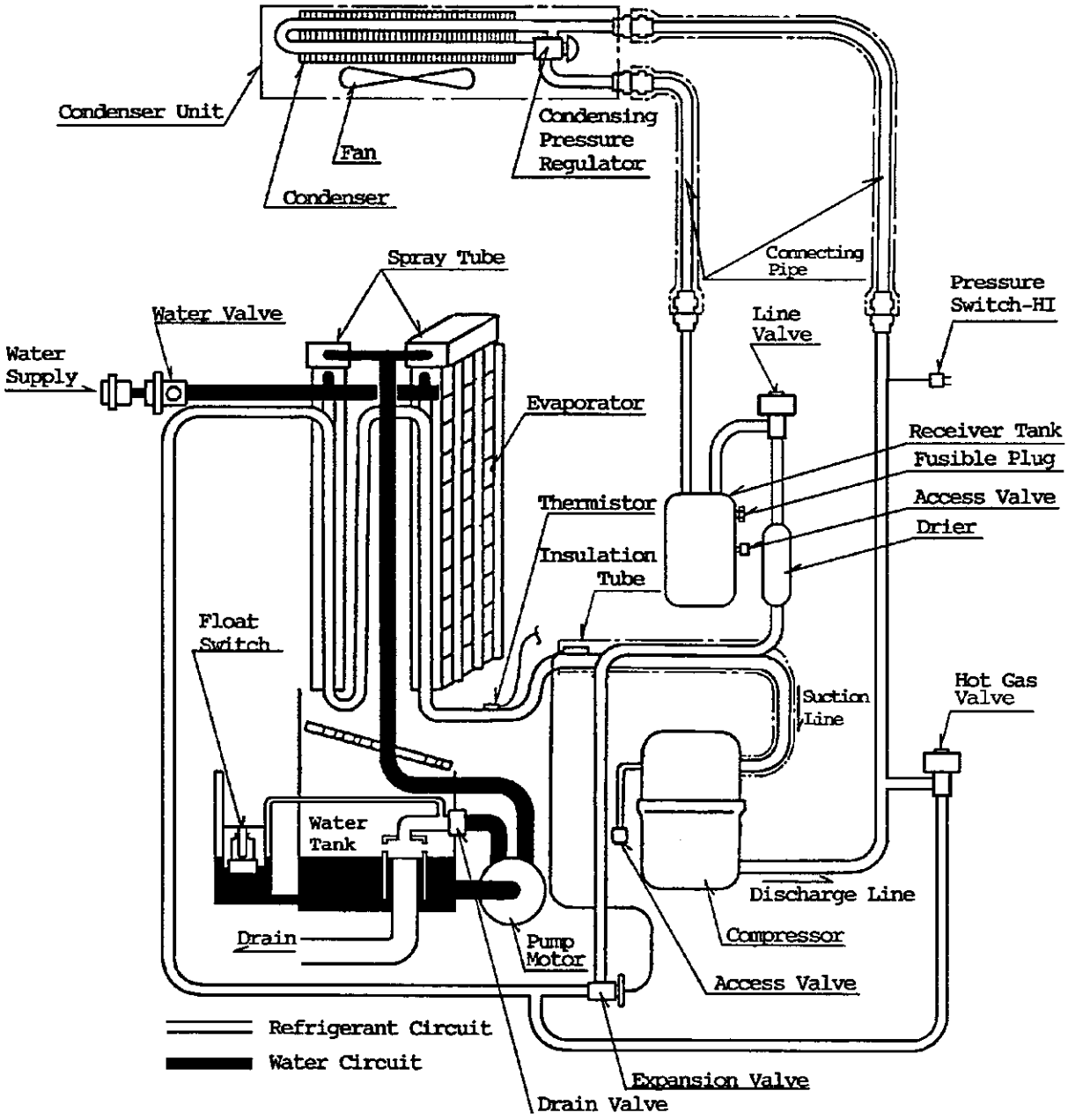


Fig. 21 Water and Refrigerant Circuit - KM-450MRB

2. WIRING DIAGRAM

[a] KM-450MAB, MWB

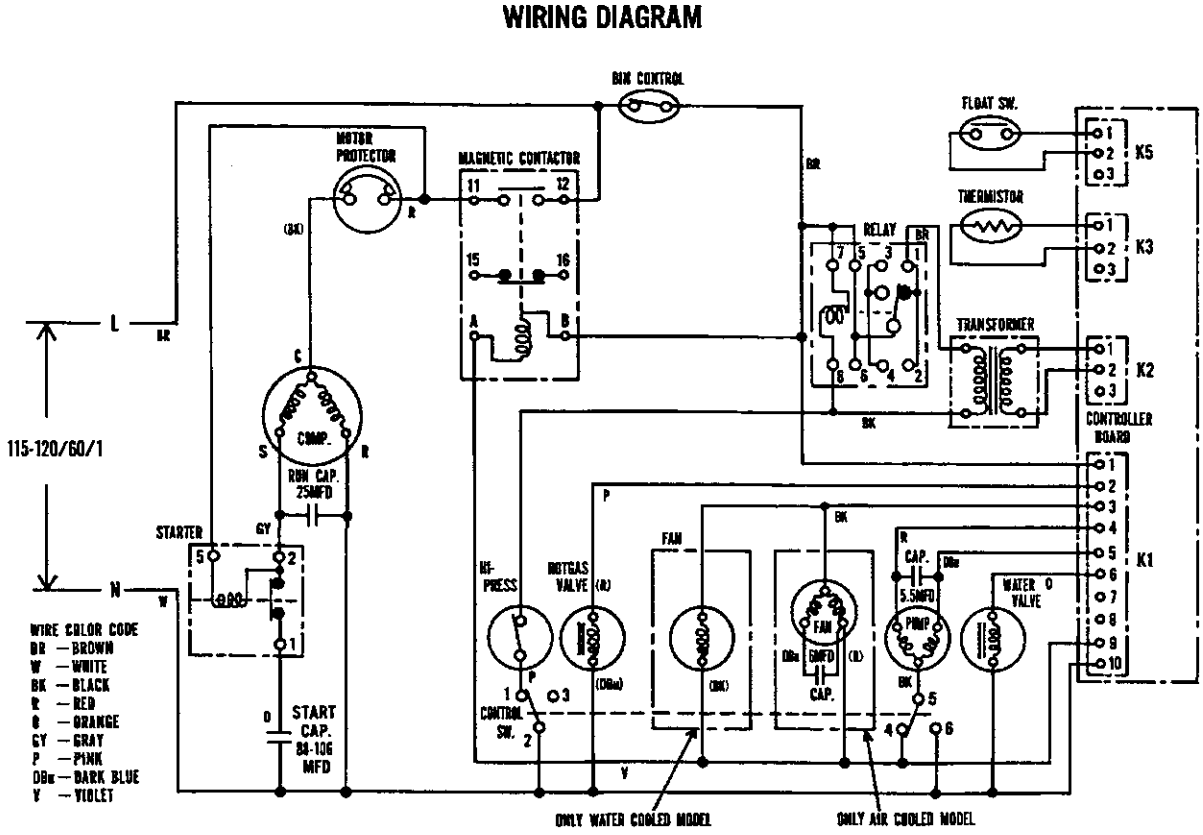


Fig. 22 Wiring Diagram - KM-450MAB, MWB

Note: Pressure Switch - HI

	KM-450MAB		KM-450MWB	
Cutout	384.0	PSIG	355.6	PSIG
Cutin	284.5±21.3	PSIG	256.0±21.3	PSIG

