SHUTTLE ICE DISPENSER

DSM-13DE

SERVICE MANUAL

L026-1211 (091925)

CONTENTS PAGE

I. SPECIFICATIONS

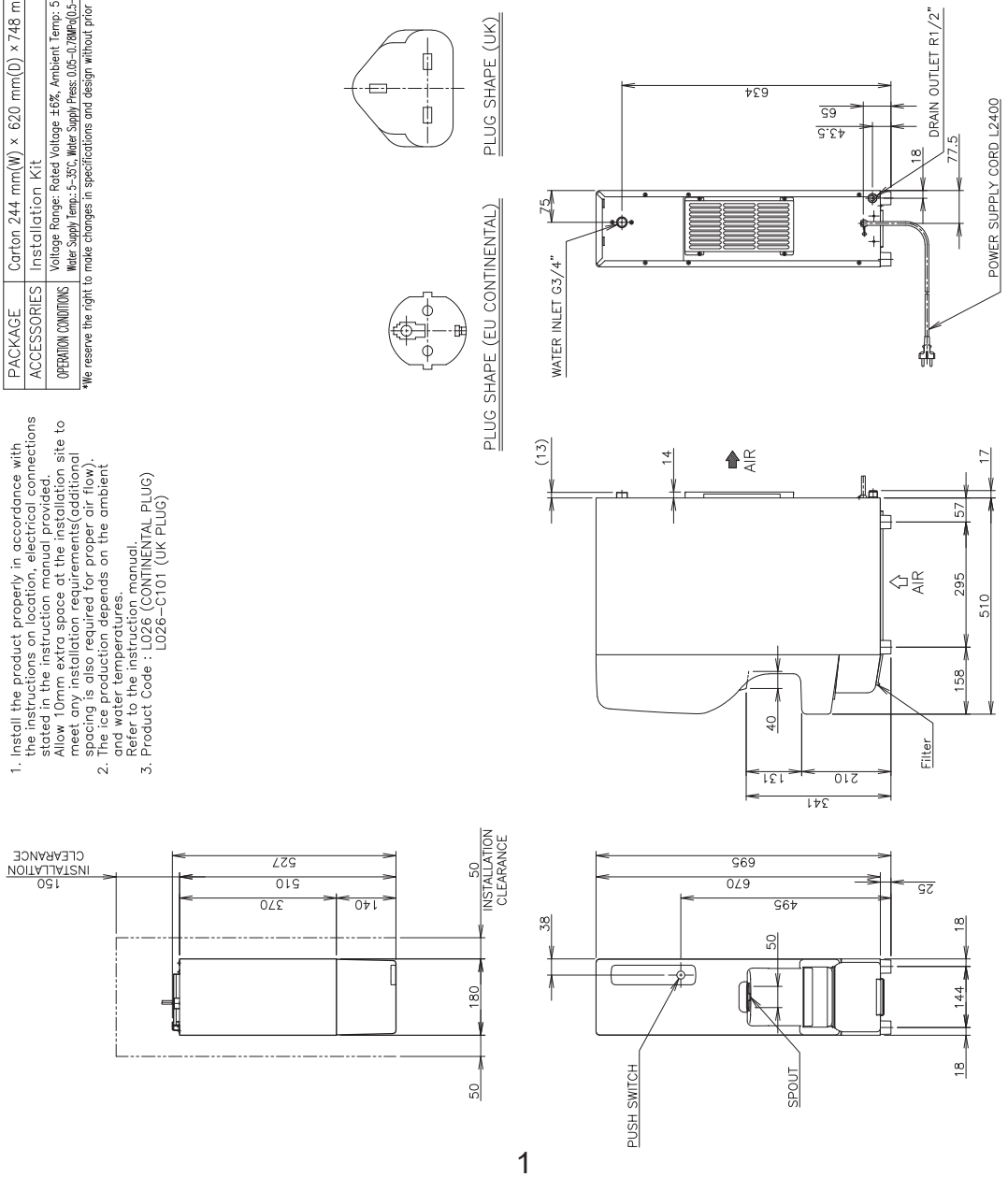
1. DIMENSIONS/CONNECTIONS

ITEM	Hoshizaki Shuttle Ice Dispenser
MODEL	DSM-13DE
POWER SUPPLY	1 PHASE 220-240V 50Hz Capacity: 0.49kVA (2.0A)
AMPERAGE	Rated: 1.4A(AT. 32°C, WT. 21°C) Starting: 7.5kVA
ELECTRICAL CONSUMPTION	160W(AT. 32°C, WT. 21°C) (Power factor: 48%)
ICE PRODUCTION PER 24h	Approx. 13kg(AT. 10°C, WT. 10°C) Approx. 11kg(AT. 21°C, WT. 15°C) Approx. 9kg(AT. 32°C, WT. 21°C)
WATER CONSUMPTION PER 24h	Approx. 0.108m³ (AT. 10°C, WT. 10°C) Approx. 0.088m³ (AT. 21°C, WT. 15°C) Approx. 0.081m³ (AT. 32°C, WT. 21°C)
SHAPE OF ICE	Shuttle
FREEZE CYCLE TIME	Approx. 12min(AT. 21°C, WT. 15°C)
ICE PRODUCTION PER CYCLE	Approx. 0.085kg / 27pcs.(AT. 21°C, WT. 15°C)
STORAGE CAPACITY	Approx. 3kg
ICE DISPENSING RATE	Approx. 700g / min
DIMENSIONS	180 mm(W) × 527 mm(D) × 695 mm(H)
EXTERIOR	Acrylic Baked Steel (Cabinet), ABS Molding (Front Panel)
INSULATION	Polyurethane Foam
INSULATION FOAM BLOWING AGENT	HFO-1233zd(E)
CONNECTIONS -ELECTRIC	Y-Type Connection
CONNECTIONS -WATER SUPPLY	Inlet G3/4 (Connected at rear side)
CONNECTIONS-DRAIN	Outlet R1/2 (Connected at rear side)
ICE MAKING SYSTEM	Mandrel type, Water agitated by plate
HARVESTING SYSTEM	Hot Gas Defrost, Water Pan tilted by motor
ICE DISPENSING SYSTEM	Auger Operated by Push Switch
COMPRESSOR	Hermetic
CONDENSER	Air-cooled, Fin and Tube type
HEAT REJECTION	300W(258 kcal/h)(AT. 32°C, WT. 21°C)
EVAPORATOR	Tin-plated copper tube on sheet with copper mandrel
REFRIGERANT CONTROL	Capillary Tube
REFRIGERANT CHARGE	R-600a/36g
ICE MAKING CONTROL	Ice thickness measurement
HARVESTING CONTROL	Thermistor on Evaporator Outlet
ICE STORAGE CONTROL	Microswitch
WATER SUPPLY CONTROL	Water Pan's movement
ICE MAKING WATER CONTROL	Overflow
ELECTRICAL PROTECTION	Class I Appliance, 5A Fuse
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-out(Internal)
COMPRESSOR PROTECTION	Auto-reset Overload Protector(Internal)
GEAR MOTOR PROTECTION	Auto-reset Thermal Protector
WEIGHT	26kg (Gross 28kg)

PACKAGE	Carton 244 mm(W) × 620 mm(D) × 748 mm(H)
ACCESSORIES	Installation Kit
OPERATION CONDITIONS	Voltage Range: Rated Voltage ±6%, Ambient Temp: 5~40°C Water Supply Temp.: 5~35°C, Water Supply Press: 0.05~0.78MPa(0.5~7.8bar)

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

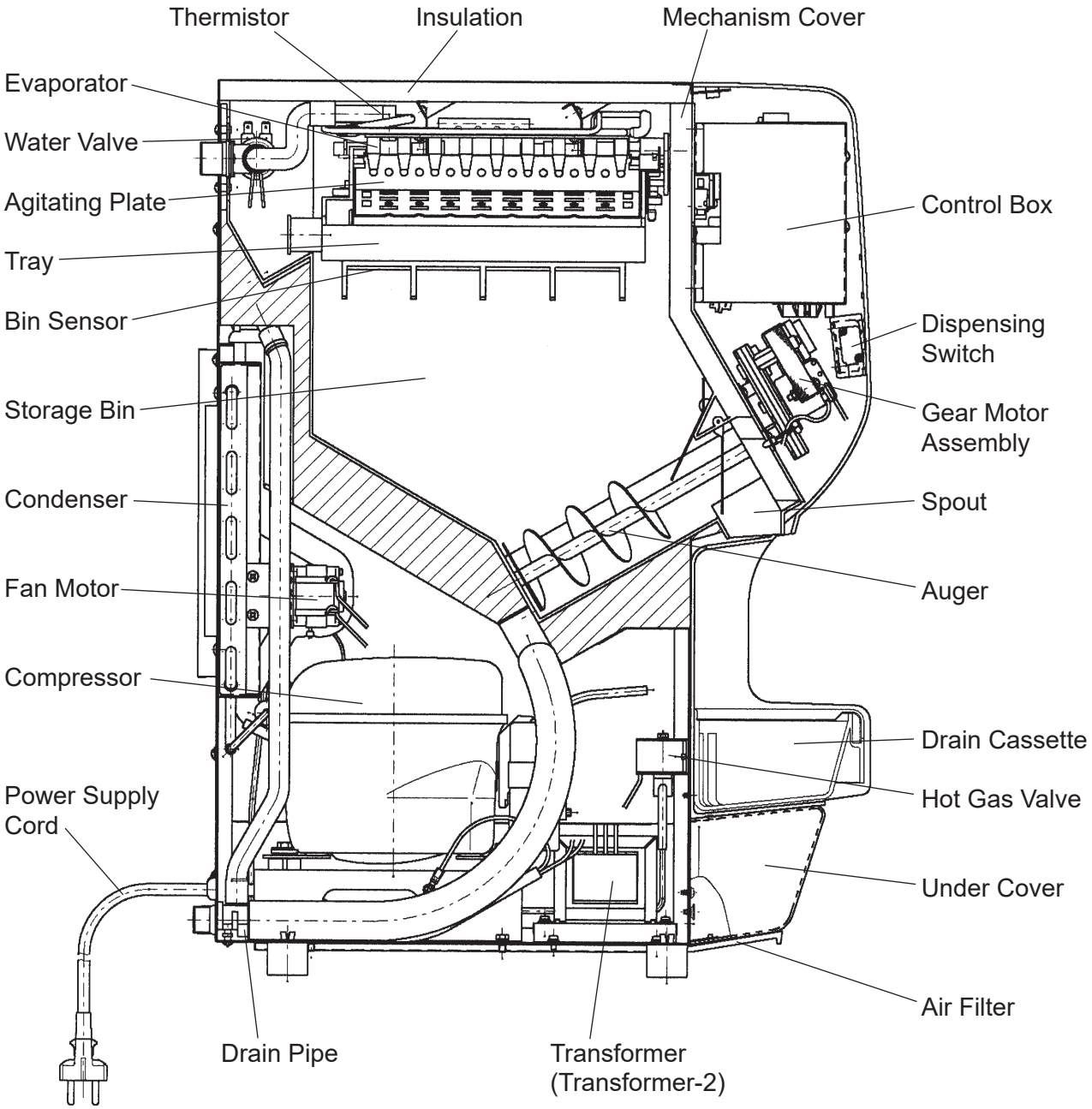
1. Install the product properly in accordance with the instructions on location, electrical connections stated in the instruction manual provided. Allow 10mm extra space at the installation site to meet any installation requirements(additional spacing is also required for proper air flow).
2. The ice production depends on the ambient and water temperatures. Refer to the instruction manual.
3. Product Code : L026 (CONTINENTAL PLUG)
   L026-C101 (UK PLUG)



