

Hoshizaki America, Inc.

Modular Flaker

Models

FD-650MAH-C, MWH-C, MRH-C



“A Superior Degree
of Reliability”

www.hoshizaki.com

SERVICE MANUAL



Number: 73199
Issued: 11-3-2014

⚠ WARNING

Only qualified service technicians should install and service the appliance. To obtain the name and phone number of your local Hoshizaki Certified Service Representative, visit www.hoshizaki.com. No service should be undertaken until the technician has thoroughly read this Service Manual. Failure to service and maintain the appliance in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage and may result in costly water damage. Proper installation is the responsibility of the installer. Product failure or property damage due to improper installation is not covered under warranty.

Hoshizaki provides this manual primarily to assist qualified service technicians in the service of the appliance.

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

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HOSHIZAKI AMERICA, INC.

618 Highway 74 South

Peachtree City, GA 30269

Attn: Hoshizaki Technical Support Department

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

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

IMPORTANT

This manual should be read carefully before the appliance is service. Read the warnings and guidelines contained in this manual carefully as they provide essential information for the continued safe use, service, and maintenance of the appliance. Retain this manual for any further reference that may be necessary.

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Important Safety Information

Throughout this manual, notices appear to bring your attention to situations which could result in death, serious injury, damage to the appliance, or damage to property.

⚠ WARNING Indicates a hazardous situation which could result in death or serious injury.

NOTICE Indicates a situation which could result in damage to the appliance or property.

IMPORTANT Indicates important information about the use and care of the appliance.

⚠ WARNING

The appliance should be destined only to the use for which it has been expressly conceived. Any other use should be considered improper and therefore dangerous. The manufacturer cannot be held responsible for injury or damage resulting from improper, incorrect, and unreasonable use. Failure to service and maintain the appliance in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage and may result in costly water damage.

To reduce the risk of death, electric shock, serious injury, or fire, follow basic precautions including the following:

- Only qualified service technicians should install and service the appliance.
- The appliance must be installed in accordance with applicable national, state, and local codes and regulations. Failure to meet these code requirements could result in death, electric shock, serious injury, fire, or damage to the appliance.
- Electrical connection must be hard-wired and must meet national, state, and local electrical code requirements. Failure to meet these code requirements could result in death, electric shock, serious injury, fire, or damage.
- The icemaker requires an independent power supply of proper capacity. See the nameplate for electrical specifications. Failure to use an independent power supply of proper capacity can result in a tripped breaker, blown fuse, damage to existing wiring, or component failure. This could lead to heat generation or fire.
- **THE ICEMAKER MUST BE GROUNDED.** Failure to properly ground the icemaker could result in death or serious injury.
- To reduce the risk of electric shock, do not touch the power switch or control switch with damp hands.
- Move the power switch to the "OFF" position and turn off the power supply before servicing. Place the disconnect (if applicable) in the off position. Lockout/Tagout to prevent the power supply from being turned back on inadvertently. Power switch in "OFF" position does not de-energize all loads.
- Do not place fingers or any other objects into the ice discharge opening.
- Do not make any alterations to the appliance. Alterations could result in electric shock, injury, fire, or damage.

⚠ WARNING, continued

- The appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be properly supervised around the appliance.
- Do not climb, stand, or hang on the appliance or allow children or animals to do so. Serious injury could occur or the appliance could be damaged.
- Do not use combustible spray or place volatile or flammable substances near the appliance. They might catch fire.
- Keep the area around the appliance clean. Dirt, dust, or insects in the appliance could cause harm to individuals or damage to the appliance.

Additional Warning for Remote Models

- **THE REMOTE CONDENSER UNIT MUST BE GROUNDED.** The power supply and ground connection to the remote condenser unit are supplied from the icemaker. Failure to properly ground the remote condenser unit could result in death or serious injury.
- Wire routing (conduit) and disconnect (if required) must meet national, state, and local electrical code requirements. Failure to meet these code requirements could result in death, electric shock, serious injury, fire, or damage.
- Move the icemaker power switch to the "OFF" position and turn off the power supply to the icemaker before servicing the remote condenser unit. Lockout/Tagout to prevent the power supply from being turned back on inadvertently.

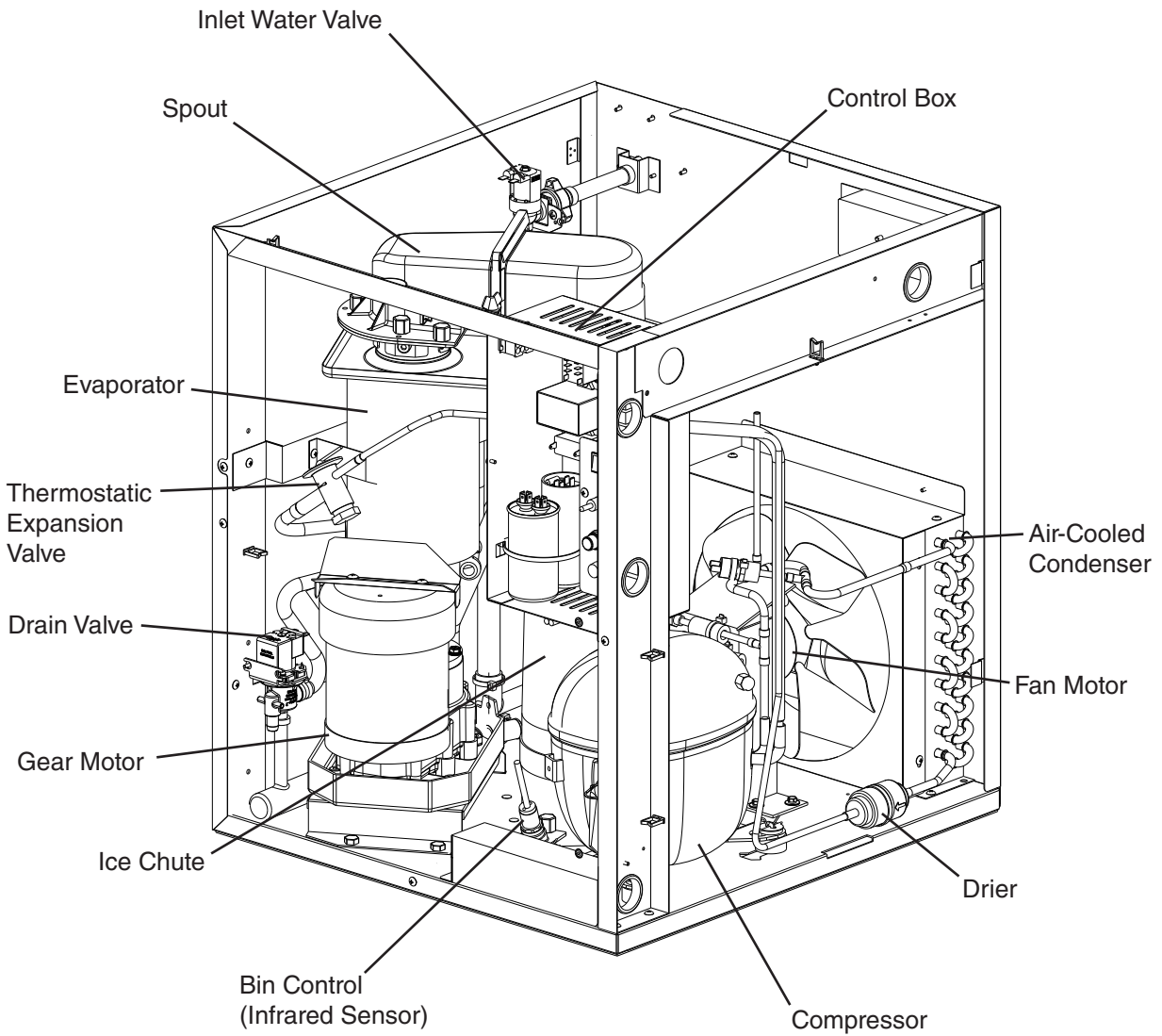
NOTICE

- Follow the instructions in this manual carefully to reduce the risk of costly water damage.
- In areas where water damage is a concern, install in a contained area with a floor drain.
- Install the appliance in a location that stays above freezing. Normal operating ambient temperature must be within 45°F to 100°F (7°C to 38°C).
- Do not leave the icemaker on during extended periods of non-use, extended absences, or in sub-freezing temperatures. To properly prepare the icemaker for these occasions, follow the instructions in "VI. Preparing the Icemaker for Periods of Non-Use."
- Do not place objects on top of the appliance.
- The dispenser unit/ice storage bin is for ice use only. Do not store anything else in the dispenser unit/ice storage bin.