[b] KM-450MRB

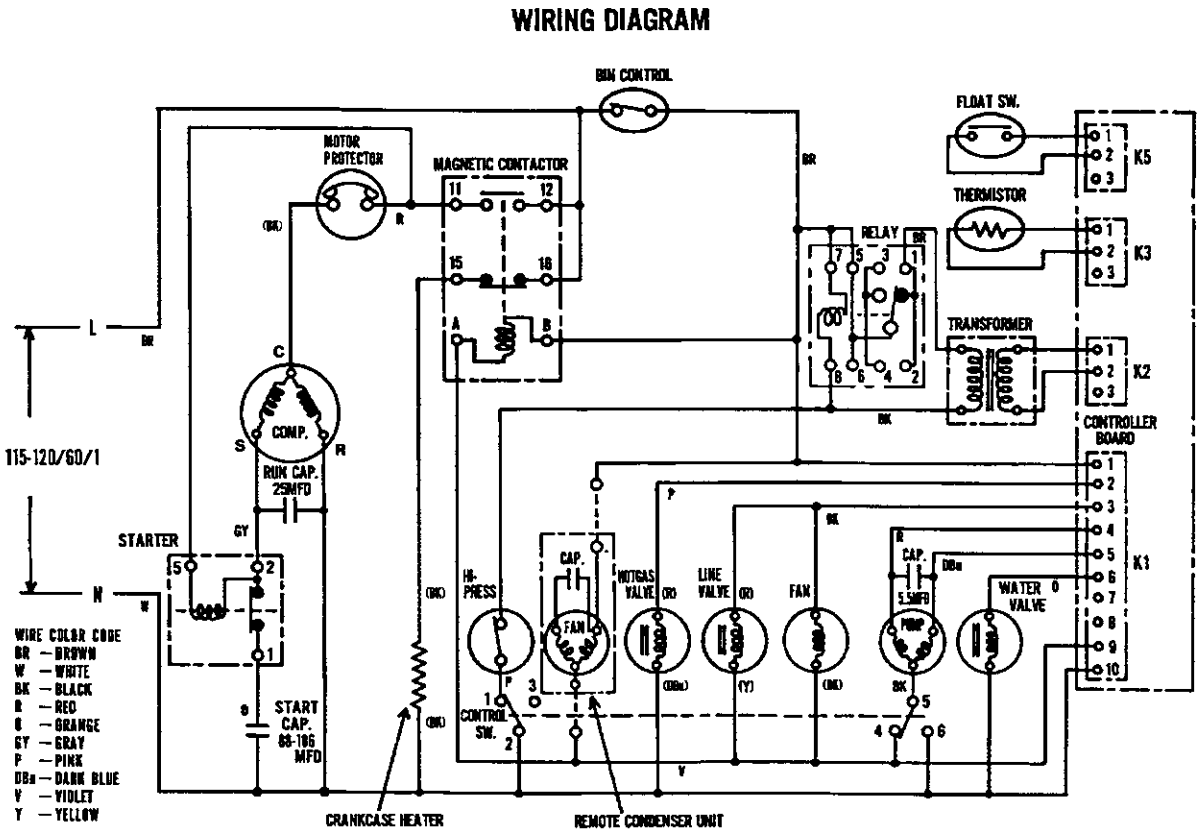
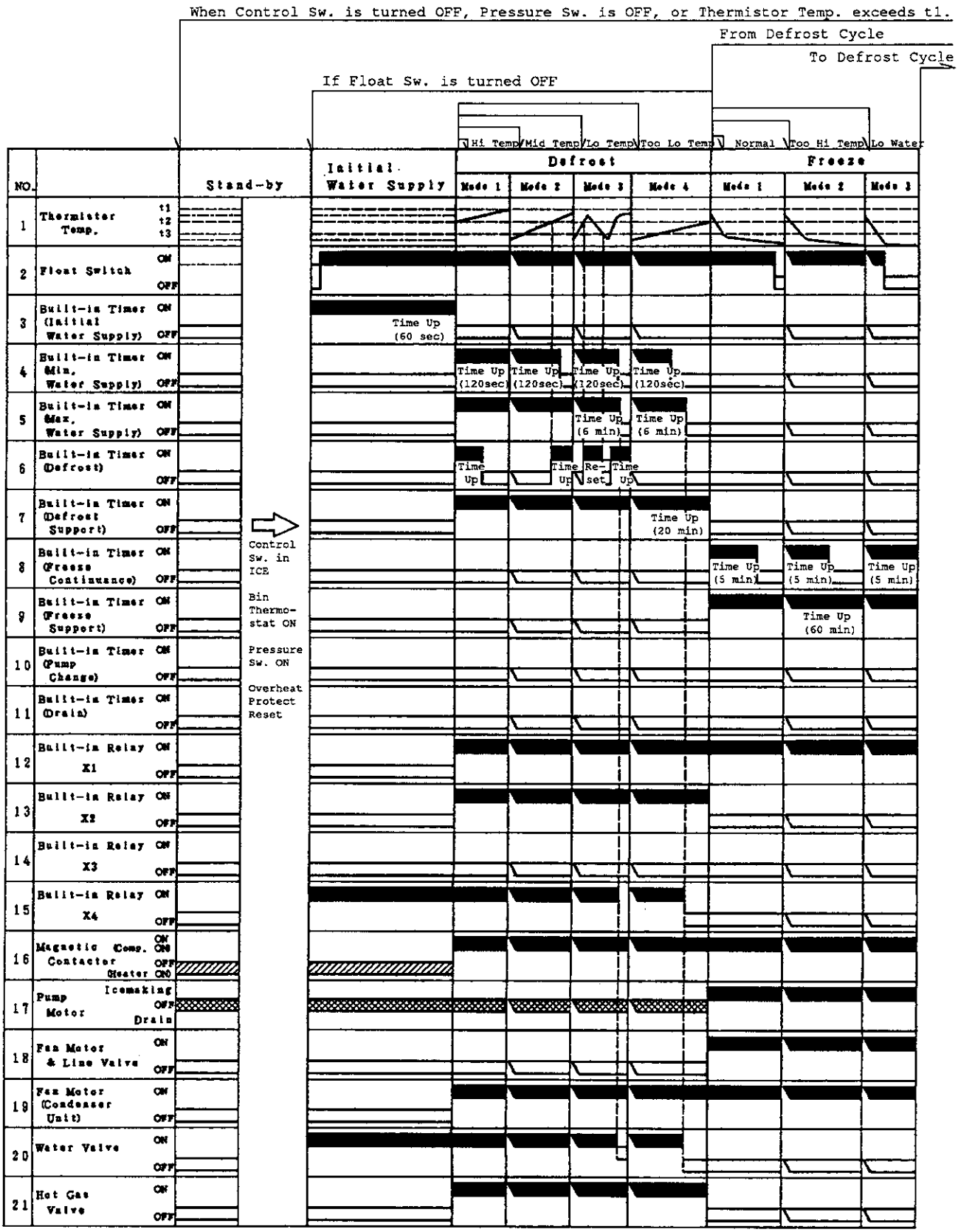