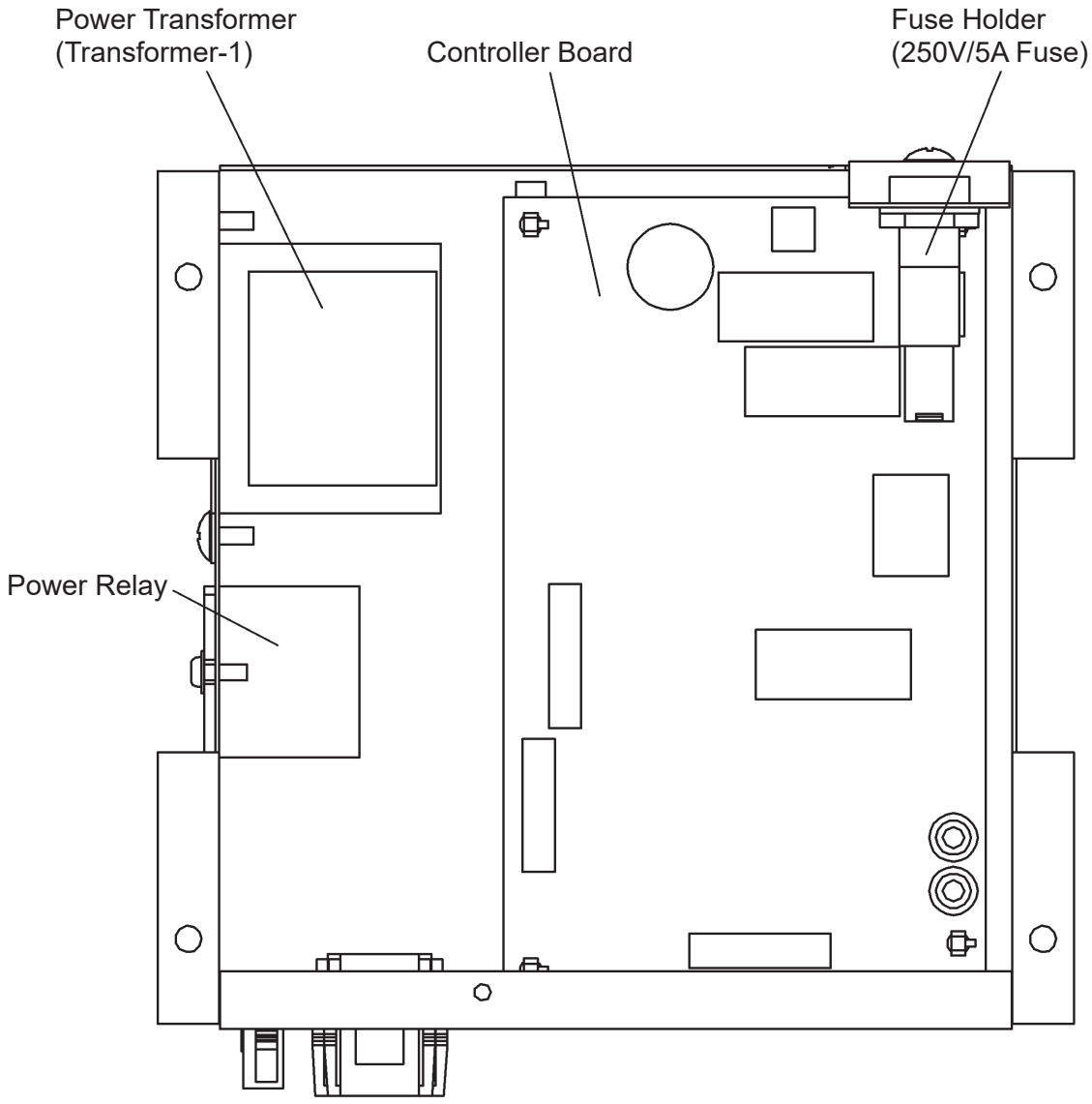
II. GENERAL INFORMATION

1. CONSTRUCTION

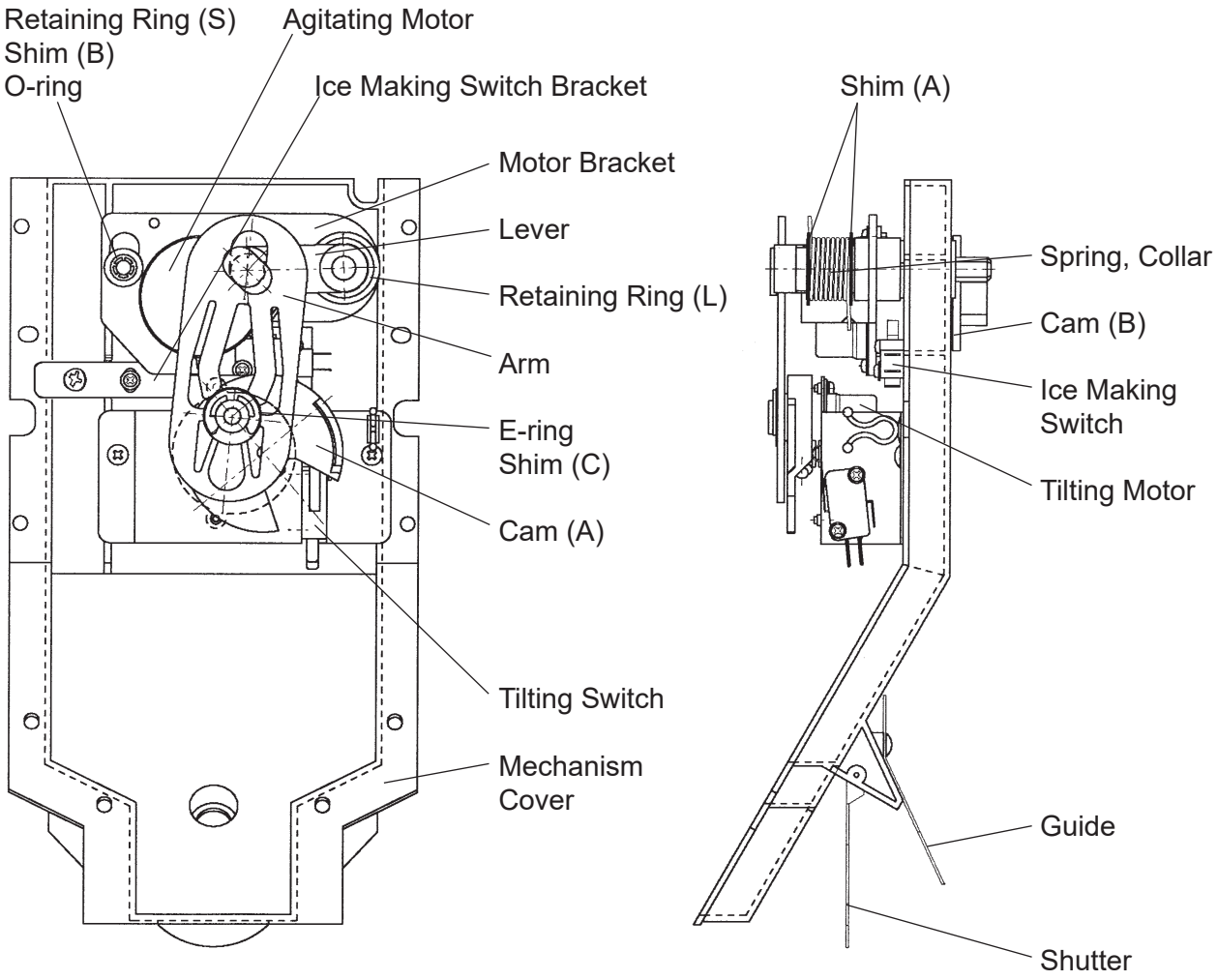
[a] LEFT SIDE VIEW WITH PANELS REMOVED



[b] CONTROL BOX



[c] MECHANISM ASSEMBLY



III. MAINTENANCE

WARNING

1. Before carrying out any cleaning or maintenance operations, unplug the ice dispenser from the electrical supply network.

2. This appliance must not be cleaned by use of a water jet.

3. To prevent possible damage, do not clean the plastic parts with water above 40°C or in a dishwasher.

[1] Condenser

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

[2] Storage Bin Interior and Tray Cleaning/Sanitisation (as required)

IMPORTANT

Every time the mechanism cover or tray is removed, check the ice size after assembling the removed parts.

1) Dispense all ice, and empty the storage bin.

2) Unplug the ice dispenser.

3) Remove the front panel.

4) Disconnect all the connectors from the control box. Remove the screws, and put the control box on top of the cabinet.

   Note: Be careful not to break the thermostat capillaries.

5) Unscrew and remove the gear motor assembly.

6) Remove the E-ring and shim (C), and take the arm off the cam (A) and lever.

7) Pull out the lever.

8) Remove the mechanism cover.

9) Remove the tray and auger.

10) Wash the storage bin, tray, auger and mechanism cover liner with a neutral non-abrasive cleaner. Rinse thoroughly.

    Note: Do not splash water on the electrical parts on the surface of the mechanism cover.

11) Mix 5 litres of water with 18 ml of 5.25% sodium hypochlorite solution in a suitable container.

12) Soak a clean sponge or cloth with the solution, and wipe the storage bin, tray, auger and mechanism cover liner.