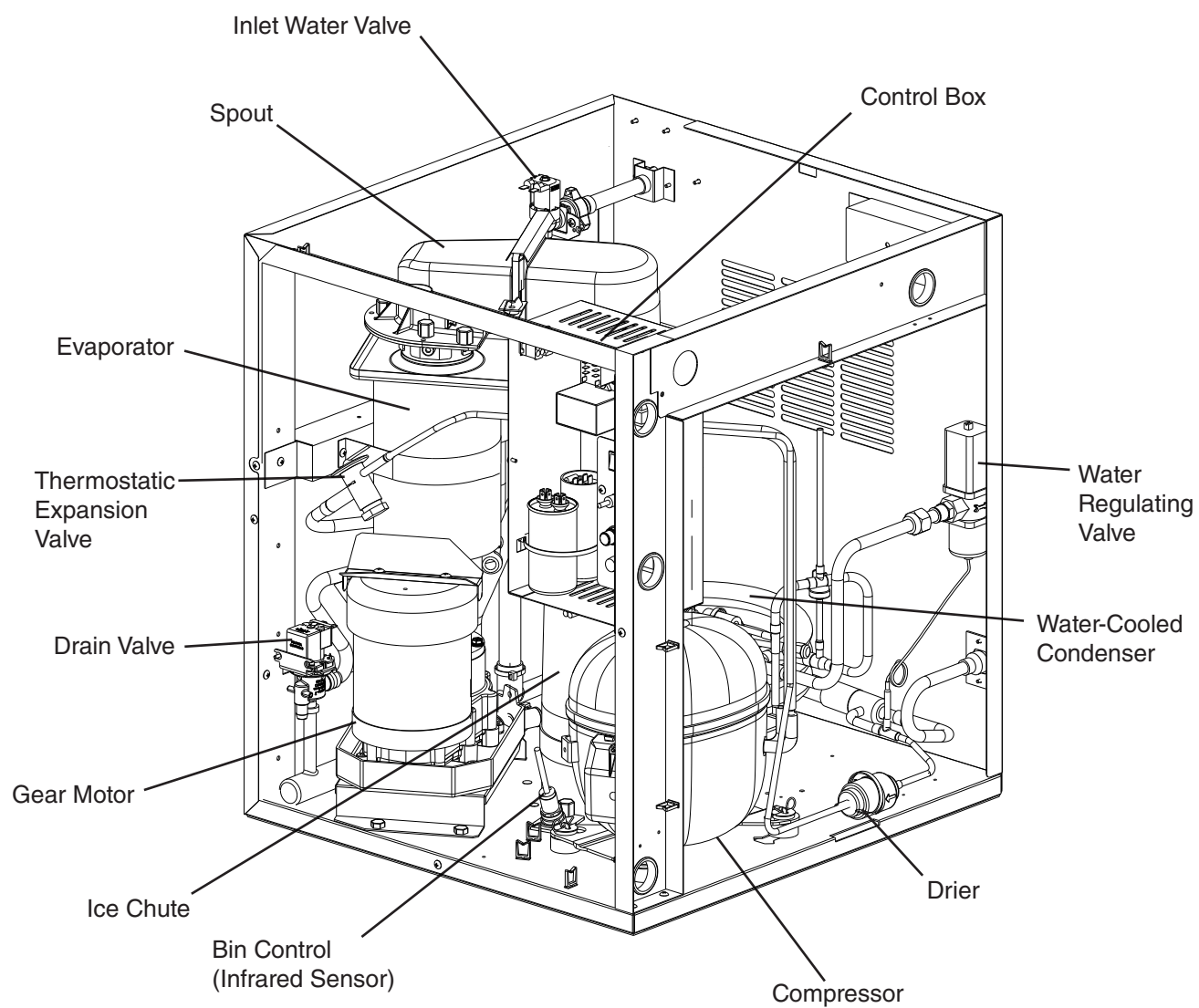
I. Construction and Water/Refrigeration Circuit Diagram

A. Construction

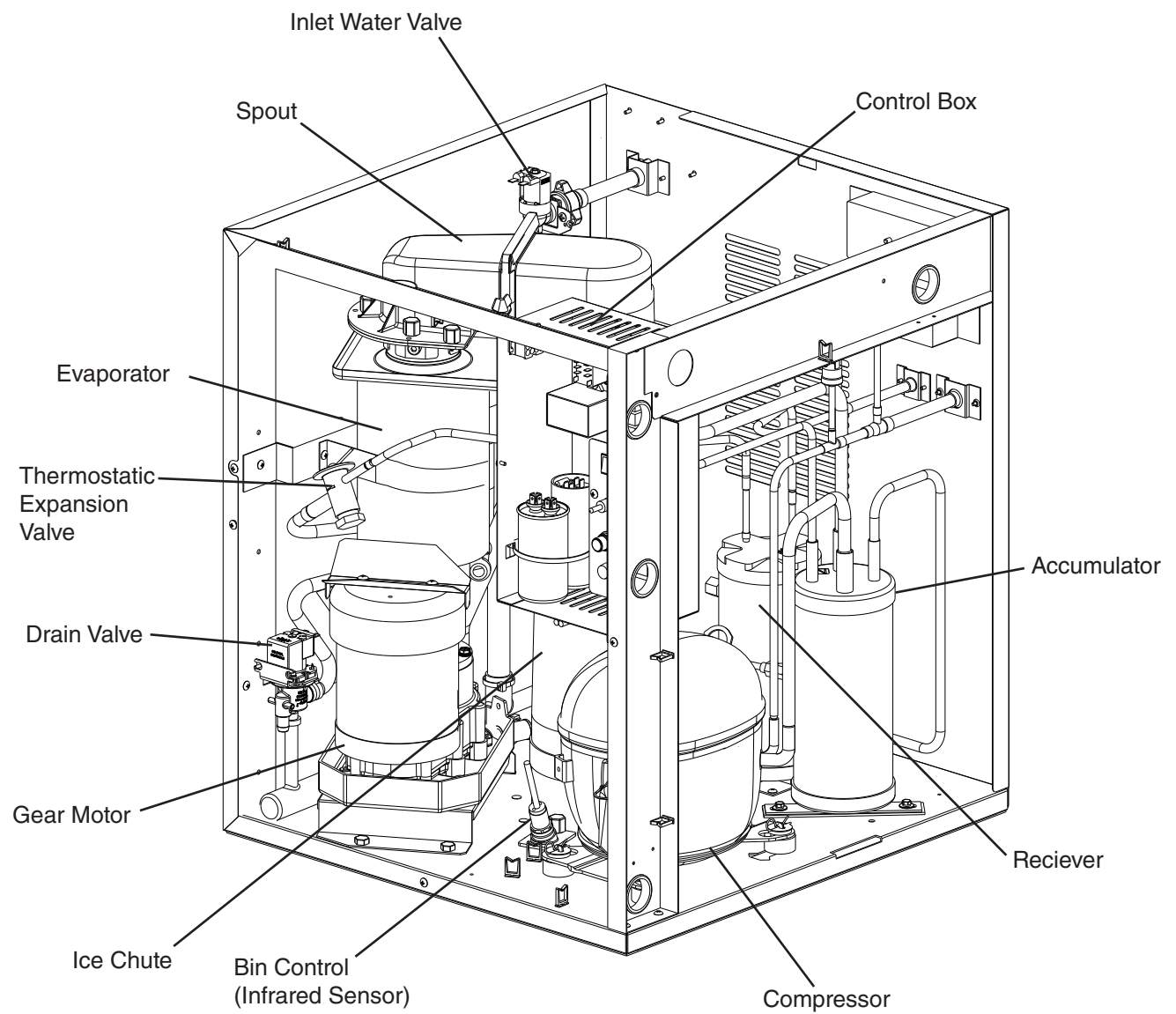
1. Air-Cooled Models (MAH-C)