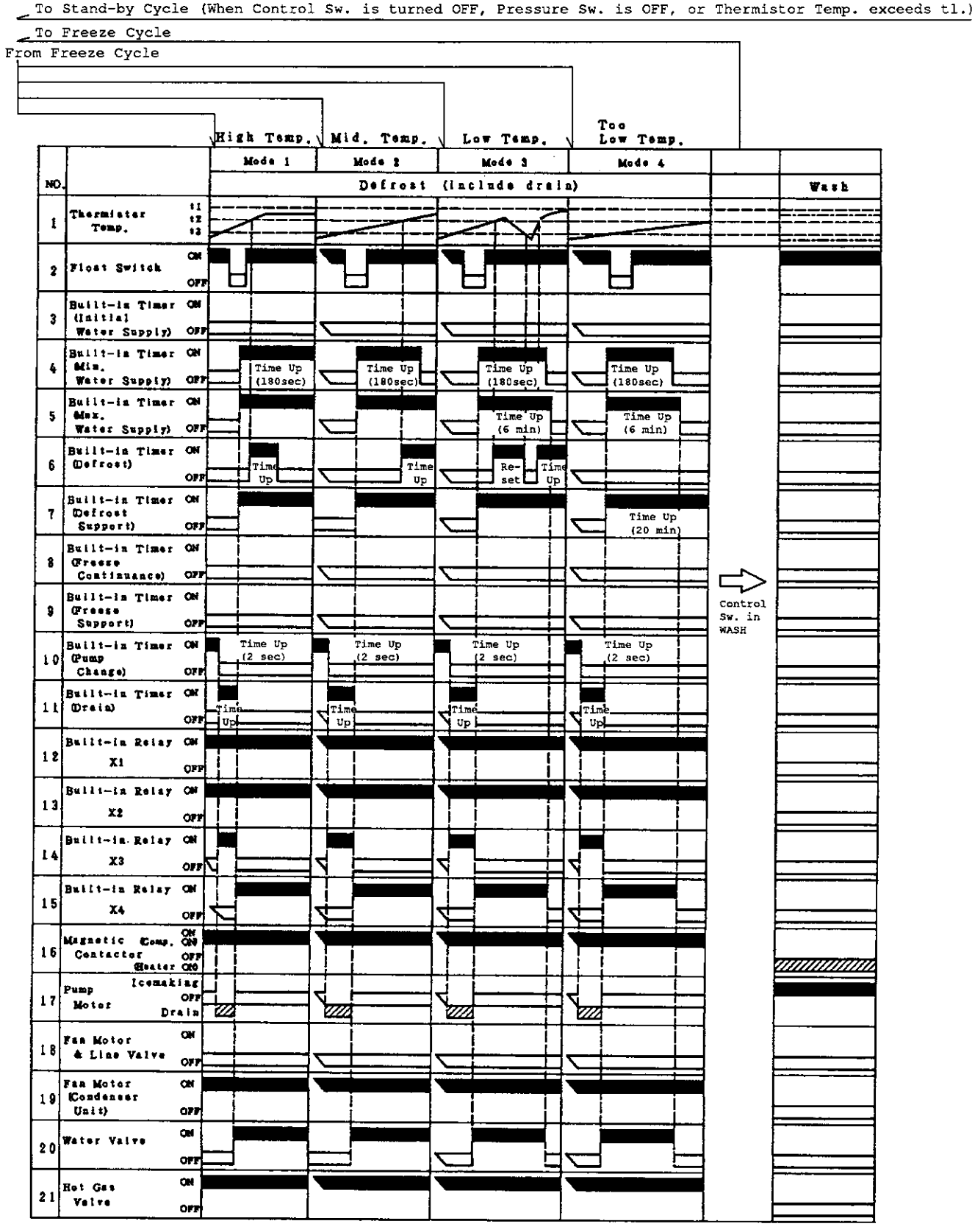
Fig. 23 Wiring Diagram - KM-450MRB

Note: Pressure Switch - HI

Cutout	384.0	PSIG
Cutin	284.5±21.3	PSIG

3. TIMING CHART




To Stand-by Cycle (When Control Sw. is turned OFF, Pressure Sw. is OFF, or Thermistor Temp. exceeds t1.)
To Freeze Cycle
From Freeze Cycle
High Temp.
Mid. Temp.
Low Temp.
Too Low Temp.
NO.
Mode 1
Mode 2
Mode 3
Mode 4
Defrost (include drain)
Wash
1 Thermister Temp. t1 t2 t3
2 Float Switch ON OFF
3 Built-in Timer (Initial Water Supply) ON OFF
4 Built-in Timer (Min. Water Supply) ON OFF
Time Up (180sec)
5 Built-in Timer (Max. Water Supply) ON OFF
Time Up (6 min)
6 Built-in Timer (Defrost) ON OFF
Time Up
Re-set
7 Built-in Timer (Defrost Support) ON OFF
Time Up (20 min)
8 Built-in Timer (Freeze Continuance) ON OFF
9 Built-in Timer (Freeze Support) ON OFF
10 Built-in Timer (Pump Change) ON OFF
Time Up (2 sec)
11 Built-in Timer (Drain) ON OFF
Time Up
12 Built-in Relay X1 ON OFF
13 Built-in Relay X2 ON OFF
14 Built-in Relay X3 ON OFF
15 Built-in Relay X4 ON OFF
16 Magnetic Contactor Comp. ON ON OFF
Heater ON OFF
17 Pump Motor Icemaking OFF Drain
18 Fan Motor & Line Valve ON OFF
19 Fan Motor (Condenser Unit) ON OFF
20 Water Valve ON OFF
21 Hot Gas Valve ON OFF
Control Sw. in WASH

4. PERFORMANCE DATA

[a] KM-450MAB

	Ambient Temp. (°F)	Water Temp. (°F) 50	70	90
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day)	70	*460 (209)	410 (186)	350 (159)
	80	420 (190)	370 (168)	330 (150)
	90	375 (170)	*340 (154)	300 (136)
	100	340 (154)	295 (133)	260 (118)
APPROXIMATE ELECTRIC CONSUMPTION watts	70	*1050	1080	1080
	80	1080	1120	1120
	90	1110	*1150	1160
	100	1130	1160	1180
APPROXIMATE WATER CONSUMPTION PER 24 HR. gal./day (m^3/day)	70	198 (0.75)	145 (0.55)	132 (0.50)
	80	185 (0.70)	127 (0.48)	116 (0.44)
	90	153 (0.58)	114 (0.43)	106 (0.40)
	100	119 (0.45)	100 (0.38)	92 (0.35)
FREEZING CYCLE TIME min.	70	30	33	41
	80	35	37	40
	90	38	42	46
	100	41	49	53
HARVEST CYCLE TIME min.	70	4	3	3
	80	4	3	3
	90	4	3	3
	100	3	3	3
HEAD PRESSURE PSIG (kg/cm^2G)	70	216 (15.2)	219 (15.4)	220 (15.5)
	80	242 (17.0)	249 (17.5)	253 (17.8)
	90	270 (19.0)	270 (19.0)	276 (19.4)
	100	306 (21.5)	306 (21.5)	309 (21.7)
SUCTION PRESSURE PSIG (kg/cm^2G)	70	43 (3.0)	43 (3.0)	43 (3.0)
	80	43 (3.0)	43 (3.0)	44 (3.1)
	90	44 (3.1)	44 (3.1)	47 (3.3)
	100	46 (3.2)	46 (3.2)	47 (3.3)
TOTAL HEAT OF REJECTION	9250 BTU/h (AT 90 °/WT 70 °F)			

Note: Pressure data is recorded first 5 minutes in freezing cycle.
The data without *marks should be used for reference.