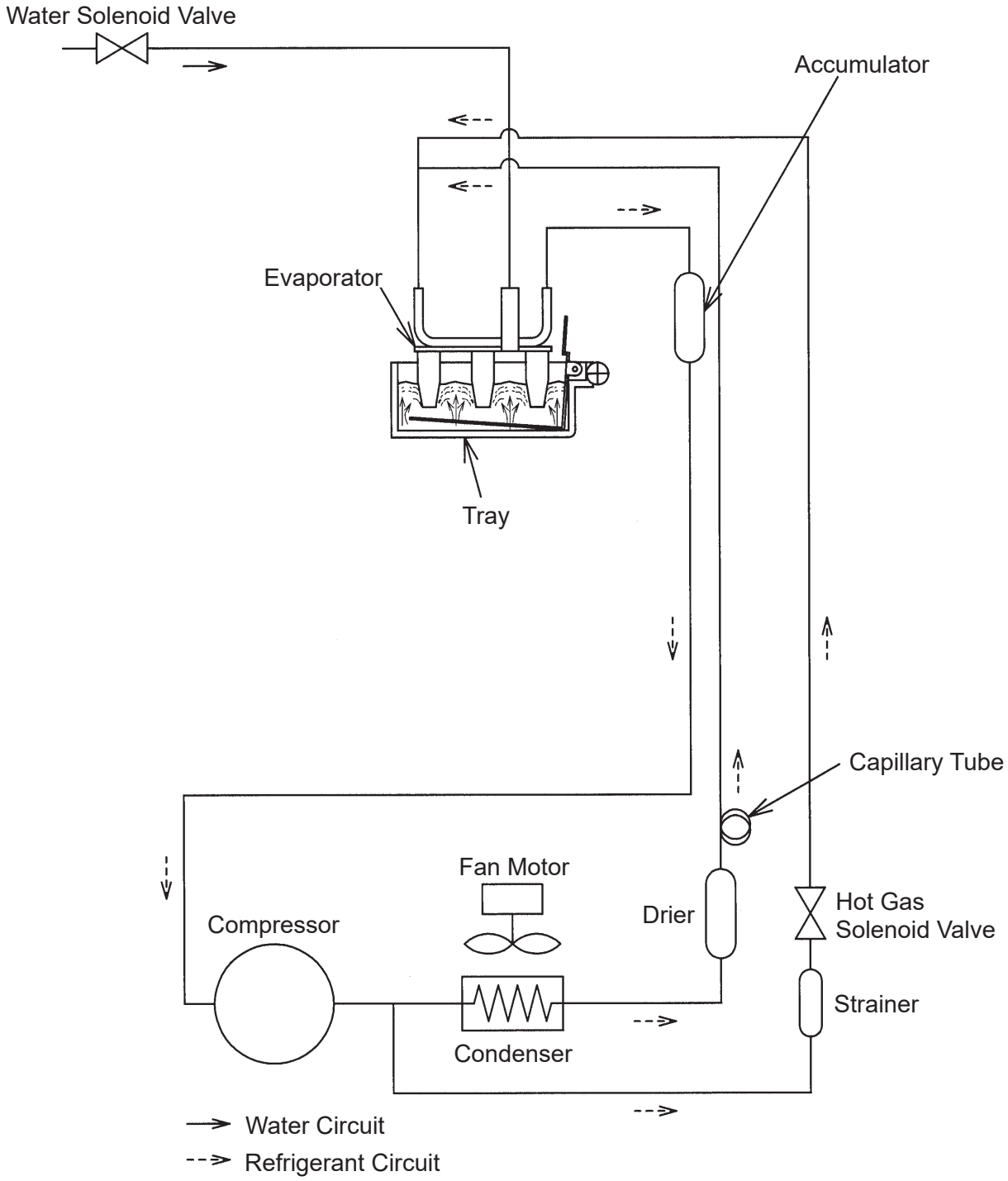
13) Replace the removed parts in their correct position.

14) Plug in the ice dispenser.

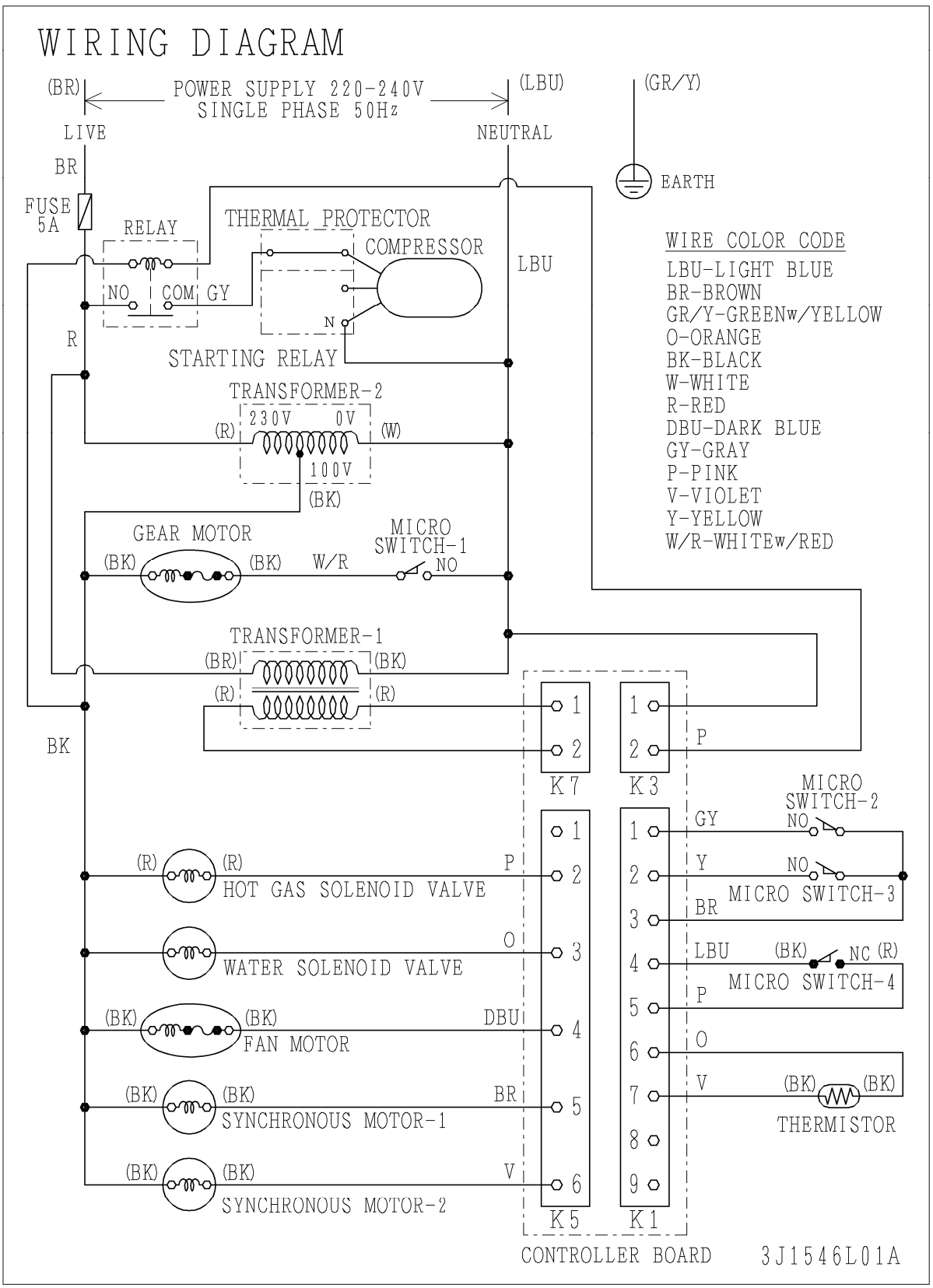
Note: Do not wipe dry or rinse after sanitising, but allow to air dry.

IV. TECHNICAL INFORMATION

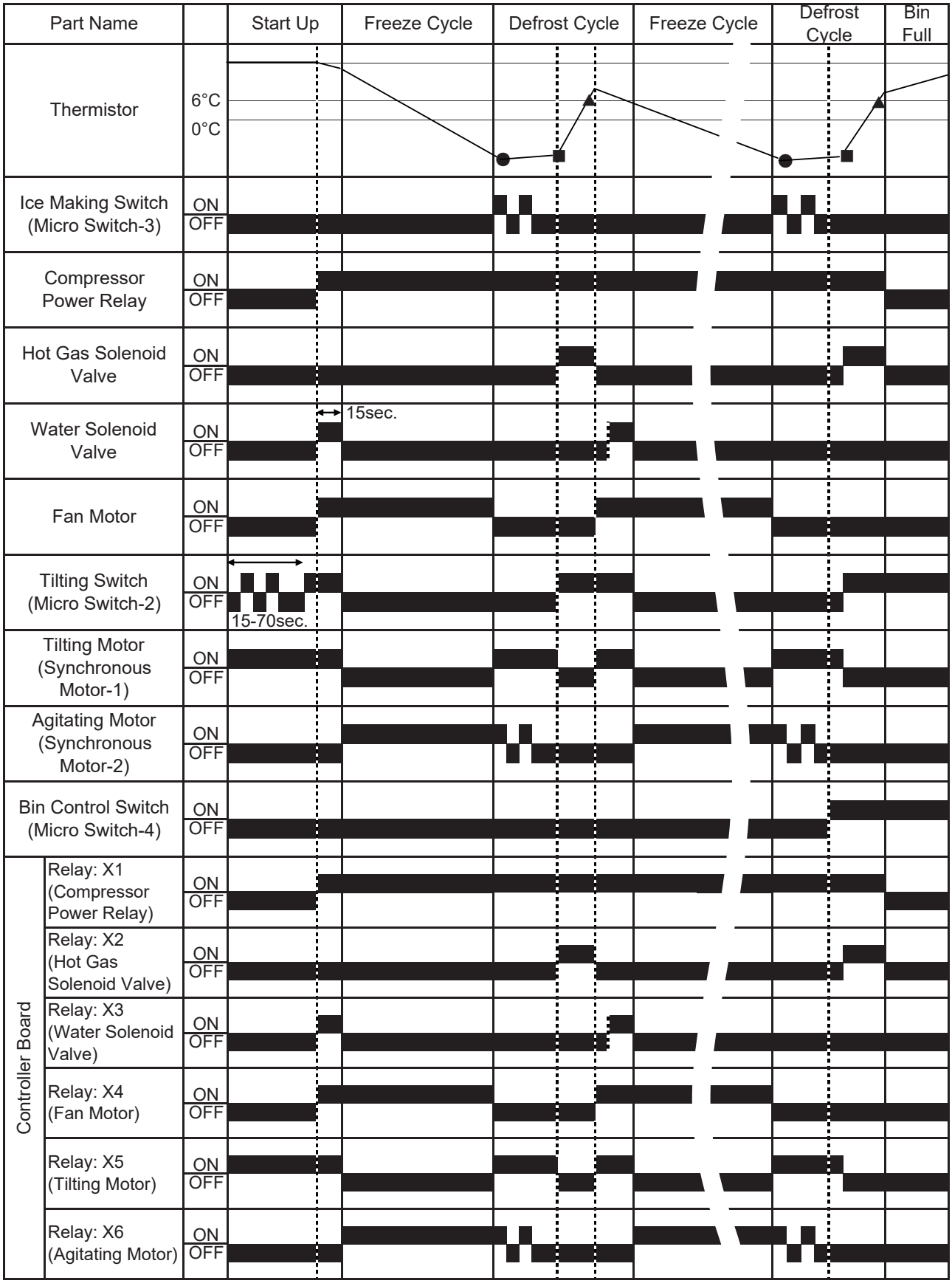
1. WATER CIRCUIT AND REFRIGERANT CIRCUIT



2. WIRING DIAGRAM



3. TIMING CHART



4. SEQUENCE

1) When the water supply tap is opened and the unit is energized, the compressor starts and the tilting motor (synchronous motor-1) operates to move the tray into the horizontal position. Meanwhile the water valve opens to supply ice making water into the tray. When the tray reaches the horizontal, the water valve closes to start a freeze cycle.