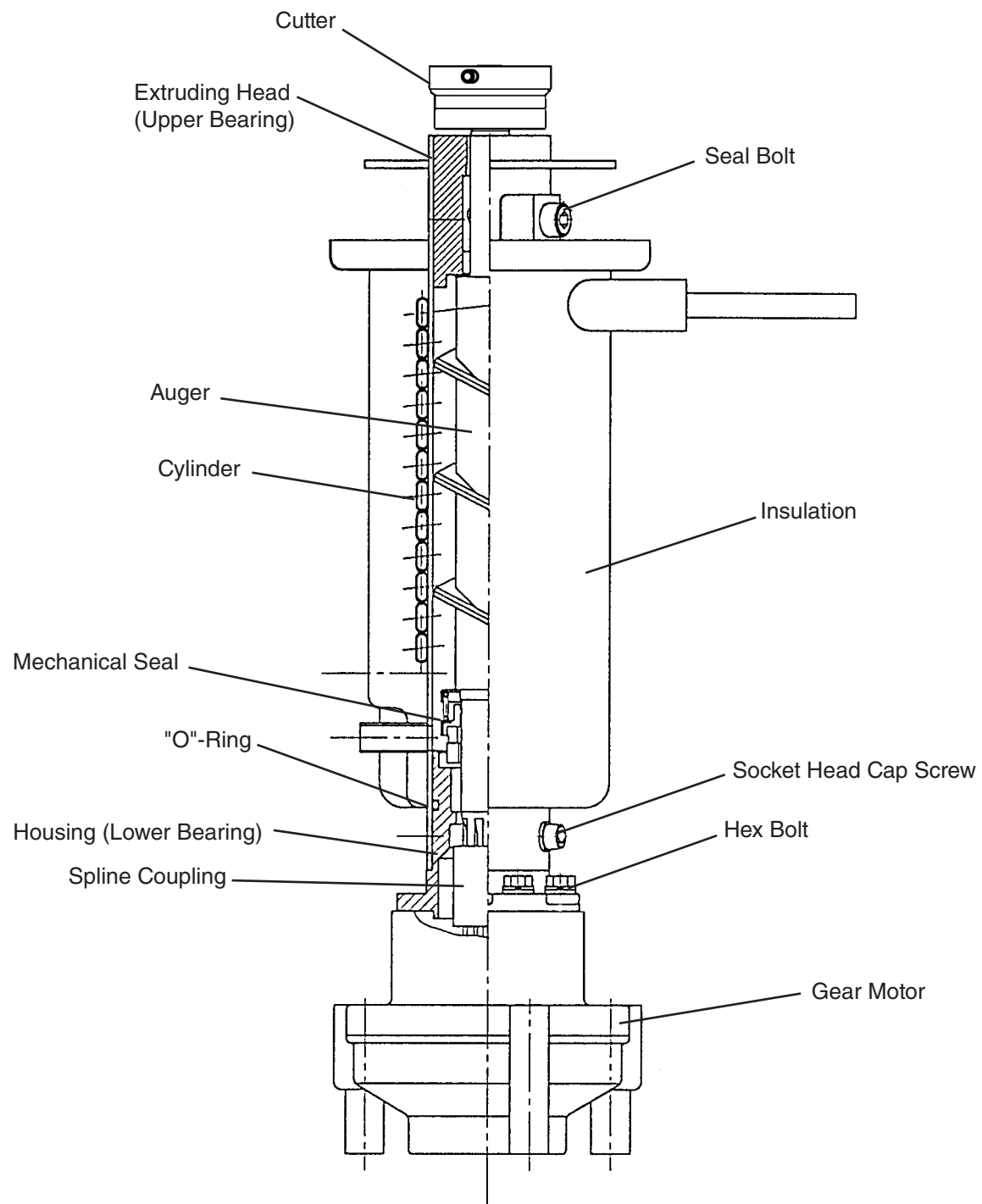
2. Water-Cooled Models (MWH-C)