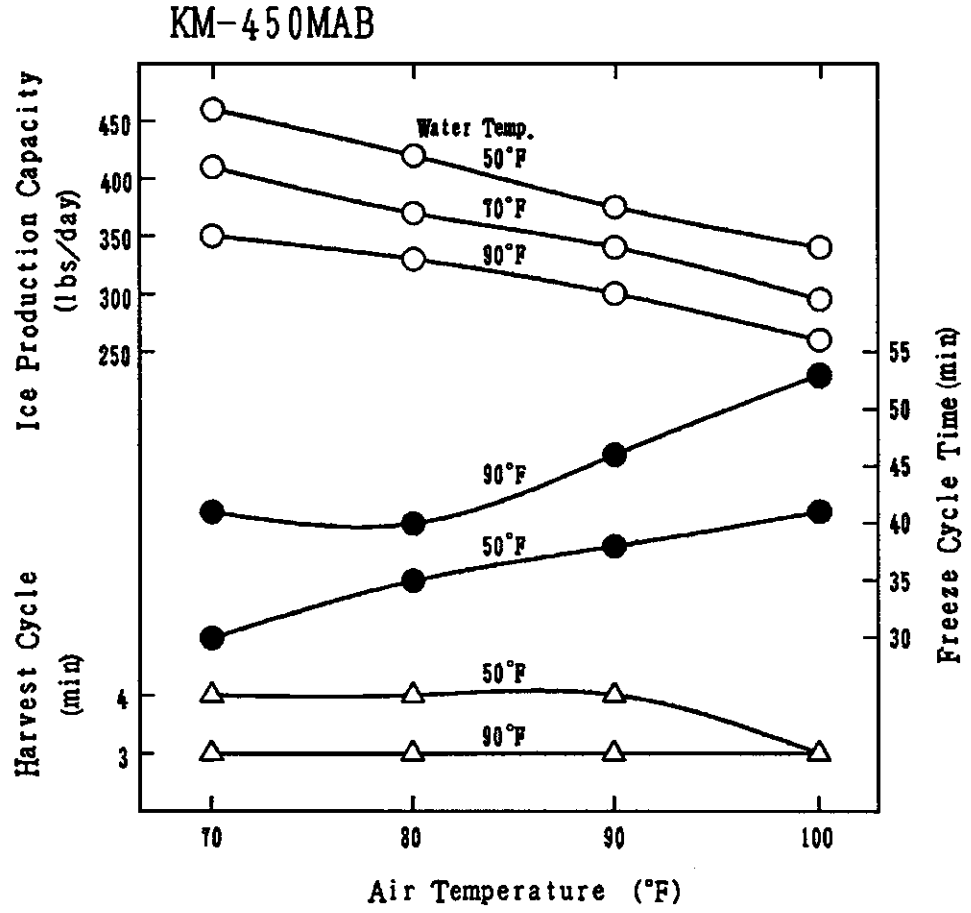


Fig. 24 Performance Data (1) - KM-450MAB

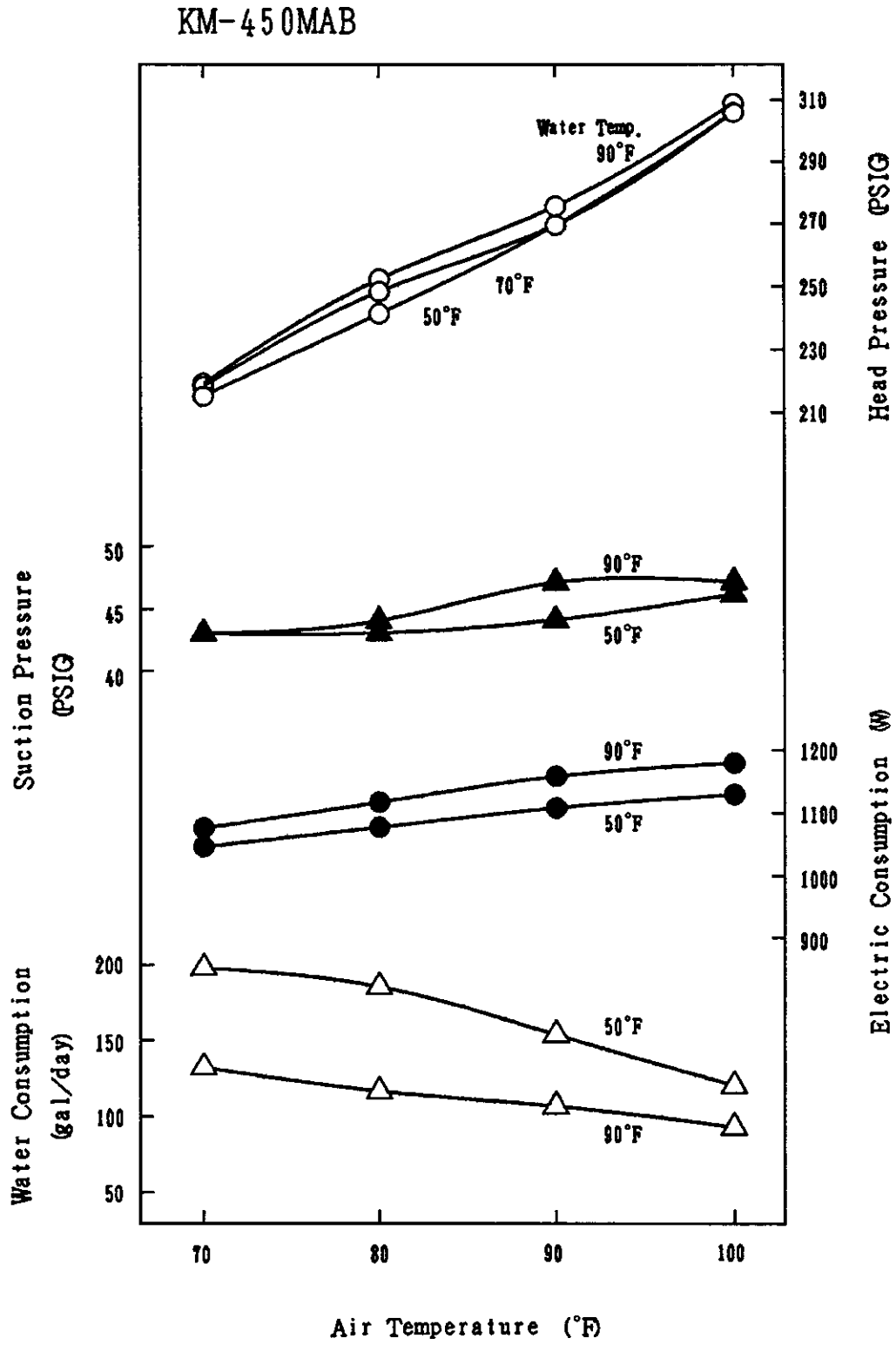


Fig. 25 Performance Data (2) - KM-450MAB

[b] KM-450MWB

APPROXIMATE ICE PRODUCTION PER 24 HR.	Ambient Temp. (°F)	Water Temp. (°F) 50	70	90
lbs./day (kg/day)	70	*490(222)	425(193)	360(163)
	80	485(220)	420(190)	350(159)
	90	475(215)	*420(190)	330(150)
	100	460(209)	395(179)	330(150)
APPROXIMATE ELECTRIC CONSUMPTION watts	70	* 980	980	1020
	80	1000	1000	1020
	90	1000	*1020	1020
	100	1000	1030	1030
APPROXIMATE WATER CONSUMPTION PER 24 HR. gal./day (m^3/day)	70	816(3.09)	1041(3.94)	1981(7.50)
	80	830(3.14)	1051(3.98)	1992(7.54)
	90	845(3.20)	1062(4.02)	2002(7.58)
	100	859(3.25)	1075(4.07)	2016(7.63)
FREEZING CYCLE TIME min.	70	29	34	39
	80	29	34	40
	90	30	35	41
	100	33	36	41
HARVEST CYCLE TIME min.	70	4	3	3
	80	4	3	3
	90	4	3	3
	100	4	3	3
HEAD PRESSURE PSIG (kg/cm^2G)	70	230(16.2)	232(16.3)	249(17.5)
	80	232(16.3)	235(16.5)	249(17.5)
	90	232(16.3)	235(16.5)	249(17.5)
	100	232(16.3)	235(16.5)	250(17.6)
SUCTION PRESSURE PSIG (kg/cm^2G)	70	43(3.0)	43(3.0)	43(3.0)
	80	43(3.0)	43(3.0)	44(3.1)
	90	44(3.1)	46(3.2)	47(3.3)
	100	46(3.2)	46(3.3)	47(3.3)
HEAT OF REJECTION FROM CONDENSER	9160 BTU/h (AT 90°/WT 70°F)			
HEAT OF REJECTION FROM COMPRESSOR	1450 BTU/h (AT 90°/WT 70°F)			
WATER FLOW FOR CONDENSER	70 gal./h (AT 100°/WT 90°F)			
PRESSURE DROP OF COOLING WATER LINE	less than 7 PSIG			

Note: Pressure data is recorded first 5 minutes in freezing cycle.
The data without *marks should be used for reference.