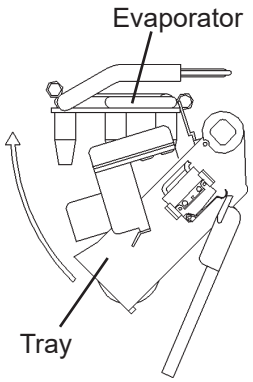
2) Rotation of the agitating motor (synchronous motor-2) cam moves the agitating plate up and down inside the tray to stir up the ice making water. As the evaporator temperature falls, ice forms on the surface of the projections immersed in the tray.
Growth of ice gradually obstructs the rise of the agitating plate, while the motor bracket starts to go down. When ice grows into a certain size, the motor bracket hits the ice making switch (michroswitch-3) as it goes down. This will complete the freeze cycle and start a defrost cycle.

3) The tilting motor (synchronous motor-1) operates to tilt the horizontal tray. When the tilting switch (microswitch-2) operates, the tilting motor (synchronous motor-1) stops and the hot gas valve opens to flow hot gas for heating the evaporator. As the evaporator temperature rises and ice drops from the tray, the thermistor senses the temperature to close the hot gas valve and to operate the tilting motor (synchronous motor-1) so that the tray will move back into the horizontal position. Meanwhile the water valve opens to supply ice making water into the tray. When the tray reaches the horizontal, another freeze cycle starts.

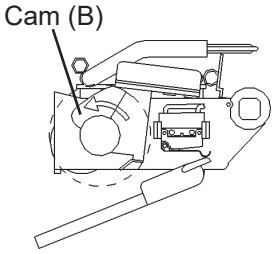
4) As the unit repeats the above freeze and defrost cycles, the storage bin is gradually filled with ice. When ice reaches a certain level, a tilt of the tray moves the bin control activator at the bottom of the tray to operate the bin control switch (michroswitch-4) so that the ice making mechanism will stop.

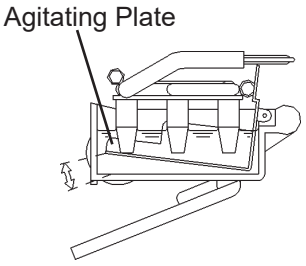
5) When the push button switch (microswitch-1) is pressed, the gear motor starts and ice is dispensed from the spout.

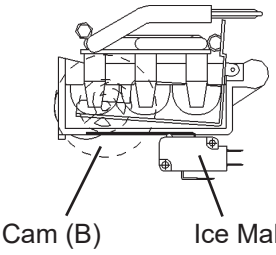
1)



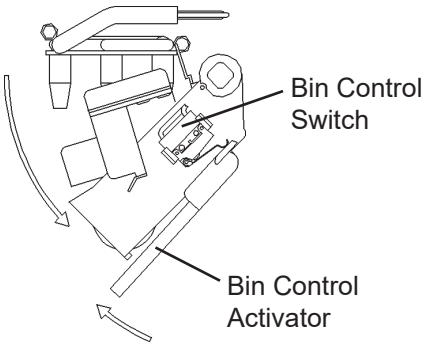
2)







4)

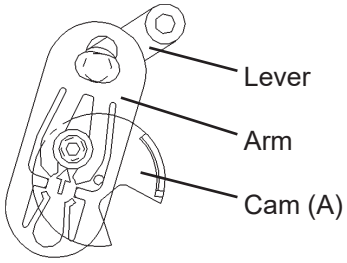


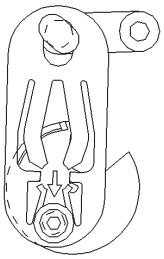
6) If the tray runs out of ice making water due to suspension of water supply, the evaporator temperature in a freeze cycle becomes lower than in normal operation. In this case, the thermistor senses the temperature and discontinues the freeze cycle to start a defrost cycle. The unit repeats the same process until proper water supply is resumed.

7) If something obstructs the rise of tray and the tilting motor (synchronous motor-1) keeps running, the joint of cam (A) and arm comes off upward to prevent the tilting motor (synchronous motor-1) from being locked. If the descent of tray is obstructed, the joint comes off downward.

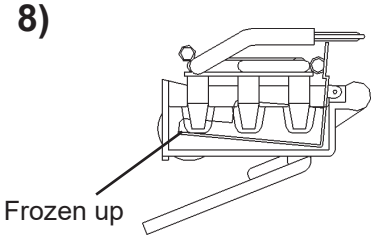
8) When the agitating plate is likely to be frozen up with ice and stuck in its upper position, the rotating cam (B) hits the reset plate to push down the agitating plate. Then the agitating plate comes apart from ice and resumes its normal movement.

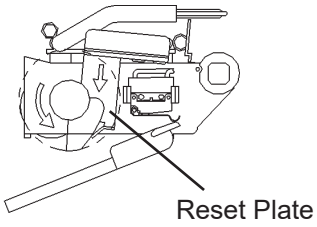
7)





8)





5. PERFORMANCE DATA

Ambient Temp. (°C)	5	10	21	32	38
Water Temp. (°C)	5	10	15	21	32
Ice Production (kg/d)	9	13	12	10	7.5
Freeze Cycle Time	7’45”	9’22”	10’55”	12’20”	13’32”
Defrost Cycle Time	3’39”	2’09”	1’13”	0’48”	0’39”
Water Consumption (lit/d)	-	81	77	71	66
Electric Consumption (W)	103	110	123	138	146

V. SERVICE DIAGNOSIS

PROBLEM	POSSIBLE CAUSE		REMEDY
[1] The ice dispenser will not start.	a) Power supply cord	1. Open circuit.	1. Replace.
		2. Loose connection.	2. Reconnect.
		3. Unplugged.	3. Plug in.
	b) Fuse	1. Blown out.	1. Check for continuity and replace.
	c) Bin control switch (microswitch-4)	1. Microswitch-4 contacts fused or short circuit.	1. Replace.
		2. Sensor damaged.	2. Replace.
		3. Sensor out of position.	3. Place in position.
	d) Transformer (transformer-2)	1. Open circuit (including built-in fuse operation).	1. Check for output (approx. 100V±15%) and replace.
	e) Power transformer (transformer-1)	1. Open circuit (including built-in fuse operation).	1. Check for output (approx. 11V±15%) and replace.
	f) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[2] Compressor will not start.	a) Starting relay	1. Open circuit.	1. Replace.
		2. Bad contacts.	2. Replace.
	b) Compressor	1. Coil winding opened. See [3].	1. Check for continuity and replace.
	c) Power relay	1. Bad contacts.	1. Check for continuity and replace.
	d) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[3] Compressor operates intermittently.	a) Supply voltage	1. Too high or too low.	1. Get recommended voltage.
	b) Ambient temperature	1. Too high or too low.	1. Get recommended temperature.
	c) Installation	1. Vent (air inlet or outlet) blocked.	1. Unblock.
	d) Air filter, condenser	1. Clogged.	1. Clean.
	e) Fan	1. Fan not rotating.	1. See [4].
[4] Fan will not turn.	a) Fan	1. Fan blades blocked.	1. Unblock
		2. Fan out of position.	1. Place in position.
	b) Fan motor	1. Coil winding opened.	1. Check for proper voltage and replace.
	c) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[5] Water supply is off or too little.	a) Water supply line	1. Water supply tap closed.	1. Open.
		2. Water supply cut off.	1. Unplug the ice dispenser and wait for resumed water supply.
		3. Water supply pressure too high or too low.	3. Get recommended pressure.
	b) Water circuit	1. Water leaks from connections.	1. Repair.
		2. Clogged with foreign matter.	2. Clean.

PROBLEM	POSSIBLE CAUSE		REMEDY
[5] (Continued)	c) Water valve	1. Clogged filter.	1. Clean.
		2. Coil winding opened.	2. Check for proper voltage and replace.
	d) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[6] Water supply never stops or is too much.	a) Water supply line	1. Water supply pressure too high or too low.	1. Get recommended pressure.
	b) Water valve	1. Clogged with foreign matter.	1. Clean.
[7] Tray will not go down. (Freeze cycle never ends.)	a) Agitating motor (synchronous motor-2)	1. See [12].	
	b) Water supply	1. See [5].	
	c) Tilting motor (synchronous motor-1)	1. Coil winding opened.	1. Check for proper voltage and replace.
	d) Bin control switch (microswitch-4)	1. See [14].	
[8] Tray will not go up to the horizontal position.	a) Hot gas valve	1. See [10].	
	b) Tilting motor (synchronous motor-1)	1. Coil winding opened.	1. Check for proper voltage and replace.
		2. Gear broken. See [19].	2. Replace.
	c) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[9] Tray keeps on going up and down.	a) Ice making switch (microswitch-3) *1	1. Fused contacts.	1. Replace.
		2. Not fixed securely and inoperative.	2. Fix in proper position.
	b) Connector (7P) *2	1. Disconnected (control box bottom).	1. Reconnect.
	c) Tilting switch (microswitch-2) *2	1. Switch terminal disconnected.	1. Reconnect.
		2. Switch or cam (A) not fixed securely and inoperative.	2. Fix securely and check for proper switching action.
		3. Bad contacts.	3. Replace.
		4. Fused contacts.	4. Replace.
	d) See [5].		
	e) Agitating plate	1. Obstructed.	1. Remove obstacles (capillary tubes or refrigerant lines).
	f) Cam (B)	1. Obstructed.	1. Remove obstacles (capillary tubes or refrigerant lines).
	g) Agitating motor (synchronous motor-2)	1. Gear broken. See [19].	1. Replace.
	h) See [11].		

*1: (1) Agitating motor (synchronous motor-2) runs with tray down (banging sound).
(2) Tray goes up after 1.5 minutes, and freeze cycle starts but ice making switch turns off soon.
(3) Stays off for 5 minutes, then repeats from (1).

*2: (1) Tray repeats going up and down (tilting motor: 1 turn or 2 turns).
(2) Stops for 5 minutes, then repeats from (1).