3. Remote Models (MRH-C)

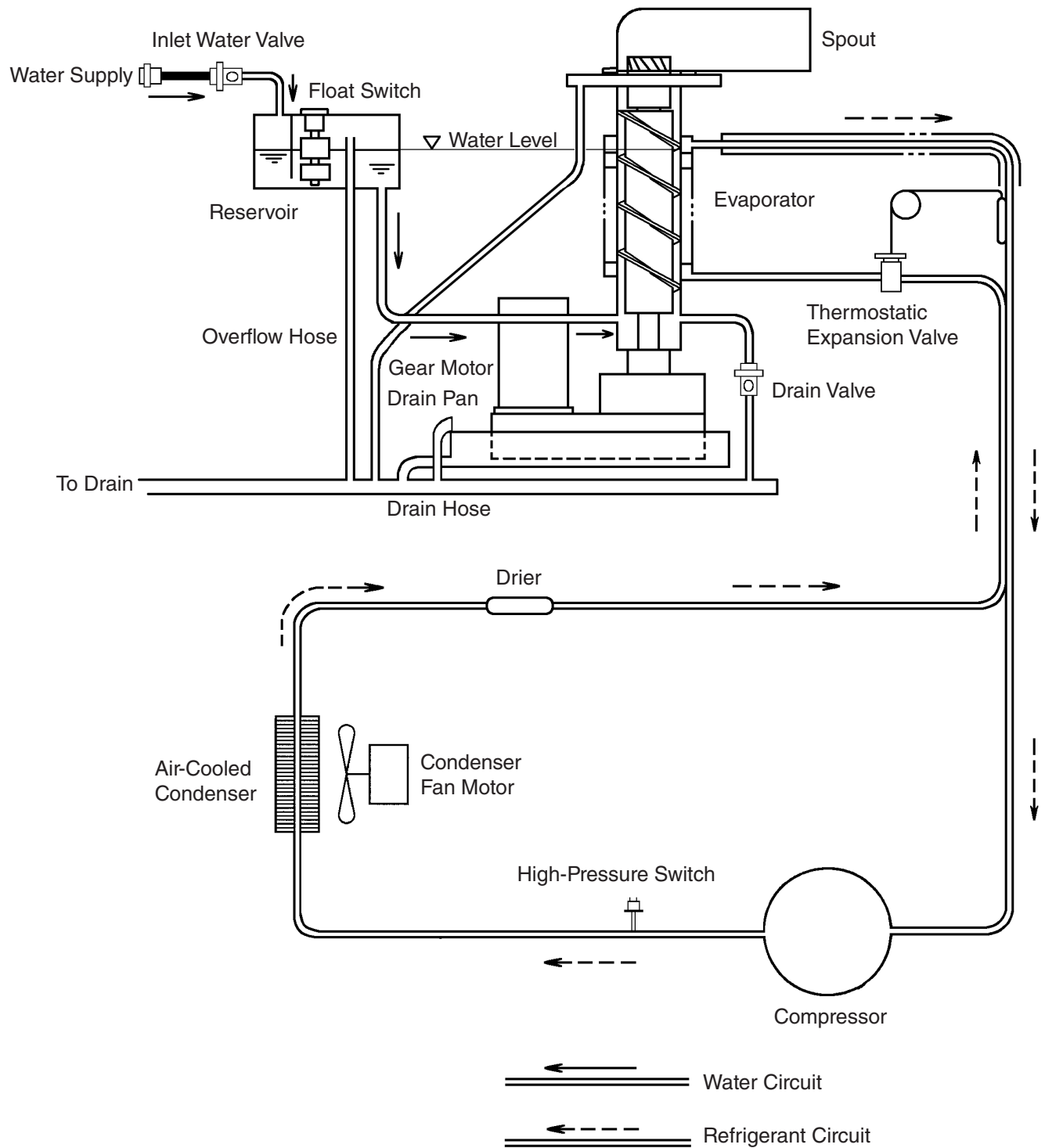


4. Ice Making Unit

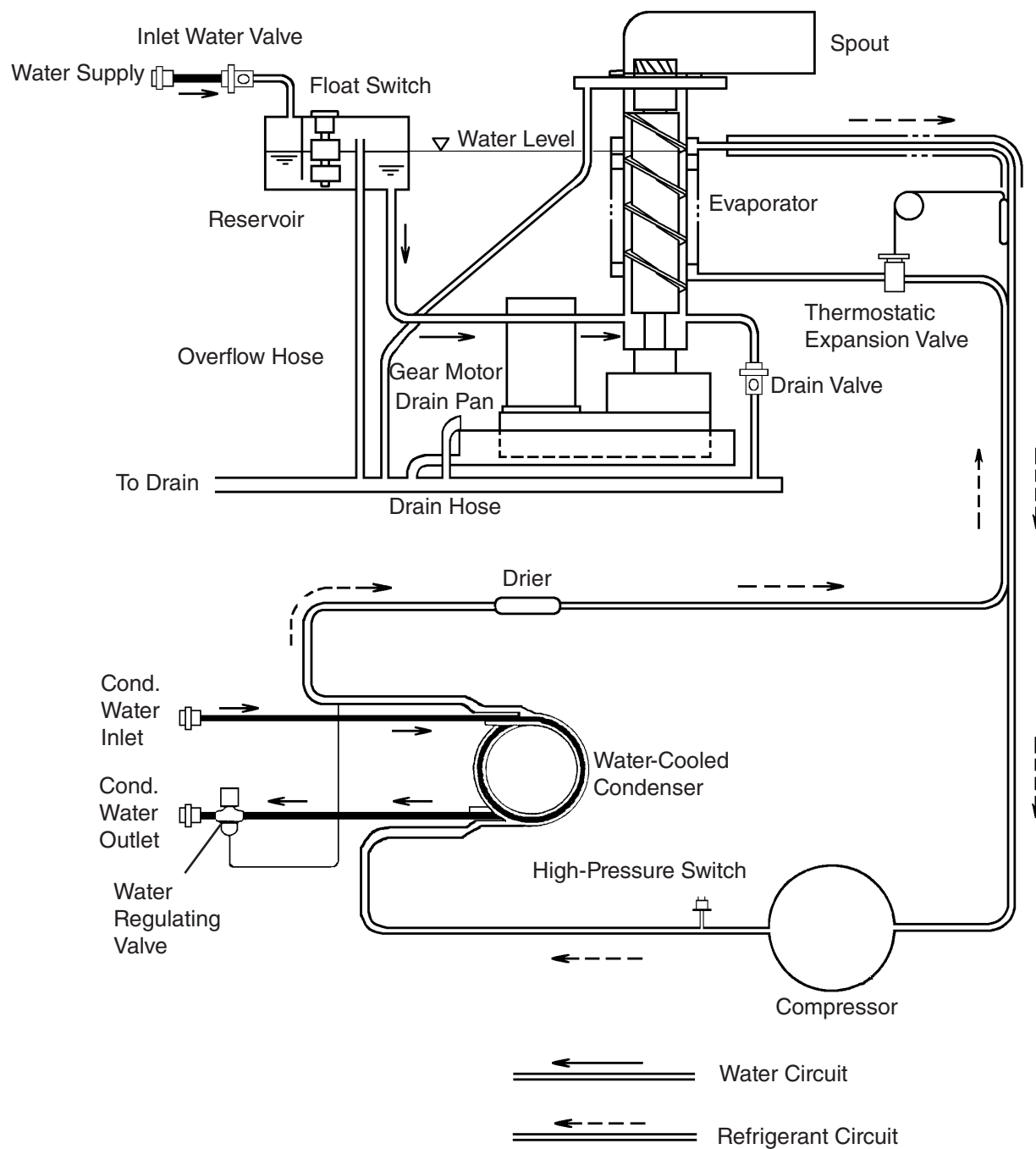


B. Water/Refrigeration Circuit Diagram

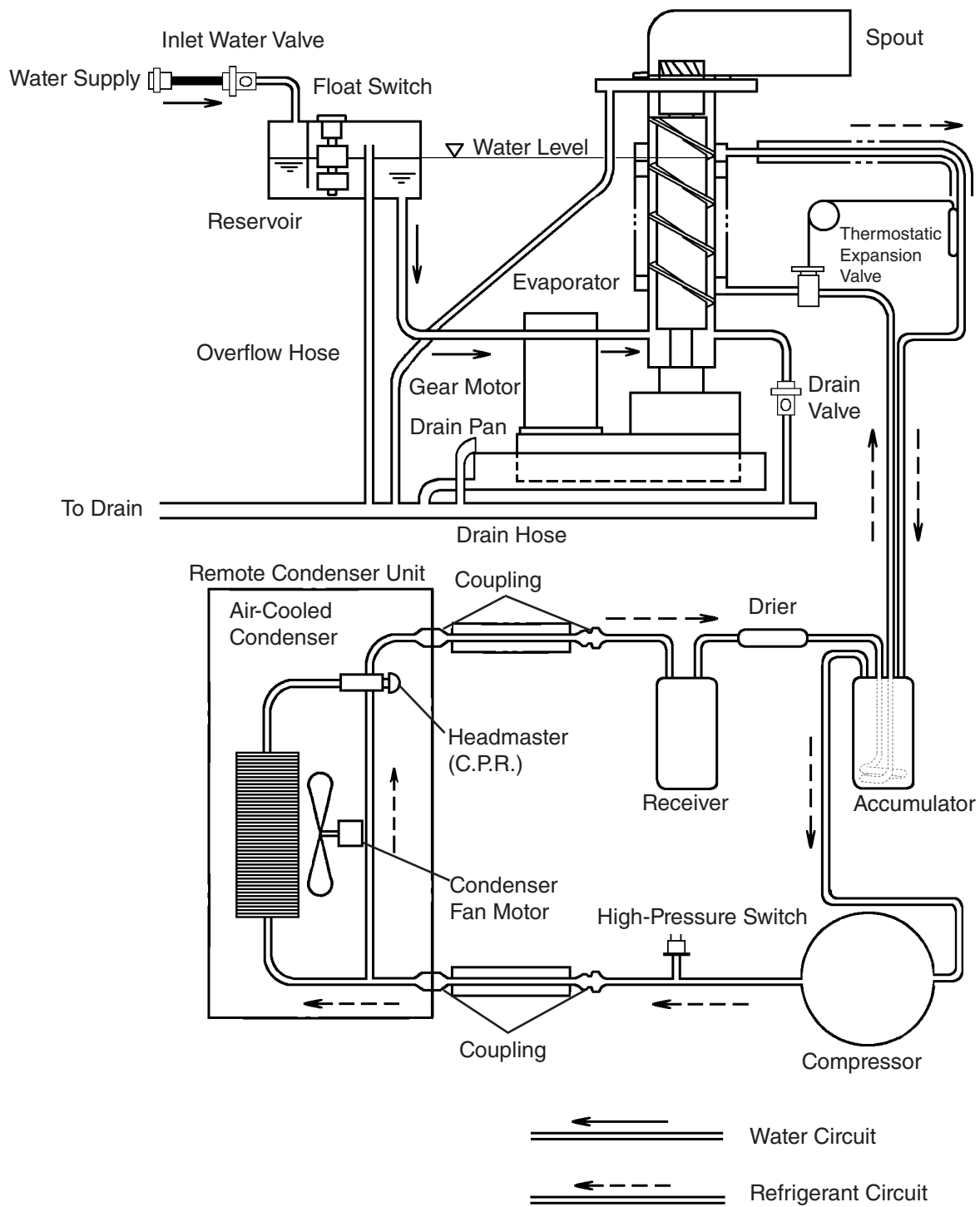
1. Air-Cooled Models (MAH-C)



2. Water-Cooled Models (MWH-C)



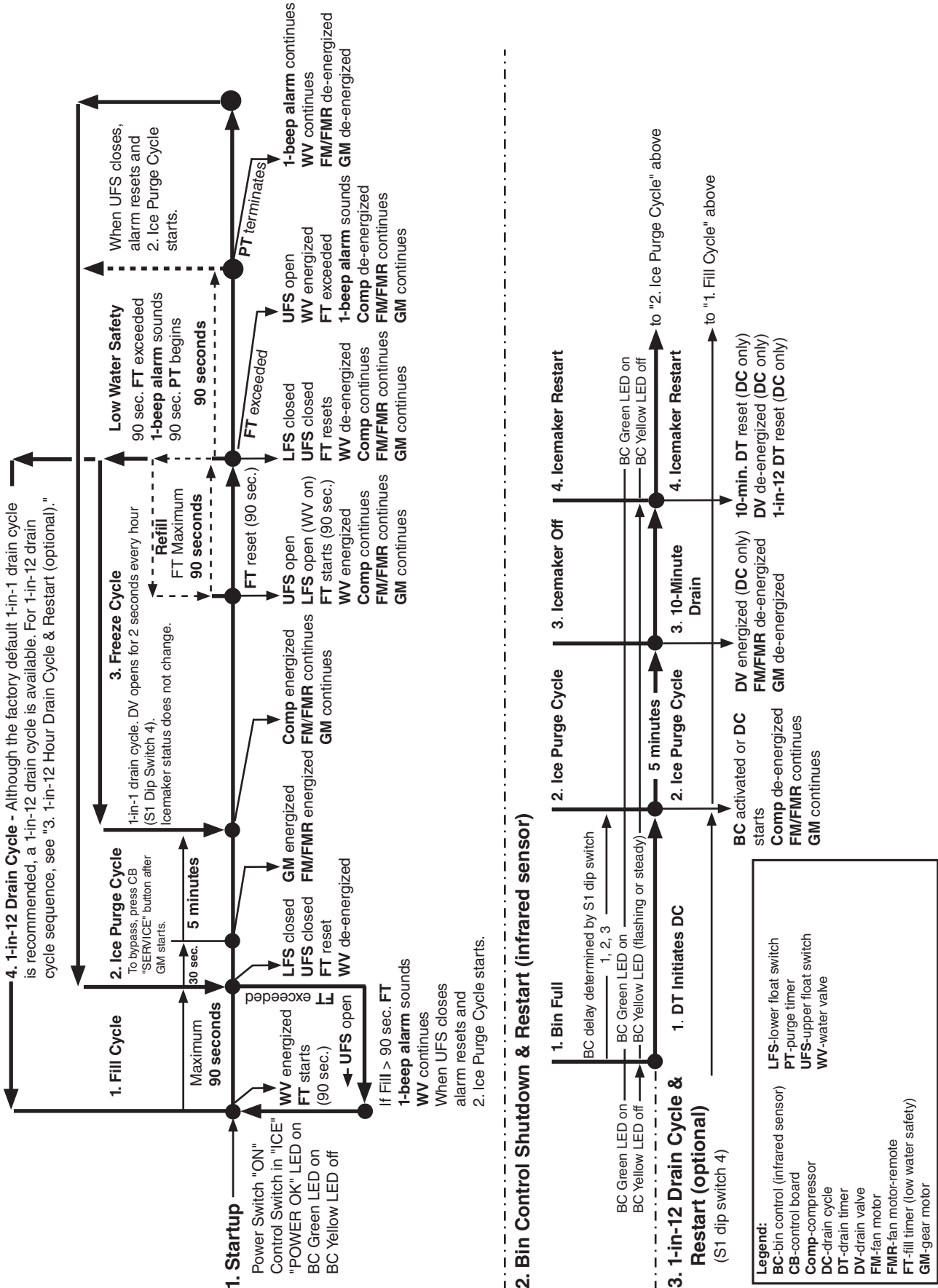
3. Remote Models (MRH-C)