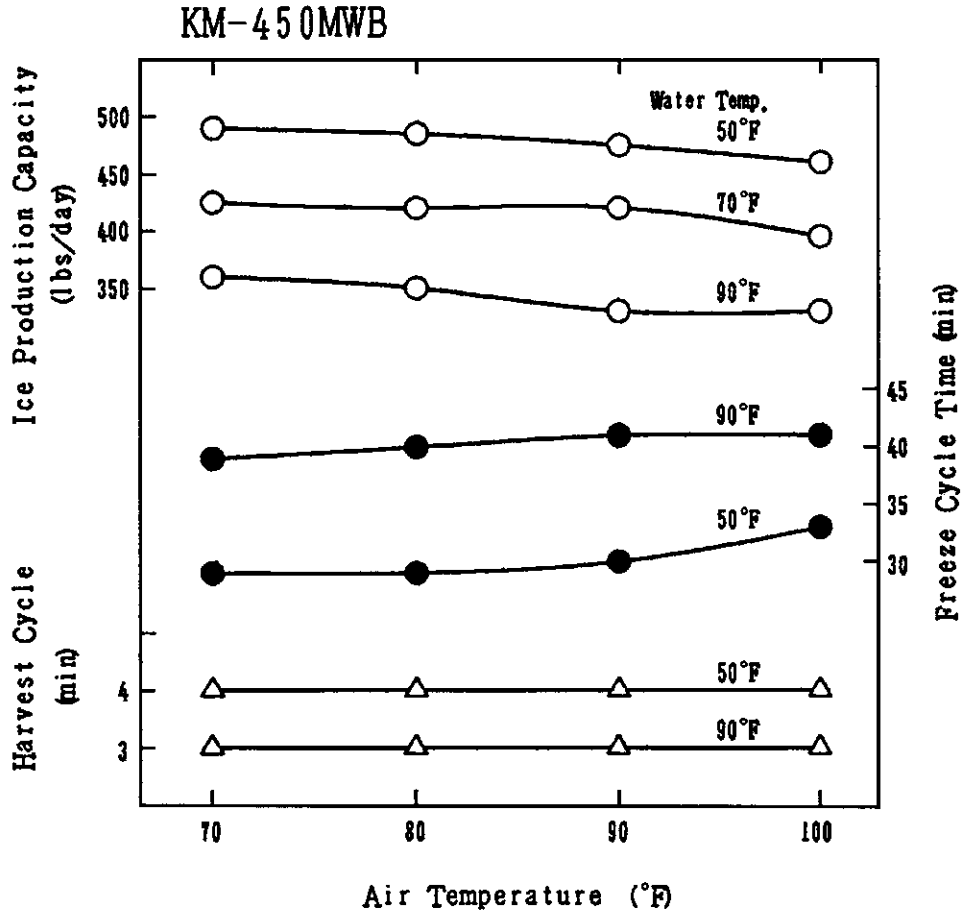


Fig. 26 Performance Data (1) - KM-450MWB

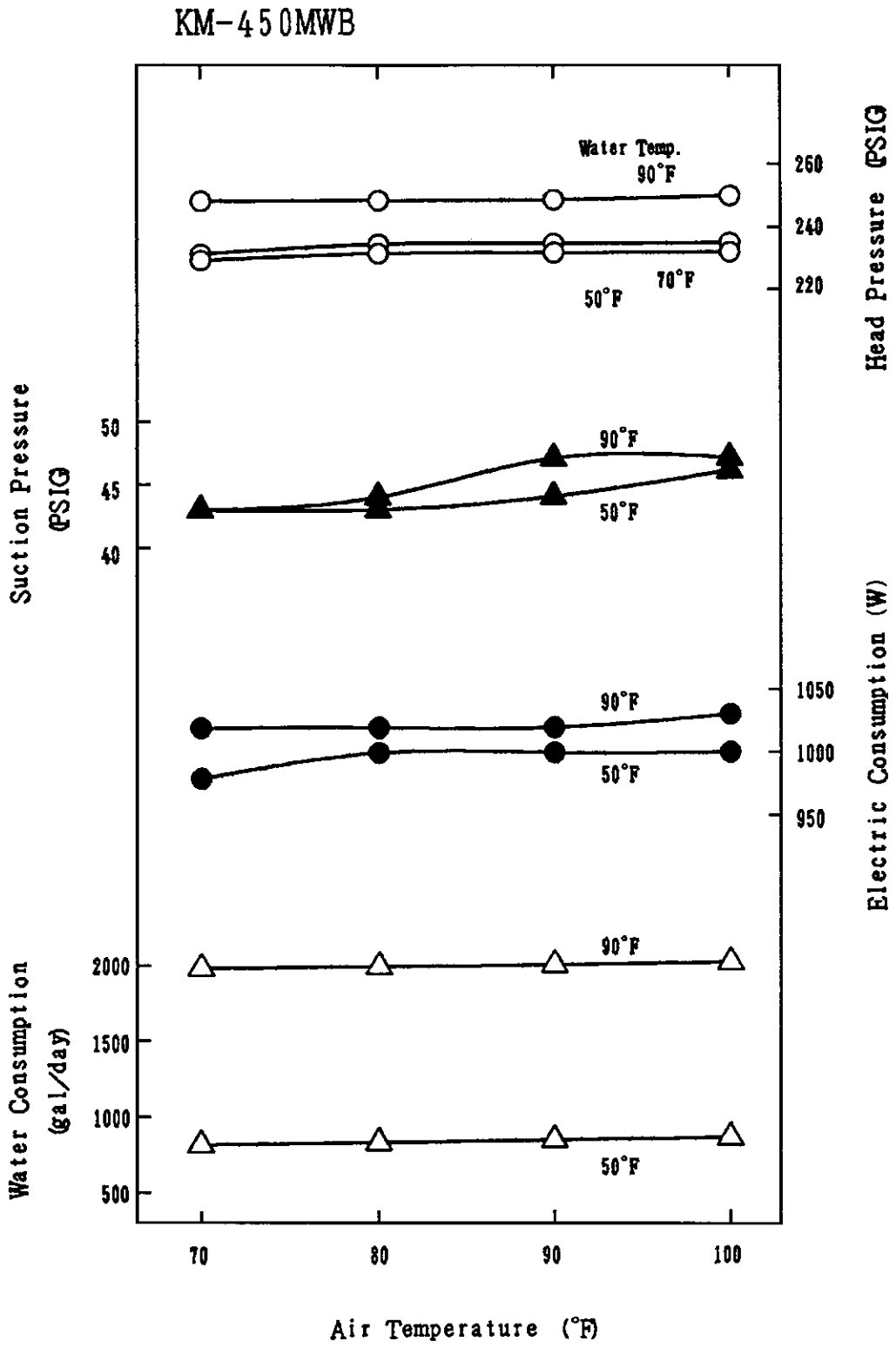


Fig. 27 Performance Data (2) - KM-450MWB

[c] KM-450MRB

	Ambient Temp. (°F)	Water Temp. (°F) 50	70	90
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day)	70	*470 (213)	430 (195)	380 (172)
	80	430 (195)	400 (181)	360 (163)
	90	400 (181)	*370 (168)	330 (150)
	100	360 (163)	330 (150)	290 (132)
APPROXIMATE ELECTRIC CONSUMPTION watts	70	*1080	1080	1090
	80	1090	1100	1130
	90	1120	*1140	1160
	100	1160	1160	1200
APPROXIMATE WATER CONSUMPTION PER 24 HR. gal./day (m^3/day)	70	210 (0.82)	169 (0.64)	148 (0.57)
	80	198 (0.77)	153 (0.59)	141 (0.55)
	90	159 (0.62)	141 (0.55)	131 (0.51)
	100	137 (0.53)	127 (0.49)	116 (0.45)
FREEZING CYCLE TIME min.	70	28	29	33
	80	30	32	35
	90	32	35	38
	100	36	39	43
HARVEST CYCLE TIME min.	70	4	3	3
	80	4	3	3
	90	3.5	3	3
	100	3	3	3
HEAD PRESSURE PSIG (kg/cm^2G)	70	199 (14.0)	199 (14.0)	199 (14.0)
	80	218 (15.3)	222 (15.6)	223 (15.7)
	90	242 (17.0)	245 (17.2)	249 (17.5)
	100	280 (19.7)	272 (19.1)	284 (20.0)
SUCTION PRESSURE PSIG (kg/cm^2G)	70	43 (3.0)	43 (3.0)	43 (3.0)
	80	43 (3.0)	43 (3.0)	44 (3.1)
	90	44 (3.1)	44 (3.1)	47 (3.3)
	100	46 (3.2)	46 (3.2)	47 (3.3)
HEAT OF REJECTION FROM CONDENSER	8800 BTU/h (AT 90 °/WT 70 °F, URC-4A)			
HEAT OF REJECTION FROM COMPRESSOR	1450 BTU/h (AT 90 °/WT 70 °F)			
CONDENSER VOLUME	54.3 cu.in. (URC-4A)			

Note: Pressure data is recorded first 5 minutes in freezing cycle.
The data without *marks should be used for reference.