PROBLEM	POSSIBLE CAUSE		REMEDY
[10] Hot gas will not flow or stop. (Defrost temperature is too high.)	a) Connector (7P) *3	1. Disconnected in freeze cycle (control box bottom).	1. Reconnect.
	b) Thermistor *4	1. Not fixed securely on evaporator outlet pipe.	1. Fix securely.
		2. Open or short circuit.	2. Replace.
	c) Hot gas valve	1. Coil winding opened.	1. Replace.
		2. Defective.	2. Replace.
	d) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
	e) See [11].		
[11] Tray starts to go up with remaining ice, causing ice bridges.	a) Ice making switch (midroswitch-3)	1. Loose connection.	1. Reconnect.
		2. Open circuit.	2. Repair.
		3. Not fixed securely and inoperative.	3. Fix in proper position.
		4. Bad contacts.	4. Replace.
	b) Thermistor	1. Not fixed securely on evaporator outlet pipe.	1. Fix securely.
	c) Evaporator	1. Burrs or foreign matter.	1. Clean.
		2. Deformed.	2. Repair or replace.
	d) Tray, agitating plate	1. Deformed.	1. Repair or replace.
	e) Tilting switch (microswitch-2)	1. Switch or cam (A) not fixed securely and inoperative.	1. Fix securely and check for proper switching action.
		2. Fused contacts.	2. Replace.
	f) See [13].		
[12] Agitating motor will not run.	a) Agitating motor (synchronous motor-2)	1. Gear broken.	1. Replace.
		2. Coil winding opened.	2. Replace.
	b) Controller board	1. Defective (no output). Check input from power transformer.	1. Check for output to LED on board and replace.
[13] Agitating motor stops in a wrong position.	a) Ice making switch (midroswitch-3)	1. Not fixed securely and inoperative.	1. Fix in proper position.
[14] Ice dispenser will not stop when bin is filled with ice.	a) Bin control switch (microswitch-4)	1. Not fixed securely on Tray.	1. Fix securely.
		2. Loose connection.	2. Reconnect.
		3. Open circuit.	3. Repair.
		4. Bad contacts.	4. Replace.
	b) Bin sensor	1. Not fixed securely.	1. Fix securely.
		2. Broken.	2. Replace.

*3: (1) Hot gas valve opens, then closes after 10 minutes.
(2) Stays closed for 5 minutes, then repeats from (1).
*4: (1) Hot gas valve opens, then closes after 10 minutes.
(2) Starts freeze cycle, then repeats from (1).

PROBLEM	POSSIBLE CAUSE		REMEDY
[15] Defective ice	a) Tray	1. Deformed or damaged.	1. Replace.
		2. Obstructed from horizontal position.	2. Remove obstacles (capillary tubes or refrigerant lines).
	b) Refrigeration circuit	1. Undercharged or gas leaks	1. Check for leaks by leakage detector. Braze leaks and recharge. Gas leaks from low side require thorough evacuation.
	c) See [5].		
[16] No ice is dispensed with push button pressed.	a) Dispensing switch (microswitch-1)	1. Loose connection.	1. Reconnect.
		2. Bad contacts.	2. Replace.
		3. Not fixed securely or fixed part deformed or damaged.	3. Repair or replace and check for proper switching action.
	b) Dispensing motor	1. Coil winding opened.	1. Replace.
		2. Gear broken.	2. Replace.
		3. Thermal protector operates.	3. Reset automatically when winding temperature goes down.
		4. Fails to start at low voltage.	4. Adjust voltage.
	c) Storage bin	1. Little ice storage.	1. A small amount of remaining ice cannot be dispensed. Wait for enough ice storage.
		2. Ice bridges.	2. Long suspension of ice dispensing may cause ice bridges. Instruct the user to dispense everyday.
	d) Auger	1. Deformed or damaged.	1. Repair or replace.
[17] Ice keeps on being dispensed.	a) Dispensing switch (microswitch-1)	1. Fused contacts.	1. Replace.
		2. Not fixed securely or fixed part deformed or damaged.	2. Repair or replace and check for proper switching action.
[18] Abnormal noise	a) Fan motor	1. Bearing worn out.	1. Replace.
	b) Dispensing motor	1. Bearing worn out.	1. Replace.
		2. Gear worn out or damaged.	2. Replace.
	c) Auger	1. Deformed or damaged.	1. Repair or replace.
[19] Low or no ice production	a) Refrigeration circuit	1. Undercharged or gas leaks	1. Check for leaks by leakage detector. Braze leaks and recharge. Gas leaks from low side require thorough evacuation.
	b) Drier, capillary tubes, strainer	1. Clogged with moisture or dust.	1. Replace.

VI. REMOVAL AND REPLACEMENT OF COMPONENTS

1. PANELS

[a] FRONT PANEL

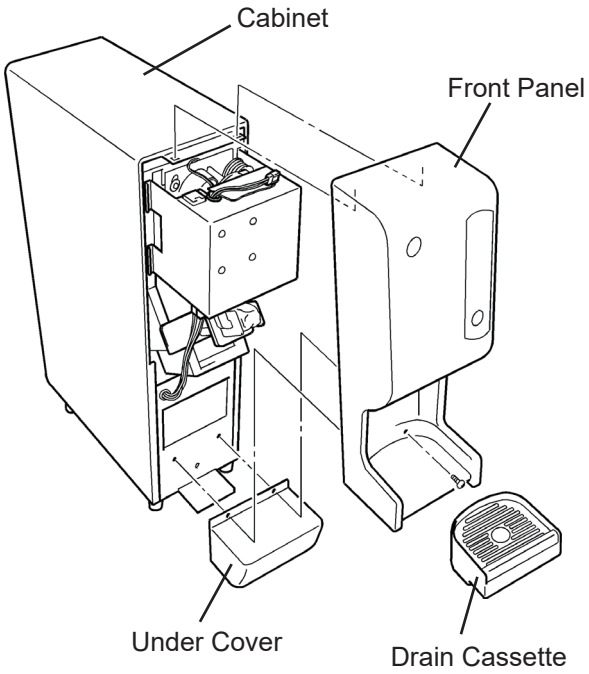
1) Unplug the ice dispenser.

2) Pull out the drain cassette.

3) Remove the screws behind the drain cassette.

4) Unhook the front panel by lifting it up, and pull it toward you.

5) Disconnect the connectors from the push button switch.



[b] UNDER COVER

1) Remove the front panel. The upper part of the under cover is screwed with the front panel.

2) Unhook the under cover by lifting it up and pull it toward you.

[c] CABINET

1) Remove the front panel.

2) Remove the screws on the front and rear.

3) Slightly spread out the bottom, and lift off the cabinet.

2. STORAGE BIN

1) Dispense all ice from the storage bin.

2) Unplug the ice dispenser.

3) Close the water supply tap.

4) Remove the front panel, under cover and cabinet.

5) Plug in and run the ice dispenser. When it starts a defrost cycle, open the water valve to reduce the water supply pressure inside the inlet hose located downstream of the water supply tap.

6) Unplug the ice dispenser again when it starts a freeze cycle.

7) Disconnect the inlet hose from the unit.

   Note: Do not spill water around the unit.

8) Disconnect all the connectors from the control box. Unscrew and remove the control box.

9) Unscrew and remove the gear motor assembly.

10) Disconnect the wiring to the microswitches. Remove the mechanism cover from the storage bin.

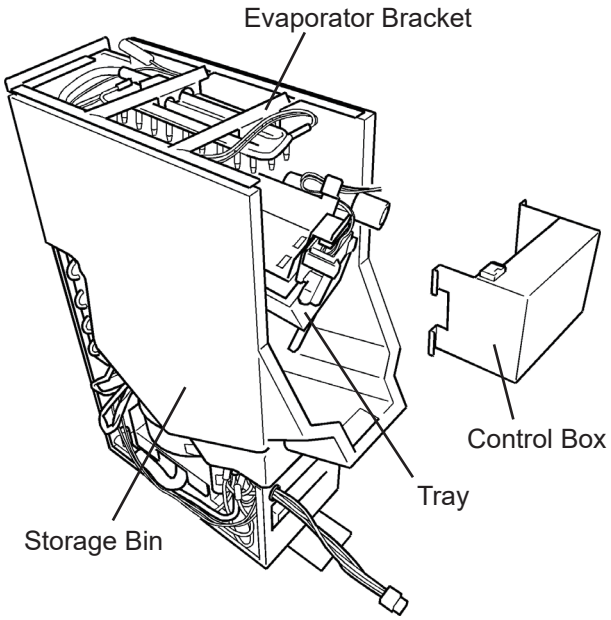
11) Remove the tray from the evaporator bracket openings. Dump out any remaining water into the storage bin before taking out the tray.

12) Remove the screws securing the two evaporator brackets.

13) Disconnect the hoses and terminals from the water valve.

14) Disconnect the hose from the drain pipe.

15) Slightly lift up the evaporator, and remove the storage bin.



3. SERVICE FOR REFRIGERANT LINES

WARNING

Only trained service engineer can service the R600a refrigeration unit.

[a] SERVICE INFORMATION

1) Allowable Compressor Opening Time and Prevention of Lubricant Mixture [R600a]

The compressor must not be opened more than 30 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 [R600a]

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 reduce 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 R600a has possibly drawn in air, the drier must be replaced. Be sure to use a drier designed for R600a.

3) Handling of Handy Flux [R600a]

Brazing is needed to connect the refrigeration circuit pipes. 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 [R600a]

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 R600a

Some parts used for refrigerants other than R600a are similar to those for R600a. But never use any parts unless they are specified for R600a because their endurance against the refrigerant has not been evaluated. Also, for R600a, do not use any parts that have been used for other refrigerants. Otherwise, wax and chlorine remaining on the parts may adversely affect the R600a.

6) Replacement Copper Tubing [R600a]

The copper tubes currently in use are suitable for R600a. 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 [R600a]

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 R600a.

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 R600a to suddenly react with oxygen and explode. Be sure to use nitrogen to prevent explosion.

[b] REFRIGERANT RECOVERY

WARNING

Do not recover the R600a refrigerant in a refrigerant recovery cylinder for R404A or R134a.

The R600a refrigerant has almost no effect on global warming, so can be released to outdoors atmosphere without risk to the environment. Recovery should only be considered if the unit cannot be taken outdoors to evacuate the circuit.
If R600a is recovered in a refrigerant recovery cylinder for R404A or R134a, there is a risk of ignition and a refrigerant destruction operator may reject collection.

[c] REFRIGERANT REMOVAL

WARNING

Remove the R600a refrigerant from the unit in an area well-ventilated and free from open flames.

When removing the refrigerant from the unit, be sure the surrounding area is well-ventilated and free from open flames. Discharge refrigerant in small amounts into the atmosphere. If the surrounding area is not well-ventilated and exposed to open flames, recover the refrigerant in a refrigerant recovery cylinder and discharge it in small amounts into the atmosphere outdoors.

[d] EVACUATION AND RECHARGE

1) Attach charging hoses, a service manifold and a vacuum pump to the system.

2) Turn on the vacuum pump.

3) Allow the vacuum pump to pull down to a 760 mmHg vacuum. Evacuating period depends on pump capacity.

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

5) Disconnect the vacuum pump, and attach a refrigerant service can. Remember to loosen the connection, and purge the air from the hose. See the nameplate for the required refrigerant charge.