II. Sequence of Operation and Service Diagnosis

A. Sequence of Operation Flow Chart

"F-A" Control Board Operation Flow Chart



B. Service Diagnosis

WARNING

- The appliance should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- Risk of electric shock. Use extreme caution and exercise safe electrical practices. Power switch in "OFF" position does not de-energize all loads.
- Moving parts (e.g., fan blade) can crush and cut. Keep hands clear.
- **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after the appliance is serviced. Make sure that none have fallen into the storage bin.
- Make sure all food zones in the icemaker and dispensing unit/ice storage bin are clean after service.

1. Ice Production Check

To check production, prepare a bucket or pan to catch the ice and a set of scales to weigh the ice. After the appliance has operated for 10 to 20 minutes, catch the ice production for 10 minutes. Weigh the ice to establish the batch weight. Multiply the batch weight by 144 for the total production in 24 hours. When confirming production or diagnosing low production, reference production information found in "VIII.A. Specification and Performance Data."

2. Diagnostic Procedure

This diagnostic procedure is a sequence check that allows you to diagnose the electrical system and components. Before proceeding, check for correct installation, proper voltage per appliance nameplate, and adequate water pressure (10 to 113 PSIG).

Note: • When checking high voltage (115VAC), always choose a neutral (W) wire to establish a good neutral connection.

- When checking low voltage (24VAC), always choose a neutral (LBU) wire.
- When checking control board DC voltage (5VDC), always place the red positive test lead from the multimeter to CB K5 pin closest to CB K4 connector. See "II.C. Control Board Check."
- To speed up the diagnostic process, the 5-min. ice purge cycle may be bypassed by pressing the "SERVICE" button on the control board after the gear motor starts. **WARNING! Risk of electric shock. Care should be taken not to touch live terminals.**

1) Confirm power supply is on and power switch is in the "ON" position.

2) Move the control switch to the "DRAIN" position.

Diagnosis "POWER OK" LED: Check that CB "POWER OK" LED is on. If not, check for 115VAC at control transformer brown (BR) wire to neutral (W). If 115VAC is not present, check the power switch and breaker. If 115VAC is present, check control transformer continuity. Replace as needed. Next, check for 24VAC at control transformer red (R) wire to neutral (LBU). If 24VAC is not present, check control transformer continuity. Replace as needed. If 24VAC is present, check 24VAC 1A fuse. If fuse is good, check for 24VAC at CB K8 #1 (W/R) to CB K8 #2 (LBU). If 24VAC is present and "POWER OK" LED is off, replace CB.

Diagnosis DV: If DV does not energize, check for 24VAC at CB K2 #10 (W/BU) to neutral (LBU). If 24VAC is not present, check control switch continuity. If open while in the "DRAIN" position, replace control switch. If closed, check for 0VDC at CB K9 #1 (W/BK) to K9 #2 (W/BK). If 5VDC is present and control switch is closed, replace CB. If DV energizes (24VAC present at CB K2 #10 (W/BU) to neutral (LBU)), and water does not drain, check for restricted DV and DV solenoid continuity. Clean or replace as needed.

Diagnosis BC: Confirm green LED is on. If not and yellow LED is on or flashing, move ice away from BC sensor. If no ice is present, clean the BC sensor lens with a warm, clean damp cloth. If cleaning the lens does not work, see "II.D. Bin Control Check."

- 3) After all of the water has drained, move control switch to the "ICE" position. CB "POWER OK" LED and BC green LED are on.
- 4) **Fill Cycle** – "WTRIN" LED is on. WV energizes. 90-sec. low water safety timer begins. LFS closes. Nothing occurs at this time. Reservoir continues to fill until UFS closes. Once UFS closes, 90-sec. low water safety timer terminates and 30-min. freeze timer starts. WV de-energizes. **Diagnosis:** Check that "WTRIN" LED turns on and water fills the reservoir. If not, check for water supply line shut-off valve closed, restricted water filters, and restricted WV screen. Next, check for 24VAC at CB K2 #8 (O) to neutral (LBU). If 24VAC is not present, replace CB. If 24VAC is present, turn off the power switch, disconnect the WV wires and check WV solenoid continuity. If open, replace WV. Reconnect WV wires, move the power switch to the "ON" position, then check that DV is not leaking by. Confirm that WV shuts off when UFS closes.
Note: **Low Water Safety**– If UFS remains open 90 sec. after WV energizes, a 1-beep alarm sounds. This alarm resets automatically once UFS closes.
- 5) **Ice Purge Cycle** – "GM" LED is on. 30-sec. GM delay timer starts. WV de-energizes and "WTRIN" LED turns off. Once the 30-sec. GM delay timer terminates, GM, FM/FMR, and CDR energize. CDR cannot energize unless GM circuit is complete (fuse, internal protector, and motor windings). Once CDR energizes, CB K9 #5 (W/O) and CB K9 #6 (W/O) 5VDC circuit closes and 5-min. ice purge timer starts. See "II.C.3) c. Compressor Delay Relay (5-min. Ice Purge Timer Circuit)." If CDR de-energizes, CB K9 #5 (W/O) and CB K9 #6 (W/O) circuit opens, an 8-beep alarm occurs. See "III.B. LED Lights and Alarm Safeties." Note: To bypass ice purge cycle and go straight to freeze cycle, press CB "SERVICE" button during 30 sec. GM delay time.
Diagnosis CB: Check that UFS closed, WV LED turned off and WV de-energized. If UFS is closed, "WV" LED is off, and "GM" LED is off, replace CB. If "GM" LED is on and GM is off, confirm 115VAC at CB K1 #2 (BR) to neutral (W). If 115VAC is not present, check for loose connection from power switch. If 115VAC is present, check for 115VAC at CB K1 #3 (R) to neutral (W). If 115VAC is not present, replace CB.
Diagnosis GM: If 115VAC is present at CB K1 #3 (R) to neutral (W), check GM fuse, GM capacitor, GM windings, and GM coupling between auger and GM.
Diagnosis CDR: Once GM energizes, check for 115VAC at CDR #7 (O) to neutral (W). If 115VAC is present and CDR contacts #3 (W/O) and #5 (W/O) do not close, replace CDR. See "II.C.3)c. Compressor Delay Relay (5-min. Ice Purge Timer Circuit)."
Diagnosis FM/FMR: If 115VAC is present at CB K1 #3 (R) to neutral (W) and FM/FMR does not energize, check FM/FMR capacitor, windings, and bearings.