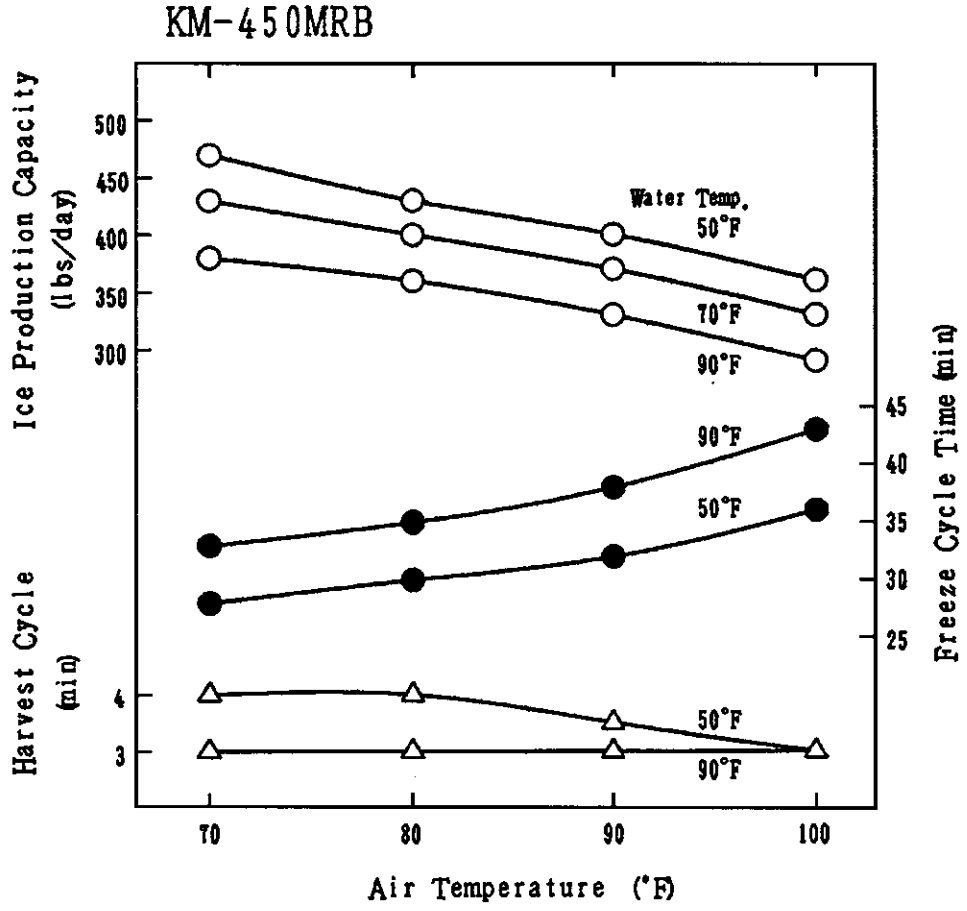


Fig. 28 Performance Data - KM-450MRB

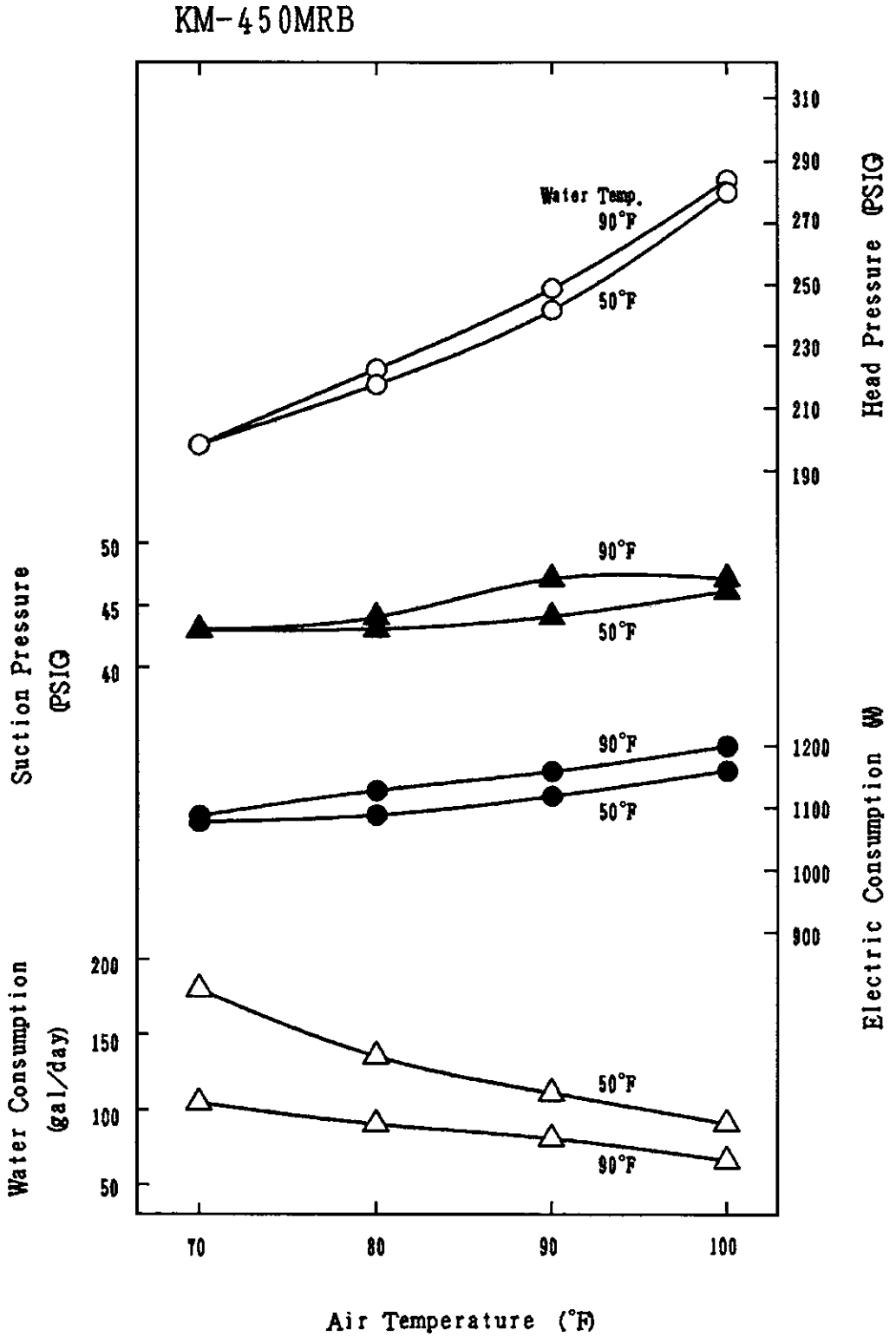


Fig. 29 Performance Data (2) - KM-450MRB

VI. SERVICE DIAGNOSIS

1. NO ICE PRODUCTION

PROBLEM	POSSIBLE CAUSE		REMEDY
[1] The icemaker will not start.	a) Power Supply	1. OFF position.	1. Move to ON position.
		2. Loose connections.	2. Tighten.
		3. Bad contacts.	3. Check for continuity and replace.
	b) Fuse (Inside Fused Disconnect, if any)	1. Blown out.	1. Check for short-circuit and replace.
	c) Control Switch	1. OFF position.	1. Move to ICE position.
		2. Bad contacts.	2. Check for continuity and replace.
	d) Bin Control Thermostat	1. Tripped with bin filled with ice.	1. Remove ice.
		2. Ambient temperature too cool.	2. Get warmer.
		3. Set too warm.	3. See "II. 2. [d] CONTROLS AND ADJUSTMENT, 4) Bin Control."
		4. Bulb out of position.	4. Place in position.
		5. Bad contacts or leaks from bulb.	5. Check for continuity and replace.
	e) High Pressure Control	1. Bad contacts.	1. Check for continuity and replace.
	f) Transformer	1. Thermal fuse blowout or coil winding opened.	1. Replace.
	g) Wiring to Controller Board	1. Loose connections or open.	1. Check for continuity and replace.
	h) Thermistor	1. Leads short-circuit or open and High Temperature Safety operates.	1. See "II. 2. [d] CONTROLS AND ADJUSTMENT, 1) Defrost Control."
	i) Hot Gas Solenoid Valve	1. Continues to open in freeze cycle and High Temperature Safety operates.	1. Check for power OFF in freeze cycle and replace.
	j) Water Supply Line	1. Water supply OFF and water supply cycle does not finish.	1. Check and get recommended pressure.
		2. Condenser water pressure too low or OFF and Pressure Control opens and closes frequently to finally operate High Temperature Safety.	2. Check and get recommended pressure.
	k) Water Solenoid Valve	1. Mesh filter or orifice gets clogged and water supply cycle does not finish.	1. Clean.

PROBLEM	POSSIBLE CAUSE		REMEDY
		2. Coil winding opened.	2. Replace.
		3. Wiring to water valve.	3. Check for loose connection or open, and replace.
	l) Controller Board	1. Defective.	1. See "II. 2. [e] CHECKING CONTROLLER BOARD."
[2] Water continues to be supplied, and the icemaker will not start.	a) Float Switch	1. Connector disconnected.	1. Place in position.
		2. Leads opened or defective switch.	2. Check and replace.
		3. Float does not move freely.	3. Clean or replace.
	b) Controller Board	1. Defective.	1. Replace.
[3] Compressor will not start, or operates intermittently.	a) Wash Switch	1. WASH position.	1. Move to ICE position.
		2. Bad contacts.	2. Check and replace.
	b) High Pressure Control	1. Dirty air filter or condenser.	1. Clean.
		2. Ambient or condenser water temperature too warm.	2. Get cooler.
		3. Refrigerant overcharged.	3. Recharge.
		4. Condenser water pressure too low or off.	4. Check and get recommended pressure.
		5. Fan not operating.	5. See chart 1 - [6].
		6. Refrigerant line or components plugged.	6. Clean and replace drier.
	c) Water Regulator	1. Set too high.	1. Adjust lower.
	d) Overload Protector	1. Bad contacts.	1. Check for continuity and replace.
		2. Voltage too low.	2. Get higher.
		3. Refrigerant overcharged or undercharged.	3. Recharge.
		4. Line valve continues to close in freeze cycle and Overload Protector operates.	4. Check line valve's operation in freeze cycle and replace.
	e) Starter	1. Bad contacts.	1. Check and replace.
		2. Coil winding opened.	2. Replace.
	f) Start Capacitor or Run Capacitor	1. Defective.	1. Replace.
	g) Magnetic Contactor	1. Bad contacts.	1. Check for continuity and replace.
		2. Coil winding opened.	2. Replace.
	h) Compressor	1. Wiring to compressor	1. Check for loose connection or open, and replace.

PROBLEM	POSSIBLE CAUSE		REMEDY
		2. Defective.	2. Replace.
[4] Water continues to be supplied in freeze cycle.	a) Water Solenoid Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker OFF.
	b) Controller Board	1. Defective.	1. See "II. 2. [e] CHECKING CONTROLLER BOARD."
[5] No water comes from Spray Tubes, water pump will not start, or freeze cycle time is too short.	a) Water Supply Line	1. Water pressure too low and water level in water tank too low.	1. Check and get recommended pressure.
	b) Water Solenoid Valve	1. Dirty mesh filter or orifice and water level in water tank too low.	1. Clean.
	c) Water System	1. Water leaks.	1. Check connections for water leaks, and replace.
		2. Clogged.	2. Clean.
	d) Pump Motor	1. Motor winding opened.	1. Replace.
		2. Bearing worn out.	2. Replace.
		3. Wiring to pump motor.	3. Check for loose connection or open, and replace.
		4. Defective capacitor.	4. Replace.
		5. Defective or bound impeller.	5. Replace or clean.
		6. Mechanical Seal worn out.	6. Check and replace.
	e) Controller Board	1. Defective.	1. See "II. 2. [e] CHECKING CONTROLLER BOARD."
[6] Fan motor will not start, or is not operating.	a) Fan Motor	1. Motor winding opened.	1. Replace.
		2. Bearing worn out.	2. Replace.
		3. Wiring to Fan Motor.	3. Check for loose connection or open, and replace.
		4. Defective capacitor	4. Replace.
		5. Fan blade bound	5. Check and replace.
	b) Controller Board	1. Defective.	1. See "II. 2. [e] CHECKING CONTROLLER BOARD."
[7] All components run, but no ice is produced.	a) Refrigerant	1. Undercharged.	1. Check for leaks and recharge.
		2. Air or moisture trapped.	2. Replace drier, and recharge.
	b) Compressor	1. Defective valve	1. Replace.
	c) Hot Gas Solenoid Valve	1. Continues to open in freeze cycle.	1. Check and replace.
	d) Line Valve (Remote Air-cooled model)	1. Continues to close in freeze cycle.	1. Check and replace.

2. EVAPORATOR IS FROZEN UP

PROBLEM	POSSIBLE CAUSE		REMEDY
[1] Freeze cycle time is too long.	a) Float Switch	1. Leads short-circuit or defective switch.	1. Check and replace.
		2. Float does not move freely.	2. Clean or replace.
	b) Water Solenoid Valve	1. Diaphragm does not close.	1. Check for water leaks with icemaker OFF.
	c) Controller Board	1. Defective.	1. See "II. 2. [e] CHECKING CONTROLLER BOARD."
[2] All ice formed on evaporator does not fall into bin in harvest cycle.	a) Controller Board	1. Defrost Timer is set too short.	1. Adjust longer, referring to "II. 2. [d] CONTROLS AND ADJUSTMENT, 2) Defrost Timer."
		2. Defective.	2. See "II. 2. [e] CHECKING CONTROLLER BOARD."
	b) Thermistor	1. Out of position or loose attachment.	1. See "VII. 10. REMOVAL AND REPLACEMENT OF THERMISTOR."
	c) Evaporator	1. Scaled up.	1. Clean.
	d) Ambient and /or water temperature	1. Too cool.	1. Get warmer.
	e) Water Supply Line	1. Water pressure too low.	1. Check and get recommended pressure.
	f) Water Solenoid Valve	1. Dirty mesh filter or orifice.	1. Clean.
		2. Diaphragm does not close.	2. Check for water leaks with icemaker OFF.
	g) Line Valve (Remote Air-cooled model)	1. Continues to open in harvest cycle.	1. Check operation in harvest cycle and replace.
[3] Others	a) Spray Tubes	1. Clogged.	1. Clean.
		2. Out of position.	2. Place in position.
	b) Water System	1. Dirty.	1. Clean.
	c) Refrigerant	1. Undercharged.	1. Check for leaks and recharge.
	d) Expansion Valve	1. Bulb out of position or loose attachment.	1. Place in position.
		2. Defective.	2. Replace.
	e) Hot Gas Solenoid Valve	1. Coil winding opened.	1. Replace.
		2. Plunger does not move.	2. Replace.
		3. Wiring to hot gas valve.	3. Check for loose connection or open, and replace.

3. LOW ICE PRODUCTION

PROBLEM	POSSIBLE CAUSE	REMEDY
[1] Freeze cycle time is long.	a) See chart 1 - [3], and check dirty air filter or condenser, ambient or water temperature, water pressure, water regulator or refrigerant charge.	
	b) See chart 2 - [1], and check float switch, water solenoid valve or controller board.	
[2] Harvest cycle time is long.	a) See chart 2 - [2], and check controller board, thermistor, evaporator, ambient and/or water temperature, water supply line, water solenoid valve or line valve.	