   Note: Do not charge more than 150 g of R600a.

6) Open the low-side valve. Do not invert the service can. A liquid charge will damage the compressor.

7) Plug in the ice dispenser when charging speed gets slow. Unplug the ice dispenser when the low-side gauge shows approximately 0 bar (0 MPa). Do not run the ice dispenser at vacuum pressures. Close the low-side valve when the service can gets empty.

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

9) Close the refrigerant access valve, and disconnect the hoses and service manifold.

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

4. BRAZING REPAIR FOR R600a REFRIGERATION CIRCUIT

1) Make sure the surrounding area of the unit to be repaired is free from ignition sources.

2) Open the window or operate the ventilator to make the surrounding area well-ventilated.

3) Connect the piercing valve. Recover the refrigerant in the specified manner or discharge it into the atmosphere.

4) The refrigeration circuit pressure is back to atmospheric pressure. Pressurize the circuit using nitrogen.

5) Discharge the pressurized nitrogen and recover the refrigeration circuit to atmospheric pressure.

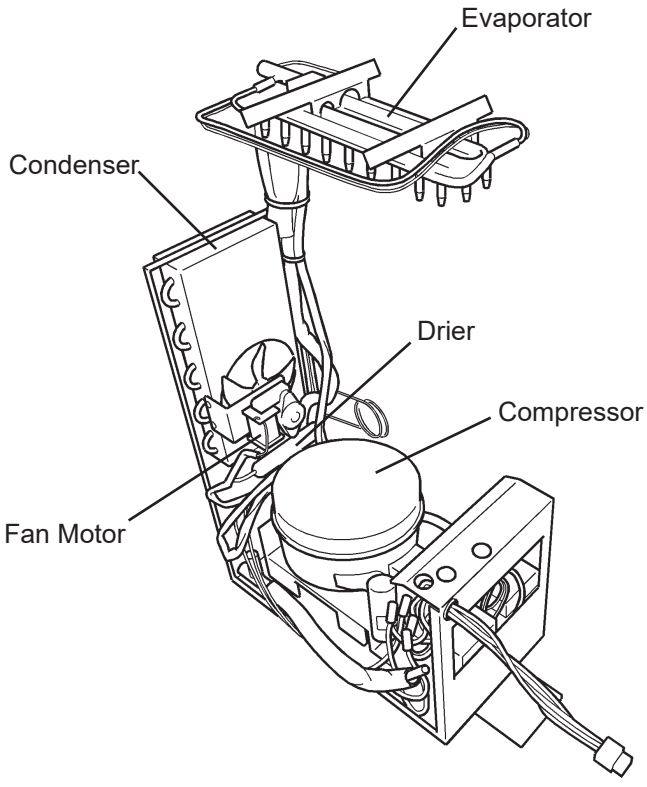
6) Repeat 4) and 5) above. Use a gas detector at the open end of refrigeration circuit to detect any gas left inside the circuit.

7) Evacuate the refrigeration circuit for 30 minutes to remove any gas left inside the circuit.

WARNING

Remove the R600a refrigerant from the unit in an area well-ventilated and free from open flames.

Note: Attach an access valve for recharging the unit charged by a lock ring.



5. DRIER

1) Unplug the ice dispenser or disconnect the power source.

2) Remove the top, front and right side panels.

3) Remove the refrigerant from the unit and then any residual refrigerant still existing in the unit to allow brazing process. (See “4. BRAZING REPAIR FOR R600a REFRIGERATION CIRCUIT”.)

4) Remove the drier holder, if any, and pull the drier toward you for easy service.

5) Disconnect the outlet and inlet of drier using a pipe cutter near the drier to keep the pipe length as much as possible. If needed, expand the end of disconnected pipes using a pipe expander to connect with the new drier.

WARNING

Remove the R600a refrigerant from the unit in an area well-ventilated and free from open flames.

6) Braze or solder the new drier, with the arrow on the drier in the direction of the refrigerant flow. Adjust the pipes to fit the drier. Use nitrogen gas at the pressure of 0.2 - 0.3 bar when brazing tubings.

7) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

8) Evacuate the system and charge it with refrigerant (See “3. [d] EVACUATION AND RECHARGE”).

9) Replace the panels in their correct positions.

10) Plug in the ice dispenser or connect the power source.

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

6. COMPRESSOR

1) Unplug the ice dispenser or disconnect the power source.

2) Remove the top, front and right side panels.

3) Remove the refrigerant from the unit and then any residual refrigerant still existing in the unit to allow brazing process. (See “4. BRAZING REPAIR FOR R600a REFRIGERATION CIRCUIT”.).

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

5) Disconnect the discharge and suction pipes using a pipe cutter near the compressor to keep the pipe length as much as possible. If needed, expand the end of disconnected pipes using a pipe expander to connect with the new compressor.

WARNING

When it is required to disconnect the pipes using brazing equipment, be careful that the refrigerant in the oil left inside the pipes may burn.

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

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

8) Attach the rubber grommets of the previous compressor.

9) Clean the suction and discharge pipes with an abrasive cloth/paper.

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

11) Remove plugs from the compressor suction and discharge pipes.

12) Adjust the pipes to fit the compressor. Braze or solder the access, suction and discharge lines (Do not change this order), with nitrogen gas flowing at the pressure of 0.2 - 0.3 bar.

13) Install the new drier (See “5. DRIER”).

14) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

15) Evacuate the system and charge it with refrigerant (See “3. [d] EVACUATION AND RECHARGE”).

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

17) Replace the panels in their correct positions.

18) Plug in the ice dispenser or connect the power source.

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

7. HOT GAS VALVE

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) Unplug the ice dispenser or disconnect the power source.

2) Remove the top, front and right side panels.

3) Remove the refrigerant from the unit and then any residual refrigerant still existing in the unit to allow brazing process. (See “4. BRAZING REPAIR FOR R600a REFRIGERATION CIRCUIT”.)

4) Disconnect the hot gas valve leads.

5) Remove the screw and the solenoid coil.

6) Disconnect the outlet and inlet of hot gas valve using a pipe cutter near the hot gas valve to keep the pipe length as much as possible. If needed, expand the end of disconnected pipes using a pipe expander to connect with the new hot gas valve.

WARNING

When it is required to disconnect the pipes using brazing equipment, be careful that the refrigerant in the oil left inside the pipes may burn.

7) Adjust the pipes to fit the solenoid valve. Braze the new hot gas valve with nitrogen gas flowing at the pressure of 0.2 - 0.3 bar.

WARNING

Always protect the valve body by using a damp cloth to prevent the valve from overheating. Do not braze with the valve body exceeding 120°C.

8) Install the new drier (See “5. DRIER”).

9) Check for leaks using nitrogen gas (10 bar) and soap bubbles.

10) Evacuate the system and charge it with refrigerant (See “3. [d] EVACUATION AND RECHARGE”).

11) Attach the solenoid coil to the valve body, and secure it with the screw.

12) Connect the leads.

13) Replace the panels in their correct positions.

14) Plug in the ice dispenser or connect the power source.

8. EVAPORATOR

1) Unplug the ice dispenser.

2) Remove the panels.

3) Remove the storage bin.

4) Recover the refrigerant and store it in a proper container.

5) Sandpaper and disconnect the brazing connection. Remove the evaporator using brazing equipment.

6) Detach the two brackets from the removed evaporator, and attach them to the new evaporator.

7) Install the new evaporator. Use nitrogen gas at the pressure of 0.2 - 0.3 bar (0.02 - 0.03 MPa) when brazing the tubings.

IMPORTANT

Always protect the evaporator pipe by using a damp cloth to prevent the plating from coming off.

8) Check for leaks using nitrogen gas [10 bar (1 MPa)] and soap bubbles.

9) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge.

10) Replace the storage bin and panels in their correct position.

11) Plug in the ice dispenser.

9. FAN MOTOR

1) Unplug the ice dispenser.

2) Remove the front panel, cabinet and under cover.

3) Cut the fan motor leads at the wire connectors.

4) Remove the fan motor assembly from the condenser, and detach the bracket and fan from the fan motor.

5) Install the new fan motor.

6) Assemble the removed parts in the reverse order of which they were removed.

7) Plug in the ice dispenser.

10. WATER VALVE

1) Unplug the ice dispenser.

2) Close the water supply tap.

3) Remove the front panel and cabinet.

4) Plug in and run the ice dispenser. When it starts a defrost cycle, open the water valve to reduce the water supply pressure inside the inlet hose located downstream of the water supply tap.

5) Unplug the ice dispenser again when it starts a freeze cycle.

6) Disconnect the inlet hose from the unit.

   Note: Do not spill water around the unit.

7) Disconnect the hoses and terminals from the water valve.

8) Remove the two screws securing the water valve, and pull out the water valve from the storage bin opening.

9) Install the new water valve.

10) Assemble the removed parts in the reverse order of which they were removed.

11) Open the water supply tap.

12) Plug in the ice dispenser.

13) Check for water leaks.

11. GEAR MOTOR

IMPORTANT

Do not reuse the spring pin. To prevent excessive strain, fix the gear motor shaft when installing the spring pin.

1) Unplug the ice dispenser.

2) Remove the front panel.

3) Cut the gear motor leads at the wire connectors.

4) Remove the gear motor assembly from the mechanism cover.

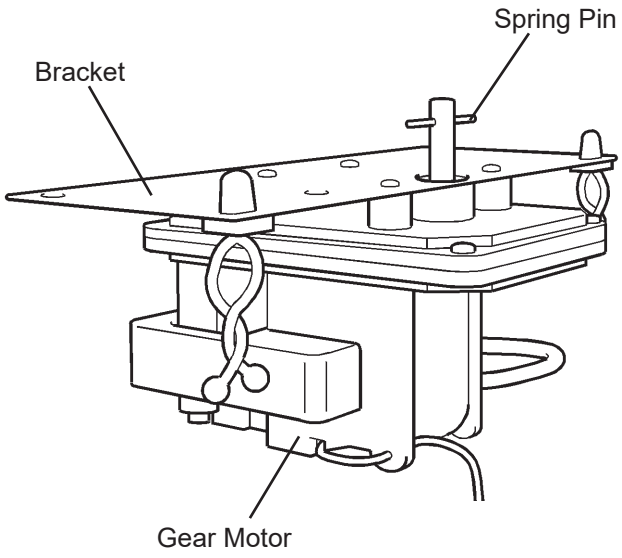
5) Detach the spring pin from the gear motor shaft, and remove the gear motor bracket.

6) Attach the bracket to the new gear motor, and install a new spring pin on the gear motor shaft.

7) Insert the gear motor assembly so that the spring pin will fit the slit at the end of the auger.

8) Assemble the removed parts in the reverse order of which they were removed.

9) Plug in the ice dispenser.



12. CONTROL BOX

IMPORTANT

Every time the mechanism cover or tray is removed, check the ice size after assembling the removed parts.