- 6) **Freeze Cycle – "COMP" LED is on.** 5-min. ice purge timer terminates or CB "SERVICE" button pressed. "COMP" LED is on. "GM" LED remains on. Comp energizes. GM, FM/FMR, and CDR continue. Ice production begins 4 to 6 minutes after Comp energizes depending on ambient and water conditions.
Diagnosis Comp: Check that "COMP" LED is on and that Comp energizes. If "COMP" LED is off, confirm 5-min. ice purge timer has terminated. Check for 0VDC across CB K9 #3 (Y) and CB K9 #4 (Y). If 5VDC is present, HPS contacts are open. If high-pressure switch is open, CB sounds a 3-beep alarm. See "III.B. LED Lights and Alarm Safeties." If HPS is closed, check for 115VAC at CDR #7 (O) to CDR #8 (W). If 115VAC is present, check CDR continuity between CDR #3 (W/O) and CDR #5 (W/O). If open, replace CDR. If closed and "COMP" LED remains off, replace CB. If "COMP" LED is on and Comp is off, check for 115VAC at CB X1 (BR) wires to neutral (W). If 115VAC is present on one and not the other, replace CB. If 115VAC is present on both, check Comp windings, start relay, and capacitors.
 Note: If CDR de-energizes, CB K9 #5 W/O and CB K9 #6 W/O circuit opens, Comp de-energizes and an 8-beep alarm occurs. See "III.B. LED Lights and Alarm Safeties."
- 7) **Refill Cycle/Low Water Safety Cycle** – As ice is produced, the water level in the reservoir drops. UFS opens. Nothing occurs at this time. When LFS opens, WV energizes, 90-sec. low water safety timer (fill timer) starts. Comp, GM, and FM/FMR continue. When UFS closes, WV de-energizes, 90-sec. low water safety timer (fill timer) terminates and 30-min. freeze timer resets. If UFS remains open 90 sec. after WV energizes (fill timer exceeded), a 90-sec. shutdown cycle starts. Comp de-energizes and CB signals a 1-beep alarm every 5 sec. 90-sec. ice purge timer starts. GM and FM/FMR continue. 90-sec. purge timer terminates, GM and FM/FMR de-energize. WV and 1-beep alarm continue until UFS closes. **Diagnosis** – Check that "WTRIN" LED is on. If not, check LFS. See "II.E. Float Switch Check and Cleaning." If LFS is open and "WTRIN" LED is off, replace CB. If "WTRIN" LED is on, check that the reservoir fills. If not, check the water supply line, restricted water filters, WV solenoid, restricted WV screen. If WV is energized and refill exceeds 90-sec. low water safety timer (fill timer), check DV leaking by, UFS open. See "II.E. Float Switch Check and Cleaning."
 Note: Each time UFS closes, 30-min. freeze timer starts. The 30-min. freeze timer resets when UFS closes again. If UFS does not close again within 30 min., CB shuts down the unit and sounds a 5-beep alarm every 5 sec. See "III.B. LED Lights and Alarm Safeties."
- 10) **Shutdown** – Use an object to cover BC sensor at the bottom of the icemaker. If the bottom of the icemaker is not accessible in your application, remove the thumbscrew securing BC housing, remove the housing from the base, then cover BC sensor. The yellow LED on BC sensor turns on (flashing or steady). The yellow LED flashes when ice is at the outer limit of its range and turns steady as ice nears. After the yellow LED turns on (flashing or steady), BC shutdown delay timer starts. When the BC shutdown delay timer terminates, CB shuts down icemaker. See "II.D. Bin Control Check."

Legend: **BC**—bin control; **CB**—control board; **CDR**—compressor delay relay;
Comp—compressor; **DV**—drain valve; **FM**—fan motor; **FMR**—fan motor-remote;
GM—gear motor; **LFS**—lower float switch; **UFS**—upper float switch; **WV**—inlet water valve

C. Control Board Check

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

Before diagnosing the control board drain the reservoir.

- 1) Check CB S1 dip switch settings to assure that they are in the factory default position. For factory default settings, see "III.C.a) Default Dip Switch Settings."
- 2) Move the power switch to the "ON" position and move the control switch to the "ICE" position. The "POWER OK" LED turns on. **Diagnosis "POWER OK" LED Off:** Check for 115VAC at control transformer brown (BR) wire to neutral (W). If 115VAC is not present, check the power switch and breaker. If 115VAC is present, check for 24VAC at control transformer red (R) wire to neutral (LBU). If 24VAC is not present, check control transformer continuity. Replace as needed. If 24VAC is present, check 24VAC 1A fuse. If fuse is good, check for 24VAC at CB K8 #1 (W/R) to CB K8 #2 (LBU). If 24VAC is present and "POWER OK" LED is off, replace CB.

3) **CB 5VDC Output:** Control Switch, High-Pressure Switch, Compressor Delay Relay, and Float Switch. When checking 5VDC voltage, always place the red positive test lead from the multimeter to CB K5 pin closest to CB K4 connector. See Fig. 1. Then place the black negative test lead from the multimeter to the corresponding pin to complete the 5VDC check. If the icemaker is in alarm (beeping), see "III.B. LED Lights and Alarm Safeties."

- a. **Control Switch:** When in the "ICE" position, control switch contacts are open and 5VDC is present at CB K5 pin closest to CB K4 connector to CB K9 #1 (W/BK). If 5VDC is not present, confirm the control switch is in the "ICE" position, then check control switch continuity (open). If 5VDC is still not present, replace CB. When the control switch is in the "DRAIN" position, the control switch contacts are closed and 0VDC is present at CB K5 pin closest to CB K4 connector to CB K9 #2 (W/BK). If 5VDC is present, confirm the control switch is in the "DRAIN" position and check control switch continuity (closed). If 0VDC is still not present, replace CB.
- b. **High-Pressure Switch:** When the high-pressure switch is closed, 0VDC is present at CB K5 pin closest to CB K4 connector to CB K9 #3 (Y) and CB K9 #4 (Y). If 0VDC is not present and high-pressure switch is closed, replace CB. If high-pressure switch is open, CB sounds a 3-beep alarm. See, "III.B. LED Lights and Alarm Safeties."
- c. **Compressor Delay Relay (5-min. Ice Purge Timer Circuit):** Gear motor energizes, energizing compressor delay relay and starting 5-min. ice purge timer. When de-energized, 5VDC is present at CB K5 pin closest to CB K4 connector to CB K9 #5 (W/O). If 5VDC is not present, replace CB. When compressor delay relay energizes, compressor delay relay #3 (W/O) and #5 (W/O) close and 0VDC is present at CB K5 pin closest to CB K4 connector to CB K9 #5 (W/O). If 5VDC is present, compressor control relay #3 (W/O) and #5 (W/O) are open. If compressor delay relay de-energizes after gear motor starts, an 8-beep alarm occurs. See "III.B. LED Lights and Alarm Safeties."

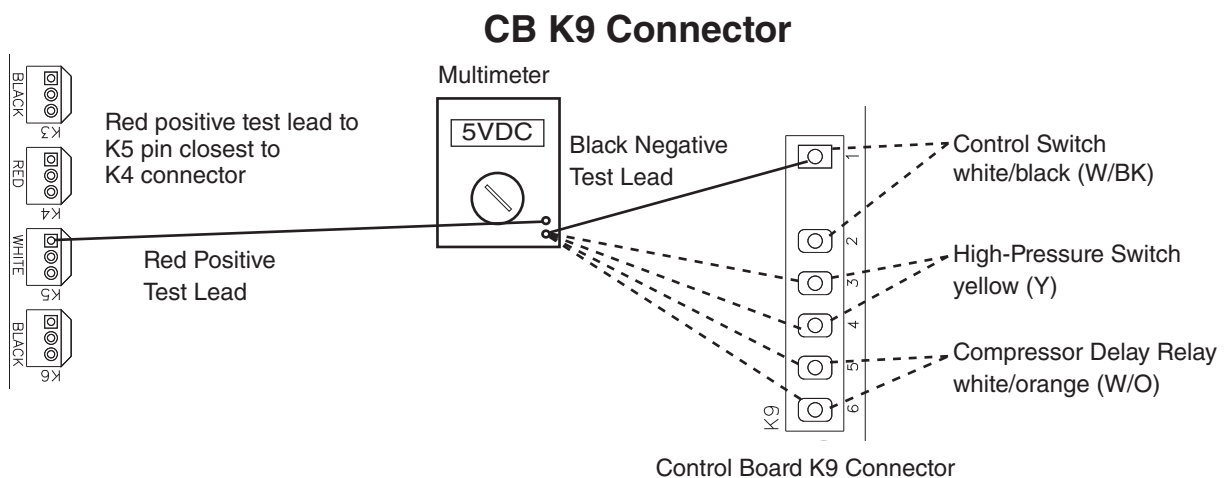


Fig. 1

- d. **Float Switch:** See Fig. 2. 5VDC is present at CB K5 pin closest to CB K4 connector to CB K8 #5 (BK). If 5VDC is not present, replace CB. When UFS and LFS are open, 5VDC is present at CB K8 #5 (BK) to K8 #6 (R) (UFS) and K8 #7 (DBU) (LFS). When UFS and LFS are closed, 0VDC is present at CB K8 #5 (BK) to K8 #6 (R) (UFS) and K8 #7 (DBU) (LFS). For further float switch diagnostics, see "II.E. Float Switch Check and Cleaning."