4. ABNORMAL ICE

PROBLEM	POSSIBLE CAUSE		REMEDY
[1] Small cube	a) Float Switch	1. Not in factory set position.	1. Move to lower position.
	b) Ice Cube Guide	1. Out of position. Circulated water falls into bin.	1. Place in position.
	c) See chart 1 - [5], and check water supply line, water solenoid valve, water system, pump motor or controller board.		
	d) Drain Valve	1. Dirty.	1. Clean.
[2] Cloudy or irregular cube	a) See chart 2 - [1] and - [3], and check float switch, water solenoid valve, controller board, spray tubes, water system, refrigerant charge or expansion valve.		
	b) Spray Guide	1. Dirty.	1. Clean.
	c) Water Quality	1. High hardness or contains impurities.	1. Install a water filter or softener.

5. OTHERS

PROBLEM	POSSIBLE CAUSE		REMEDY
[1] Icemaker will not stop when bin is filled with ice.	a) Bin Control Thermostat	1. Set too cold.	1. Adjust warmer.
		2. Defective.	2. Replace.
[2] Abnormal noise	a) Pump Motor	1. Bearings worn out.	1. Replace.
	b) Fan Motor	1. Bearings worn out.	1. Replace.
		2. Fan blade deformed.	2. Replace fan blade.
		3. Fan blade does not move freely.	3. Replace.
	c) Compressor	1. Bearings worn out, or cylinder valve broken.	1. Replace.
		2. Mounting pad out of position.	2. Reinstall.
	d) Refrigerant Lines	1. Rub or touch lines or other surfaces.	1. Replace.
[3] Ice in storage bin often melts.	a) Bin Drain	1. Plugged.	1. Clean.

VII. REMOVAL AND REPLACEMENT OF COMPONENTS

1. SERVICE FOR REFRIGERANT LINES

[a] REFRIGERANT DISCHARGE

The all models are provided with a Refrigerant Access Valve on the Low-side line. For the air-cooled and water-cooled models, install a proper fitting on the High-side line, if necessary, to check for gauge pressure. Only the remote air-cooled model is provided with a Refrigerant Access Valve on the Receiver Tank.

[b] EVACUATION AND RECHARGE

1) Attach Charging Hoses, a Service Manifold and a Vacuum Pump to the system. For the remote air-cooled model, be sure to connect Charging Hoses to both High-side and Low-side lines to evacuate the system.

2) Turn on the Vacuum Pump.

3) Allow the Vacuum Pump to pull down to a 29.9" Hg vacuum. Evacuating period depends on pump capacity.

4) Close the Low-side Valve and High-side Valve on the Service Manifold.

5) Disconnect the Vacuum Pump, and attach a Refrigerant Service Cylinder to the Low-side line. Remember to loosen the connection, and purge the air from the Hose. For the air-cooled and water-cooled models, see the Nameplate for required refrigerant charge. For the remote air-cooled model, see the Charge Label on the left side wall of the machine compartment.

6) Open the Low-side Valve. Do not invert the Service Cylinder. A liquid charge will damage the Compressor.

7) Turn on the icemaker when charging speed gets slow. Turn off the icemaker when the Low-side Gauge shows approximately 0 PSIG. Do not run the icemaker at negative pressures. Close the Low-side Valve when the Service Cylinder gets empty.

8) Repeat the above steps 4) through 7), if necessary, until a required amount of refrigerant has entered the system.

9) Close the one or two Refrigerant Access Valve(s), and disconnect the Hoses and Service Manifold.

10) Cap the Access Valve(s) to prevent possible leak.

2. BRAZING

DANGER

1. Refrigerant R502 itself is not flammable, explosive and poisonous. However, when exposed to an open flame, R502 creates Phosgene gas, hazardous in large amounts.

2. Always discharge the refrigeration system through hose vented to the outside, because it is dangerous for the room to be filled with R502 which displaces oxygen.

3. Do not use silver alloy or copper alloy containing Arsenic.

Note: All brazing-connections in the Evaporator Case are clear-paint coated. Sandpaper the brazing-connections before unbrazing the components. Use a good abrasive cloth to remove paint.

3. REMOVAL AND REPLACEMENT OF COMPRESSOR

IMPORTANT

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

Note: When replacing a Compressor with defective winding, be sure to check the Capacitor and replace if necessary.

1) Turn off the power supply.

2) Remove the Front Panel, the Top Panel and the Right Side Panel.

3) Discharge the refrigerant.

4) Remove the Barrier and the Terminal Cover on the Compressor, and disconnect the Compressor Wiring.

5) Remove the Discharge and Suction Pipes using brazing equipment.

6) Remove the Hold-down Bolts, Washers and Rubber Grommets.

7) Slide and remove the Compressor. Unpack a new Compressor package. Install a new Compressor.

8) Attach the Rubber Grommets of the prior Compressor.

9) Sandpaper the Suction, Discharge and Process Pipes.

10) Place the Compressor in position, and secure it using the Bolts and Washers.

11) Remove plugs from the Suction, Discharge and Process Pipes.

12) Braze the Process, Suction and Discharge lines (Do not change this order), while purging with nitrogen gas flowing at the pressure 3 - 4 PSIG.

13) Replace the Drier.

14) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

15) Evacuate the system, and charge it with refrigerant. For the air-cooled and water-cooled models, see the Nameplate for required refrigerant charge. For the remote air-cooled model, see the Charge Label on the left side wall of the machine compartment.

16) Connect the Terminals, and place the Terminal Cover in position. Attach the Barrier with screws.

17) Turn on the power supply.

4. REMOVAL AND REPLACEMENT OF DRIER

IMPORTANT

Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all others repairs or replacements have been made.

1) Turn off the power supply.

2) Remove the Front Panel, Top Panel and Right Side Panel.

3) Discharge the refrigerant.

4) Remove the Drier.

5) Install a new Drier, with the arrow on the Drier, in the direction of the refrigerant flow. Use nitrogen gas at the pressure of 3 - 4 PSIG when brazing the tubings.

6) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

7) Evacuate the system, and charge it with refrigerant. For the air-cooled and water-cooled models, see the Nameplate for required refrigerant charge. For the remote air-cooled model, see the Charge Label on the left side wall of the machine compartment.

8) Place the panels in position.

9) Turn on the power supply.

5. REMOVAL AND REPLACEMENT OF EXPANSION VALVE

IMPORTANT

Sometimes moisture in the refrigerant circuit exceeds the Drier capacity and freezes up at the Expansion Valve. Always install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repairs or replacement have been made.

1) Turn off the power supply.

2) Remove the Top Panel, the Upper and Lower Rear Panels and the Louver.

3) Discharge the refrigerant.

4) Remove the Expansion Valve Bulb at the Evaporator outlet.

5) Remove the Expansion Valve Cover, and disconnect the Expansion Valve using brazing equipment.

6) Braze a new Expansion Valve, with nitrogen gas flowing at the pressure of 3 - 4 PSIG.

WARNING

Always protect the valve body using a damp cloth to prevent the valve from overheat. Do not braze with the valve body exceeding 250°F.

7) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

8) Evacuate the system, and charge it with refrigerant. For the air-cooled and water-cooled models, see the Nameplate for required refrigerant charge. For the remote air-cooled model, see the Charge Label on the left side wall of the machine compartment.

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

10) Place a new set of Expansion Valve Covers in position.

11) Place the panels and the Louver in position.

12) Turn on the power supply.

6. REMOVAL AND REPLACEMENT OF HOT GAS VALVE AND/OR LINE VALVE

CAUTION

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

IMPORTANT

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

1) Turn off the power supply.

2) Remove the Front Panel, Top Panel and Right Side Panel.

3) Discharge the refrigerant.

4) Remove the screw and the Solenoid.

5) Disconnect the Hot Gas Valve and/or the Line Valve using brazing equipment.

6) Install a new valve.

WARNING

Always protect the valve body using a damp cloth to prevent the valve from overheat. Do not braze with the valve body exceeding 250°F.

7) Replace the Drier.

8) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

9) Evacuate the system, and charge it with refrigerant. For the air-cooled and water-cooled models, see the Nameplate for required refrigerant charge. For the remote air-cooled model, see the Charge Label on the left side wall of the machine compartment.

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

11) Connect a new Solenoid.

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

13) Turn on the power supply.

7. REMOVAL AND REPLACEMENT OF WATER REGULATING VALVE - WATER-COOLED MODEL ONLY

IMPORTANT

It is better to install a new Drier every time the sealed refrigeration system is opened. Do not replace the Drier until after all other repairs or replacement have been made.

1) Turn off the power supply.

2) Close the Water Supply Line Shut-off Valve.

3) Remove the Front Panel, the Top Panel and the Right Side Panel.

4) Discharge the refrigerant.

5) Disconnect the Capillary Tube at the Condenser outlet using brazing equipment.

6) Disconnect the Flare-connections of the valve.

7) Remove the screws and the valve from the Bracket.

8) Install a new valve, and braze the Capillary Tube.

9) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

10) Evacuate the system, and charge it with refrigerant. See the Nameplate for required refrigerant charge.

11) Connect the Flare-connections.

12) Open the Water Supply Line Shut-off Valve.

13) Check for water leaks.

14) Place the panels in position.

15) Turn on the power supply.