1) Unplug the ice dispenser.

2) Remove the front panel.

3) Disconnect the three connectors from the control box.

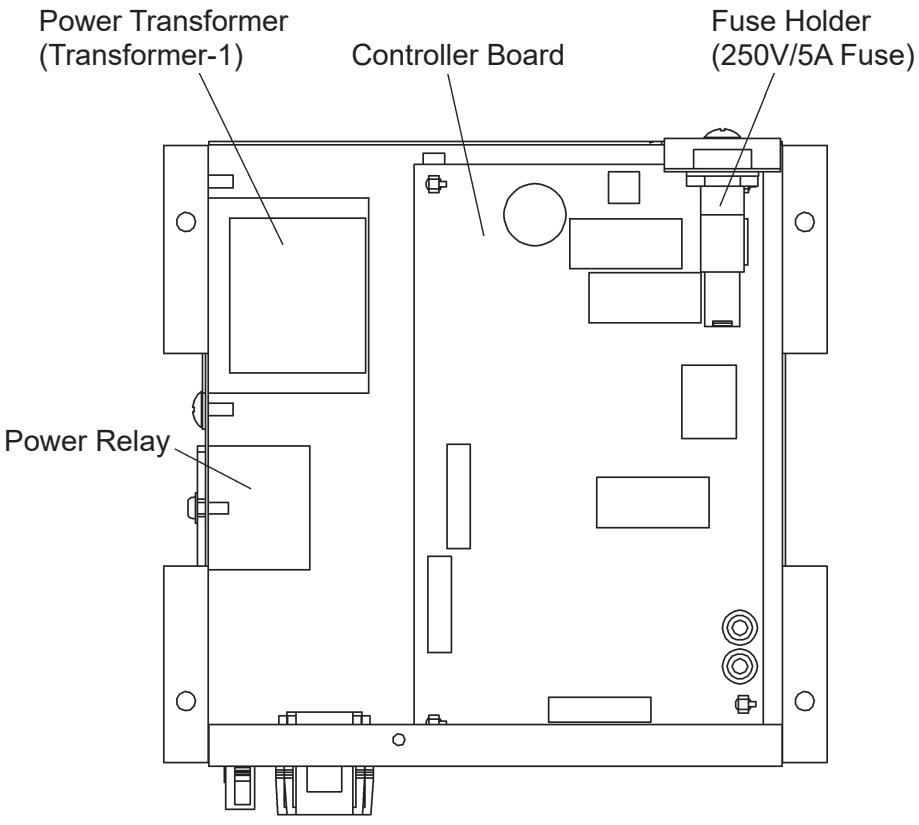
4) Remove the four screws securing the control box, and remove the control box.

5) Remove the two screws securing the cover.

6) Replace the applicable parts.

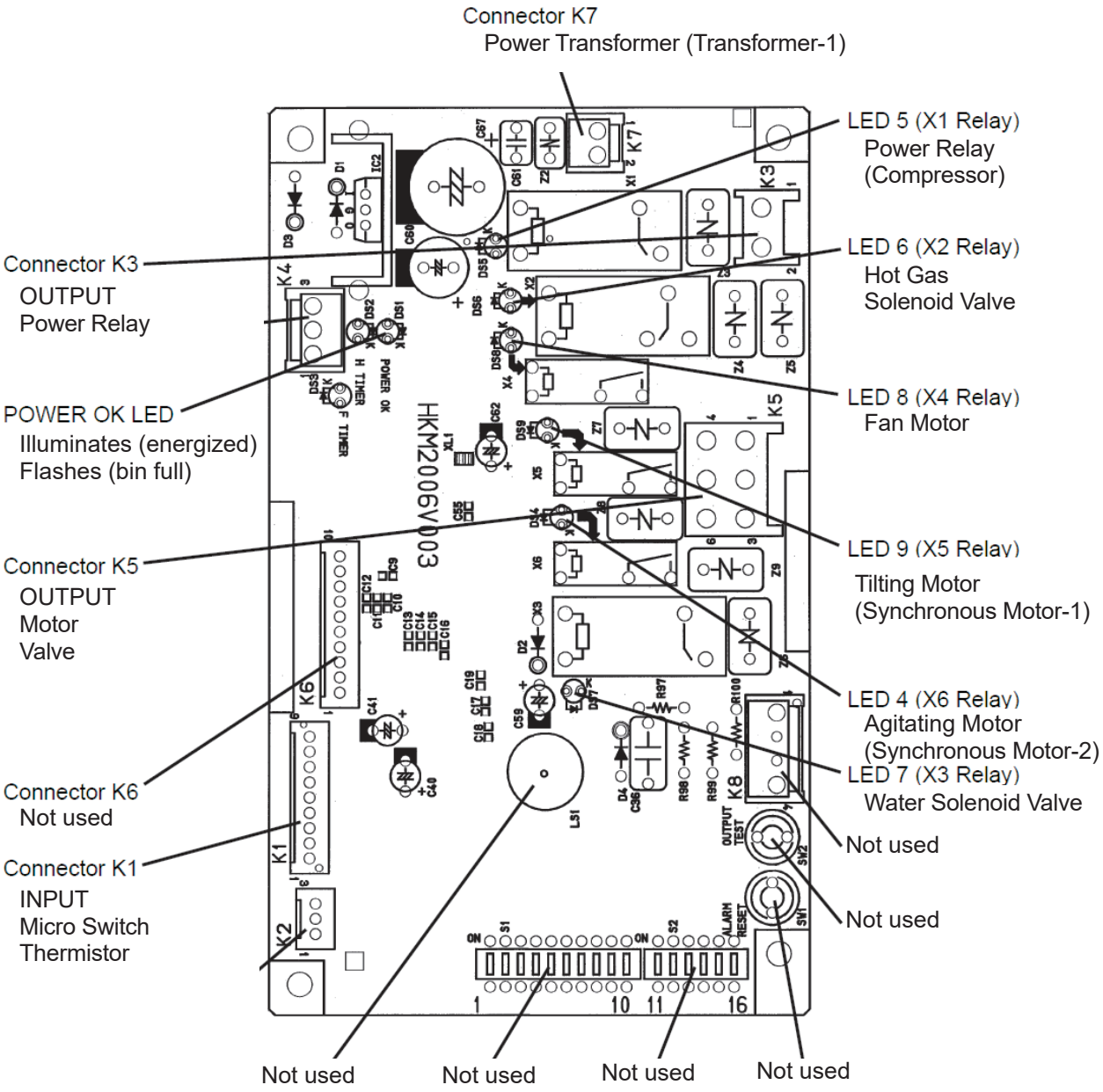
7) Assemble the removed parts in the reverse order of which they were removed.

Note: Check that the connectors are securely connected.



13. CONTROLLER BOARD

[a] CONTROLLER BOARD LAYOUT



[b] CHECKING CONTROLLER BOARD

* While checking the controller board for proper operation, keep all the connectors in place, including those in the control box.

* If the ice making switch needs to be pressed to manually end a freeze cycle, wait for at least 3 minutes after the freeze cycle begins (agitating motor starts). Otherwise, the compressor will stop for 5 minutes (considered as low water condition).

* When the unit is unplugged, wait for 5 minutes before restarting the unit.

14. MECHANISM ASSEMBLY

IMPORTANT

Every time the mechanism cover or tray is removed, check the ice size after assembling the removed parts.

[a] ARM

1) Unplug the ice dispenser.

   Note: The mechanism assembly will be easily removable if the unit is stopped just after a defrost cycle starts.

2) Remove the front panel and control box.

3) Remove the E-ring and shim (C), and take the arm off the cam (A) and lever.

4) Install the new arm.

5) Assemble the removed parts in the reverse order of which they were removed.

[b] AGITATING MOTOR

1) Unplug the ice dispenser.

   Note: The mechanism assembly will be easily removable if the unit is stopped just after a defrost cycle starts.

2) Remove the front panel, control box and arm.

3) Pull out the lever.

If the shims (A), spring and collar does not require replacement, go to 5).

4) Remove the retaining ring (L), and disassemble the above parts.

5) Remove the gear motor and mechanism cover.

6) Loosen the securing screw, and remove the cam (B) from the agitating motor (synchronous motor-2).

7) Cut the agitating motor (synchronous motor-2) leads at the wire connectors.

8) Remove the securing screw, and take off the agitating motor (synchronous motor-2).

If the shim (B) and O-rings do not require replacement, go to 10).

9) Remove the retaining ring (S), and disassemble the above parts.

10) Replace the parts as required.

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

12) Plug in the ice dispenser.

[c] TILTING MOTOR

1) Unplug the ice dispenser.

Note: The mechanism assembly will be easily removable if the unit is stopped just after a defrost cycle starts.

2) Remove the front panel, control box and arm.

If the cam (A) and tilting motor (synchronous motor-1) do not require replacement, go to 7).

3) Loosen the securing screw, and remove the cam (A) from the tilting motor (synchronous motor-1).

4) Cut the tilting motor (synchronous motor-1) leads at the wire connectors.

5) Remove the motor bracket from the mechanism cover.

6) Remove the tilting motor (synchronous motor-1) from the motor bracket.

If the tilting switch (michroswitch-2) does not require replacement, go to 9).

7) Disconnect the terminals from the above switches.

8) Remove the switches from the motor bracket.

9) Replace the parts as required.

10) Assemble the removed parts in the reverse order of which they were removed.

11) Plug in the ice dispenser.

[d] ICE MAKING SWITCH

To remove:

1) Unplug the ice dispenser.

2) Remove the front panel and cabinet.

3) Disconnect all the connectors from the control box.

4) Unscrew and remove the control box.

5) Disconnect the connector from the ice making switch.

6) Check and remember the location of the ice making switch bracket. Remove the hexagon head screw and screw (A). Take out the ice making switch together with the bracket.

7) Remove the screw (B) and take the ice making switch off the bracket.

To replace:

8) Use the screw (B) to secure the ice making switch on the bracket.

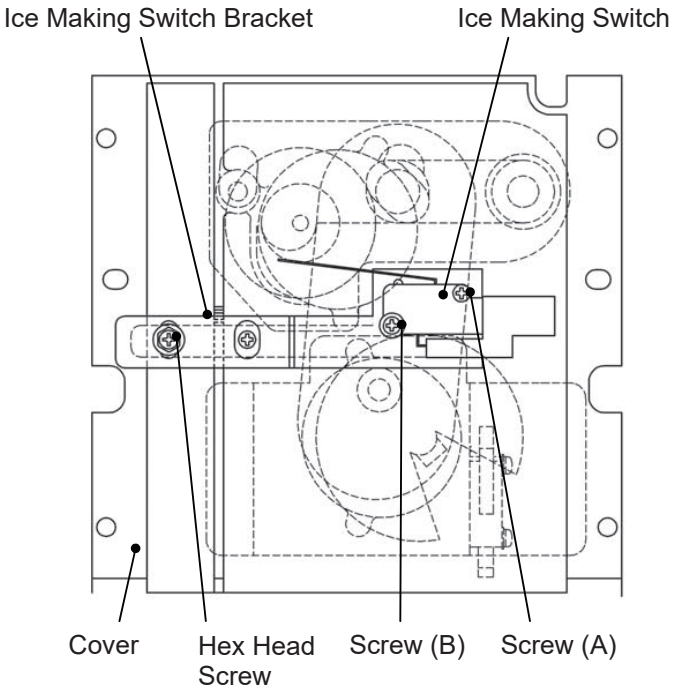
9) Use the hexagon head screw and screw (A) to secure the ice making switch and the bracket on the cover. Position the ice making switch bracket around its original location.