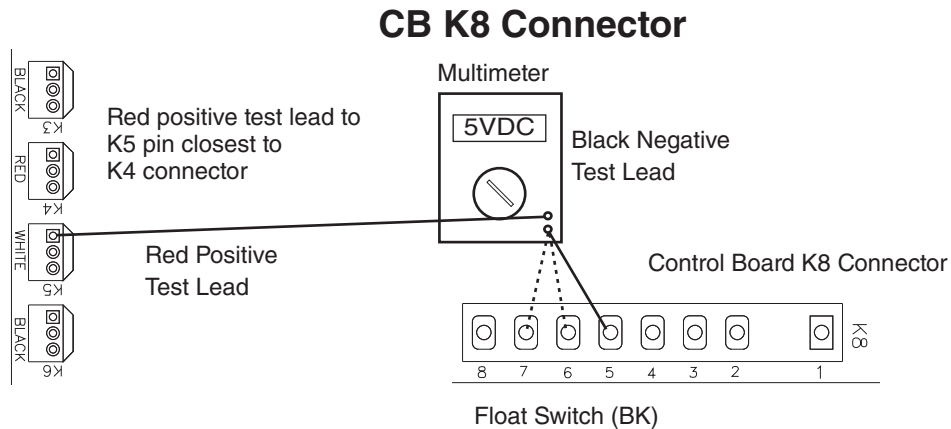
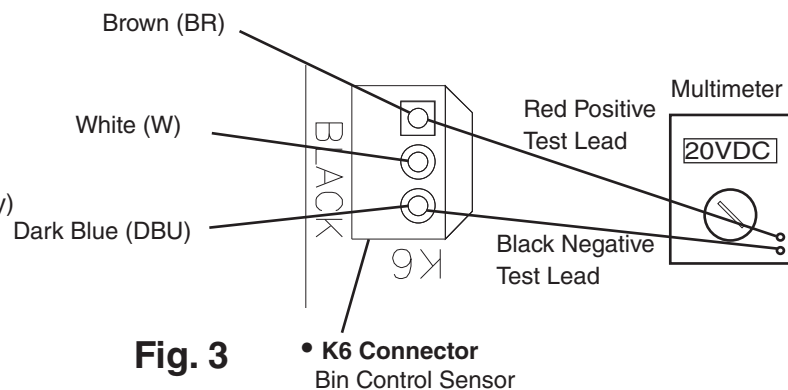


Fig. 2

- 4) **CB 20VDC Output: Bin Control.** Check that the BC green LED is on. If not, confirm that BC yellow LED is not flashing or steady. If BC green or yellow LED is not on, check for 20VDC at CB K6 #1 (DBU) to CB K6 #3 (BR). See Fig. 3. If 20VDC is not present, replace CB. If BC yellow LED is on or flashing, move ice away from BC lens. If no ice is present, clean the lens with a warm, clean damp cloth. If BC green LED is not on, see "II.D. Bin Control Check."

Bin Control Sensor (20VDC)
Closed (green LED on)
20VDC DBU to BR
20VDC DBU to W
0VDC W to BR

Bin Control Sensor (20VDC)
Open (yellow LED flashing or steady)
20VDC DBU to BR
0VDC DBU to W
20VDC W to BR



5) **CB 24VAC Output:** Inlet Water Valve and Drain Valve.

- a) **Inlet Water Valve:** When the control switch is in the "ICE" position, "WTRIN" LED turns on and inlet water valve energizes. If not, check for 24VAC at CB K2 #7 (W/R) to a neutral (LBU). If 24VAC is present, check for 24VAC at CB K2 #8 (O) to neutral (LBU). If 24VAC is not present, replace CB. If 24VAC is present, and inlet water valve does not energize, turn off the power supply and check continuity across the inlet water valve solenoid. If open, replace inlet water valve.
- b) **Drain Valve:** When the control switch is in the "DRAIN" position, "FLUSH" (drain) LED turns on and drain valve energizes. If not, check for 24VAC at CB K2 #7 (W/R) to neutral (LBU). If 24VAC is present, check for 24VAC at CB K2 #10 (W/BU) to neutral (LBU). If 24VAC is not present, replace CB. If 24VAC is present, and drain valve does not energize, turn off the power supply and check continuity across the drain valve solenoid. If open, replace drain valve.

6) **CB 115VAC Output:** Gear Motor and Compressor X1 Relay.

- a) **Gear Motor:** When UFS closes, "GM" LED turns on and gear motor energizes, energizing compressor delay relay, closing 5-min. ice purge timer 5VDC circuit and starting 5-min. ice purge timer. Confirm 115VAC at CB K1 #2 (BR) to neutral (W). If 115VAC is not present, check for loose connection from power switch. If 115VAC is present, check for 115VAC at CB K1 #3 (R) to neutral (W). If 115VAC is not present, replace CB.
- b) **Compressor X1 Relay:** When 5-min. ice purge timer terminates (CDR energized for 5-min.) or "SERVICE" button is pressed, "COMP" LED turns on and X1 relay energizes, energizing compressor. Confirm 115VAC at X1 (BR) wire to neutral (W). If 115VAC is not present, check for loose connection. If 115VAC is present, check for 115VAC at X1 (BK) to neutral (W). If 115VAC is not present and "COMP" LED is on, replace CB. Note: If CDR de-energizes, CB K9 #5 W/O and CB K9 #6 W/O circuit opens, Comp de-energizes and an 8-beep alarm occurs. See "III.B. LED Lights and Alarm Safeties."

Legend: **CB**—control board; **CT**—control transformer

D. Bin Control Check

1. Bin Control Sensor Check (infrared)

IMPORTANT

Make sure CB S1 dip switch 7 is in the "ON" position. This allows the control board to monitor the bin control sensor.

- 1) Turn off the power supply.
- 2) Remove the front panel, top panel, and control box cover.
- 3) Confirm that CB S1 dip switch 1, 2, 3 are in the proper position for your application. See "III.C.b) Bin Control Shutdown Delay (infrared sensor) (S1 dip switch 1, 2, 3)."
- 4) Confirm that BC is connected to CB K6 connector on the control board. Wipe down BC sensor lens with a clean, warm, damp cloth.
- 5) Move the control switch to the "ICE" position, then move the power switch to the "ON" position.
- 6) Turn on the power supply to start the automatic icemaking process. Green LED confirms 20VDC power from CB K6 to BC and remains on constantly. **Diagnosis:** Confirm BC green LED is on. If not and BC yellow LED is on or flashing, move ice away from BC sensor. If no ice is present and BC green LED is off, check DC voltage at CB K6 #1 (DBU) to CB K6 #3 (BR). If 20VDC is not present, replace CB. If 20VDC is present and BC green LED is off, replace BC.
- 7) Make sure CB "GM" LED is on. There is a delay of at least 30 seconds before "GM" LED turns on after power-up. After "GM" LED turns on, press CB "SERVICE" button to bypass the 5-minute ice purge cycle. **WARNING! Risk of electric shock. Care should be taken not to touch live terminals.** CB "COMP" LED turns on.

Bin Control Sensor (20VDC)
Closed (green LED on)
20VDC DBU to BR
20VDC DBU to W
0VDC W to BR

Bin Control Sensor (20VDC)
Open (yellow LED flashing or steady)
20VDC DBU to BR
0VDC DBU to W
20VDC W to BR

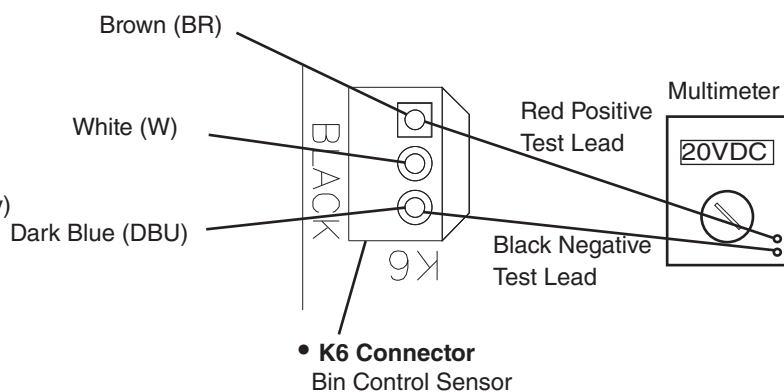


Fig. 5

- 8) CB "GM" and "COMP" LEDs are on. Use an object to cover BC sensor lens at the bottom of the icemaker. If the bottom of the icemaker is not accessible in your application, remove the thumbscrew securing BC housing, remove BC from the base, then cover BC sensor. See Fig. 6. BC yellow LED turns on (flashing or steady). BC yellow LED flashes when ice is at the outer limit of its range and turns steady as ice nears. After BC yellow LED turns on (flashing or steady), BC shutdown delay timer starts. See "III.C.b) Bin Control Shutdown Delay (infrared sensor) (S1 dip switch 1, 2, 3)." Comp should de-energize immediately after BC shutdown delay timer terminates. 5 min. later, GM and FM/FMR de-energize. **Diagnosis:** If BC yellow LED is not on after covering the BC sensor, replace BC. If unit remains on after BC shutdown delay timer terminates and the 5-minute ice purge timer terminates, replace CB.
- 9) Remove the object covering BC sensor. If you removed BC housing from the base, replace it in its correct position, and secure it with the thumbscrew.
- 10) Move the power switch to the "OFF" position. Turn off the power supply.