8. ADJUSTMENT OF WATER REGULATING VALVE - WATER-COOLED MODEL ONLY

The Water Regulating Valve or 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) Attach a pressure gauge to the high-side line of the system. Or prepare a thermometer to check for the condenser drain temperature.

2) Rotate the adjustment screw by using a flat blade screwdriver, so that the pressure gauge shows 235 PSIG, or the thermometer reads 108 - 113°F, 5 minutes after a freeze cycle or icemaking process starts. When the pressure exceeds 235 PSIG, or the condenser drain temperature exceeds 113°F, rotate the adjustment screw counterclockwise.

3) Check that the pressure or the condenser drain temperature holds a stable setting.

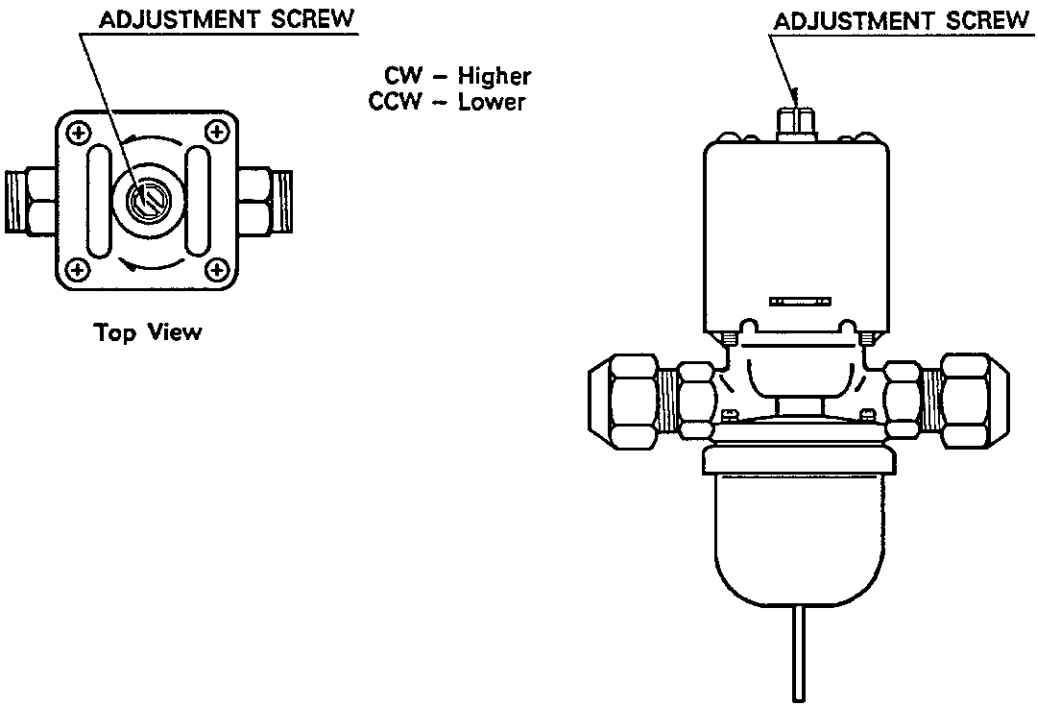


Fig. 30 Water Regulating Valve

9. REMOVAL AND REPLACEMENT OF CONDENSING PRESSURE REGULATOR (C.P.R.) - REMOTE AIR-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 repairs or replacements have been made.

1) Turn off the power supply.

2) Remove the panels from the remote condenser unit.

3) Discharge the refrigerant.

4) Remove the C.P.R. using brazing equipment.

5) Install a new C.P.R. Use nitrogen gas at the pressure of 3 - 4 PSIG when brazing the C.P.R..

WARNING

Always protect the C.P.R. body using a damp cloth to prevent the C.P.R. from overheat. Do not braze with the C.P.R. body exceeding 250°F.

6) Install a new Drier in the icemaker.

7) Check for leaks using nitrogen gas (140 PSIG) and soap bubble.

8) Evacuate the system and charge it with refrigerant. See the Charge Label on the left side wall of the machine compartment in the icemaker.

9) Place the panels in position.

10) Turn on the power supply.

10. REMOVAL AND REPLACEMENT OF THERMISTOR

CAUTION

1. Fragile, handle very carefully.
2. Always use a recommended sealant (High Thermal Conductive Type), Model KE4560RTV manufactured by SHINETSU SILICONE, Part Code 60Y000-11, or equivalent.
3. Always use a recommended foam insulation (Non-absorbent Type) or equivalent.

1) Turn off the power supply.

2) Remove the Front Panel.

3) Remove the Control Box Cover.

4) Disconnect the Thermistor leads from the K3 Connector on the Controller Board.

5) Remove the screw, Strap, Cable Tie, Foam Insulation, Thermistor Holder and Thermistor.

6) Scrape away the old sealant on the Thermistor Holder and the Suction Pipe.

7) Smoothly apply recommended sealant (KE4560RTV, Part Code 60Y000-11) to the Thermistor Holder concave.

8) Wipe off moisture or condensate on the Suction Pipe.

9) Attach a new Thermistor to the Suction Pipe very carefully to prevent damage to the leads. And secure it using the Thermistor Holder and recommended foam insulation.

10) Secure the Insulation using plastic cable ties.

11) Secure the Thermistor attachment portion using the Strap and the screw.

12) Connect the Thermistor leads through the bushing of the Control Box to the K3 Connector on the Controller Board.

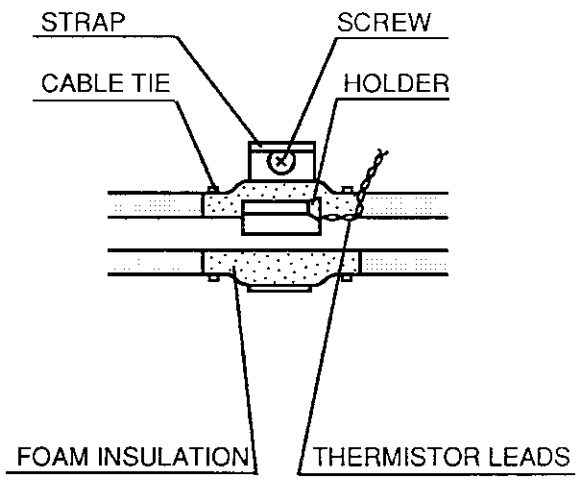


Fig. 31 Thermistor Attachment

13) Place the Control Box Cover and the panels in position.

14) Turn on the power supply.

11. REMOVAL AND REPLACEMENT OF FAN MOTOR

Note: When replacing a Fan Motor with defective winding, be sure to check the Capacitor and replace if necessary.

1) Turn off the power supply.

2) Remove the Front Panel, the Top Panel and the Right Side Panel.

3) Remove the closed end connectors from the Fan Motor leads.

4) Remove the Fan Motor Bracket and Fan Motor.

5) Install a new Fan Motor in reverse order.

6) Place the panels in position.

7) Turn on the power supply.

12. REMOVAL AND REPLACEMENT OF WATER VALVE

1) Turn off the power supply.

2) Close the Water Supply Line Shut-off Valve.

3) Remove the Front Panel.

4) Remove the Valve Outlet Tubing by releasing the Clamp.

5) Remove the Bracket from the unit.

6) Remove the Fitting Nut and Water Vlave.

7) Disconnect the Terminals from the Water Valve.

8) Install a new Water Valve in reverse order.

9) Open the Water Supply Line Shut-off Valve.

10) Turn on the power supply.

11) Check for leaks.

12) Place the panel in position.

13. REMOVAL AND REPLACEMENT OF PUMP MOTOR

Note: When replacing a Pump Motor with defective winding, be sure to check the Capacitor and replace if necessary.

1) Turn off the power supply.

2) Remove the Front panel, the Top Panel and the Base Cover.

3) Remove one end of the Pump Tubing, and drain the Water Tank.

4) Disconnect the Pump Suction and Discharge Hoses.

5) Remove the screw and the Pump Motor Bracket.

6) Remove the closed end connectors from the Pump Motor leads.

7) Remove the Pump Motor from the Pump Motor Bracket.

8) Remove the Pump Housing, and check the Impeller.

9) If the Impeller is defective, install a new Pump Motor.

10) Install a new motor or new parts in reverse order.

11) Turn on the power supply, and check for leaks.

12) Place the panels in position.

14. REMOVAL AND REPLACEMENT OF SPRAY TUBES

1) Turn off the power supply.

2) Close the Water Supply Line Shut-off Valve.

3) Remove the Front Panel and the Front Insulation.

4) Remove the Rubber Hoses from the Spray Tubes (Water Supply Pipe).

5) Release the Clamps, and disconnect the Rubber Hoses.

6) Remove the Spray Tubes by clipping the side tabs.

7) Install new Spray Tubes in reverse order.

8) Replace the panels in position.

9) Open the Water Supply Line Shut-off Valve.

10) Turn on the power supply.

VIII. PROCEDURES FOR CHECKING INSIDE THE CONTROL BOX

1) Remove the two screws fixing the front of the Control Box to the Front Frame.

2) Slightly lift the rear of the Control Box to remove it from the Hook of the Junction Box, and then pull the Control Box out.

3) Check the inside of the Control Box.

Replace the Control Box in the reverse order of steps 1) and 2).
At this time, take sufficient care so that the rear of the Control Box goes inside the guides of the Top Frame and also that the power leads are not pinched between the Top Frame and the Control Box.