10) Plug the connector into the ice making switch.

11) Screw the control box and plug in the connectors.

12) Turn on the power supply and check that:
- The tray, agitating plate, lever and arm are not obstructed.
- Ice of the proper size is produced.

13) Replace the cabinet and front panel.



15. TRAY

IMPORTANT

Every time the mechanism cover or tray is removed, check the ice size after assembling the removed parts.

1) Dispense all ice from the storage bin.

2) Unplug the ice dispenser.

3) Remove the front panel, gear motor, control box, arm, lever and mechanism cover.

4) Remove the tray from the evaporator bracket openings. Dump out any remaining water into the storage bin before taking out the tray.

If the bin control switch (microswitch-4) does not require replacement, go to 6).

5) Cut the nylon tie binding the bin control switch (microswitch-4) wiring with the tray shaft. Remove the bin control switch (microswitch-4) by spreading out the tabs on both sides.

   Note: Do not put excessive strain and break the tabs or pins.

If the bin sensor does not require replacement, go to 7).

6) Remove the rear shaft of the bin sensor first and then the front shaft.

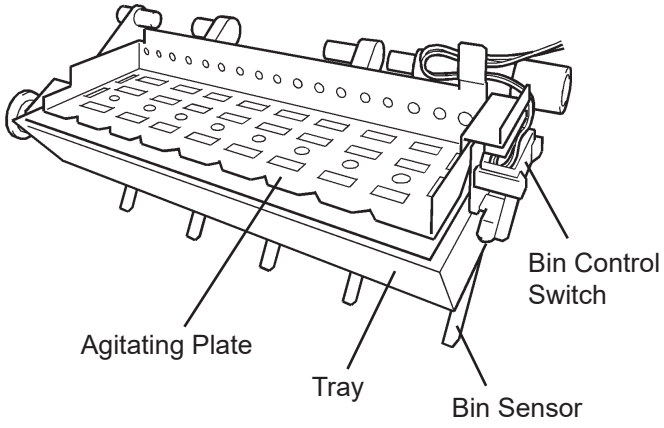
If the agitating plate does not require replacement, go to 8).

7) Pull out the pin, and remove the agitating plate.

8) Replace the parts as required.

9) Assemble the removed parts in the reverse order of which they were removed.

10) Plug in the ice dispenser.



16. THERMISTOR

[a] REMOVAL AND REPLACEMENT

1) Unplug the ice dispenser.

2) Remove the front panel and cabinet.

3) Remove the control box.

4) Disconnect the two closed end connectors of the thermistor leads.

5) Remove the ties, insulation, thermistor holder and thermistor in this order.

6) Remove the old sealant from the thermistor holder and suction pipe.

7) Turn up the thermistor holder, and press a tube of the sealant KE4560RTV, 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.

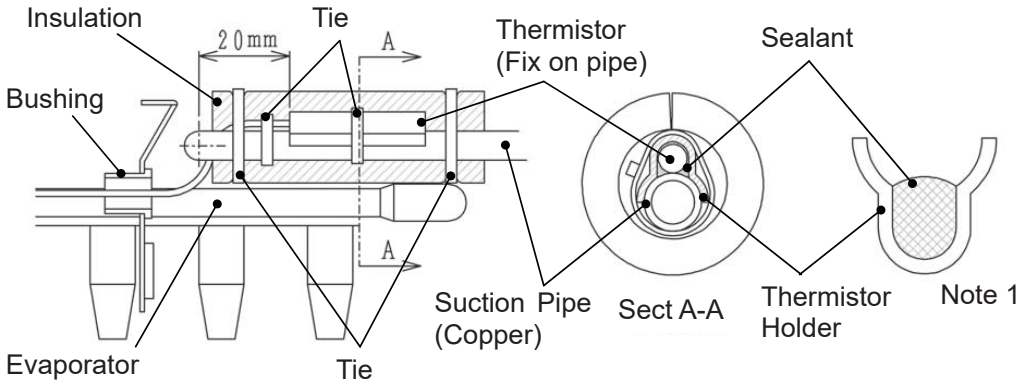
Note: 1. Be careful not to let in air and make a hollow in the recess of the thermistor holder. Fill the recess with the sealant up to slightly above the top of the recess as shown below.

2. The above specified sealant is a special type of high thermal conductivity. Do not use any sealant other than the above.

8) Attach the new thermistor in position on the suction pipe. Press down the thermistor holder over the thermistor and secure them with the ties.

Note: 3. Before attaching the thermistor, wipe off any moisture or condensation from the suction pipe surfaces.

4. Be careful not to damage the thermistor leads.



9) Cover the parts with the insulation and secure them with the ties.

Note: 5. After the thermistor holder is fitted, do NOT pull the thermistor leads to move the thermistor.

10) Cut the new thermistor leads at the bottom of the connector and connect it with a closed end connector. Fix the closed end connector to keep it facing up.

11) If any removed part or sealant has dropped into the tank, clean it off thoroughly.

12) Replace the control box, cabinet and front panel.

13) Plug in the ice dispenser.

[b] DEFROST AND LOW WATER CONTROL

When ice grows into a certain size, the ice making switch (microswitch-3) trips and the tray starts to tilt. When the tray reaches an adequate position, the hot gas valve opens to start a defrost cycle.

The thermistor senses the evaporator outlet temperature and completes a defrost cycle when ice drops from the tray and the evaporator outlet rises above a specific temperature.

In case of low water, the evaporator temperature suddenly drops. To protect the compressor, the unit shifts from freeze cycle to defrost cycle if the evaporator outlet falls below a specific temperature. Although ice does not form in low water conditions, the unit continues to operate and repeats shifting from freeze cycle to defrost cycle.

[c] CHECKING THERMISTOR

If there is any doubt of trouble, first visually check if the thermistor is properly installed on the evaporator outlet pipe. Then, check the resistance between the thermistor leads as follows:

1) Remove the thermistor according to “[a] REMOVAL AND REPLACEMENT”.

2) Immerse the thermistor sensor in a glass of icy water for a few minutes.

3) Check the resistance between the thermistor leads. If it exceeds the normal range of 5 to 7kΩ, replace the thermistor.

Temperature (°C)	Resistance (kΩ)
-12	10.61
0	6.00
10	3.87
21	2.47

17. TRANSFORMER

1) Unplug the ice dispenser.

2) Remove the front panel, cabinet and under cover.

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

4) Remove the starter.

5) Cut the transformer leads at the wire connectors.

6) Remove the transformer bracket from the base.

7) Remove the transformer from the transformer bracket.

8) Install the new transformer.

9) Assemble the removed parts in the reverse order of which they were removed.

10) Plug in the ice dispenser.

18. POWER SUPPLY CORD

1) Unplug the ice dispenser.

2) Remove the front panel, under cover and cabinet.

3) Remove the bushing securing the power supply cord.

4) Cut the power supply cord leads at the wire connectors. Remove the earth screw.

5) Install the new power supply cord.

6) Assemble the removed parts in the reverse order of which they were removed.

7) Plug in the ice dispenser.

VII. ADJUSTMENT OF ICE SIZE

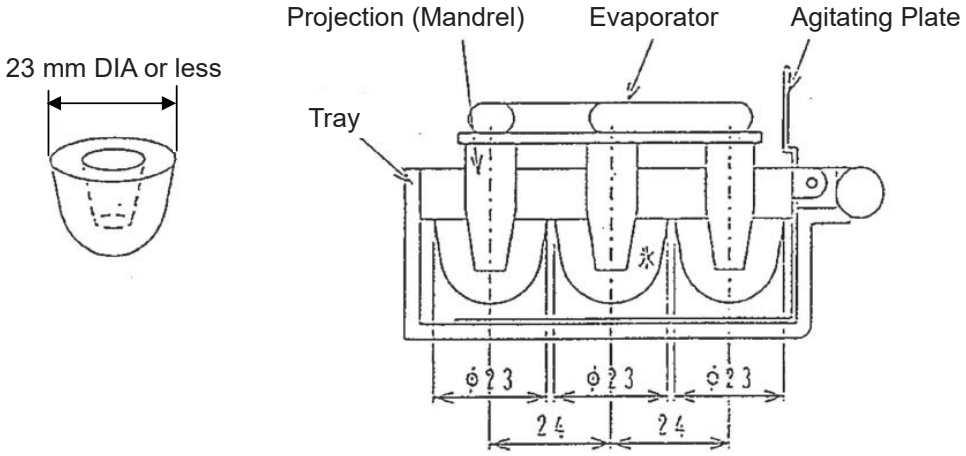
When a certain size of ice forms on the evaporator, ice obstructs the agitating plate located inside the tray and moved up and down by the agitating mechanism. The cam (B) rotates and pushes down itself to hit the ice making switch located below, which signals to end a freeze cycle.

This ice making switch is not affected by ambient temperatures and is set to automatically produce a fixed size of ice all the year round without any adjustment required. Do not touch the ice making switch unless adjustment is necessary.

As mentioned above, the positions of the evaporator, tray (including tilting mechanism), agitating mechanism and ice making switch affect the ice size. If any of these parts is removed or replaced, adjustment of the ice making switch will be required. Read and understand the following instructions thoroughly before adjusting the ice making switch.

1. PROPER ICE SIZE

The proper ice diameter is approx. 23 mm or less as shown below. This is because the evaporator's projections (mandrels) have a pitch of 24 mm and ice size exceeding 24 mm will cause ice bridges and defrost or tilting problems, resulting in failure.



2. ADJUSTMENT

1) Unplug the ice dispenser.

2) Remove the front panel and cabinet.

3) Check and remember the location of the ice making switch bracket from the square hole in the left side of the control box.

4) Use a spanner (7 mm) from the square hole in the left side of the control box to loosen the hexagon head screw a little.

5) Slightly move up and down the left end of the ice making switch bracket to tighten the above screw. Move up the bracket to decrease the ice size. Move down the bracket to increase the ice size. Moving the bracket by 1 mm will change the ice diameter by approx. 2 mm.

6) Run the ice dispenser and check the ice size. If necessary, repeat steps 4) and 5) to readjust the ice size.

7) Replace the cabinet and front panel.