Legend: **BC**—bin control; **CB**—control board; **COMP**—compressor; **FM**—fan motor; **FMR**—fan motor-remote; **GM**—gear motor

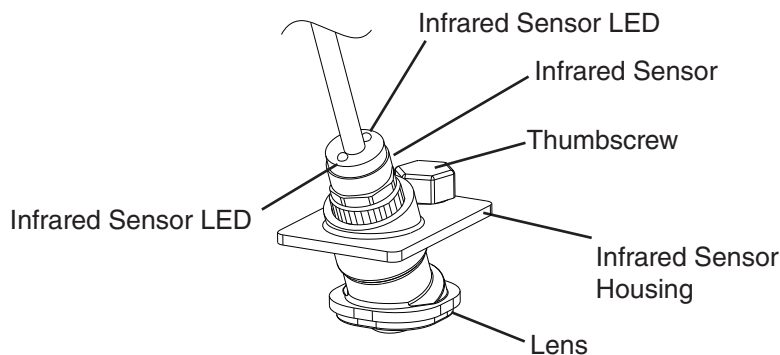


Fig. 6

E. Float Switch Check and Cleaning

1. Float Switch Check

- 1) Remove the front, top, and left side panels, then move the control switch to the "DRAIN" position.
- 2) After 3 min. move the power switch to the "OFF" position and turn off the power supply.
- 4) Remove the bell connectors from FS black (BK), dark blue (DBU), and red (R) wires. Check for open continuity between black (BK) (common) and red (R) (UFS) and between black (BK) (common) and dark blue (DBU) (LFS). If both are open, continue to step 5. If either are closed, follow the steps in "II.E.2. Float Switch Cleaning." After cleaning FS, check UFS and LFS again. Replace if necessary. See Fig. 7.
- 5) Cap the FS (BK), (R), and (DBU) wires from the control box.
- 6) Move the control switch to the "ICE" position and the power switch to the "ON" position, then turn on the power supply.
- 7) Once reservoir fills, move the power switch to the "OFF" position, then turn off the power supply.
- 8) Check FS continuity again. Both UFS and LFS should be closed. Check for closed continuity between black (BK) (common) and red (R) (UFS), and between black (BK) (common) and dark blue (DBU) (LFS). If either are open, follow the steps in "II.E.2. Float Switch Cleaning." After cleaning FS, check UFS and LFS again. Replace if necessary.
- 9) Reconnect the FS wires to the appropriate appliance wires. (BK) to (BK), (R) to (R), and (DBU) to (DBU).
- 10) Replace the left side and top panels in their correct positions.
- 11) Turn on the power supply, then move the power switch to the "ON" position to start the automatic icemaking process.
- 12) Replace the front panel in its correct position.

2. Float Switch Cleaning

Depending on water conditions, scale may build up on FS. Scale on the switch can cause inconsistent operation of UFS and LFS. In this case, FS should be cleaned and checked.

- 1) Remove the front, top, and left side panels. Move the power switch to the "OFF" position, then turn off the power supply.
- 2) Remove FS assembly from the reservoir cover. See Fig. 8.
- 3) Wipe down FS assembly with a mixture of 1 part Hoshizaki "Scale Away" and 25 parts warm water.
- 4) While not necessary, the floats can be removed from the shaft during cleaning. If you remove them, note that the blue float is on top. The floats must be installed with the magnets inside them towards the top of the switch. See Fig. 7. Installing the floats upside down will affect the timing of the float switch operation.
- 5) Rinse FS assembly thoroughly with clean water and replace in its original position.
- 6) Replace the left side and top panels in their correct positions.

- 7) Turn on the power supply, then move the power switch to the "ON" position to start the automatic icemaking process.
- 8) Replace the front panel in its correct position.

Legend: **FS**—float switch; **LFS**—lower float switch; **UFS**—upper float switch;

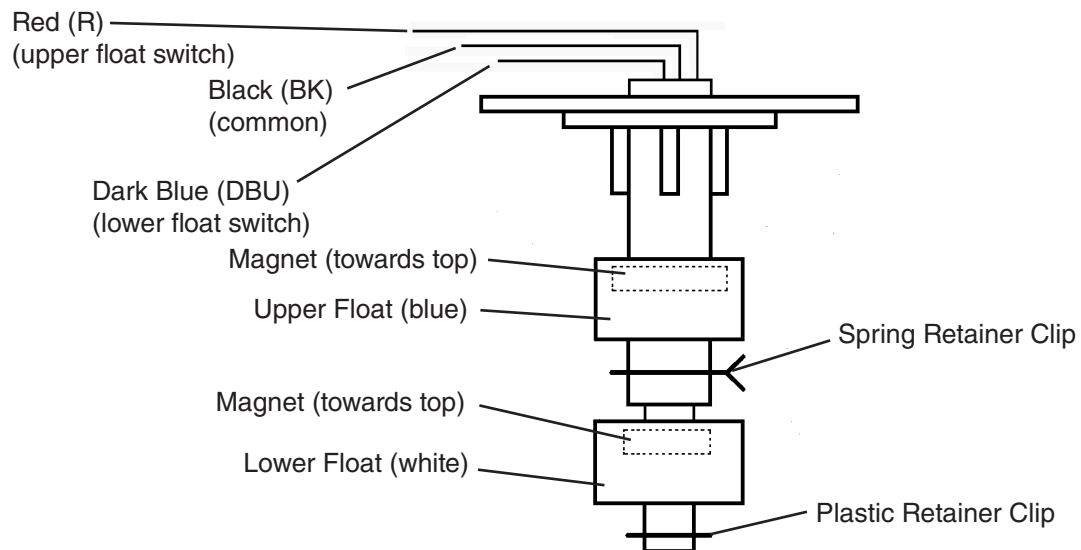


Fig. 7

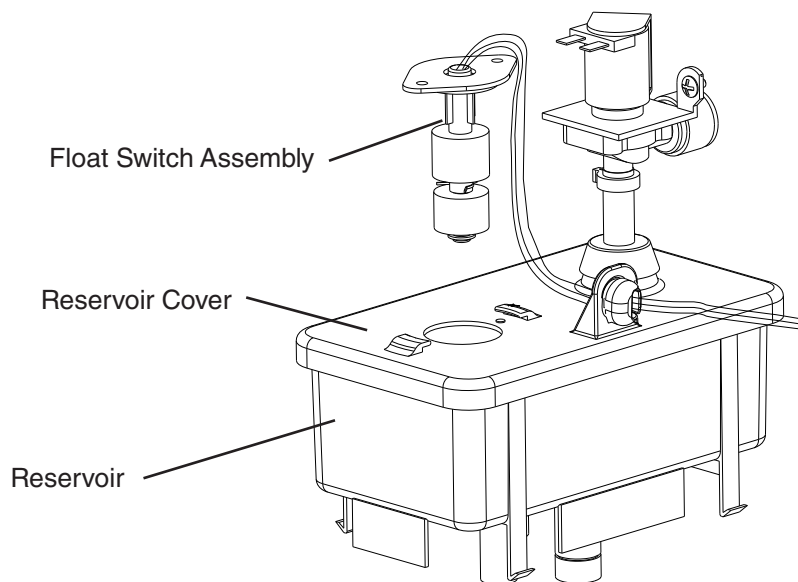


Fig. 8

F. Diagnostic Tables

Before consulting the diagnostic charts, check for correct installation, proper voltage per appliance nameplate, and adequate water supply. Check control board using the steps in "II.C. Control Board Check."

1. No Ice Production

No Ice Production - Possible Cause	
Startup	
1. Power Supply	a) Off, blown fuse, or tripped breaker. b) Not within specifications.
2. Water Supply	a) Water supply off or improper water pressure (10 to 113 PSIG). b) External water filters restricted.
3. Power Switch	a) "OFF" position. b) Defective.
4. Control Transformer (115VAC/24VAC)	a) Coil winding open or shorted.
5. Fuse (1A)	a) Blown.
6. Control Board See "II.C. Control Board Check."	a) Defective.
7. Control Switch	a) In "DRAIN" position. b) Defective. c) Control board defective.
8. High-Pressure Switch	a) Dirty air filter or condenser. b) Condenser fan motor defective. c) Refrigerant overcharge. d) Refrigerant lines or components plugged. e) Control board defective.
9. Bin Control See "II.D. Bin Control Check."	a) Dirty or misaligned. b) Defective. c) Control board defective.
Startup/Fill Cycle (reservoir empty)	
1. Control Board See "II.C. Control Board Check."	a) Defective.
2. Inlet Water Valve	a) Screen or orifice clogged. b) Defective. c) Control board defective.
Startup/Fill Cycle (reservoir full)	
1. Float Switch See "II.E. Float Switch Check and Cleaning."	a) Float does not move freely. b) Defective. c) Control board defective.
2. Gear Motor	a) Fuse blown. b) Internal protector open. c) Gear motor winding open. d) Mechanical failure. e) Control board defective.
3. Compressor Delay Relay	a) Not energized. b) Defective.

No Ice Production - Possible Cause	
Startup/Fill Cycle (reservoir full) (continued)	
4. Fan Motor	a) Open motor windings. b) Mechanical failure or fan blade binding.
Freeze Cycle	
1. Compressor Delay Relay	a) Not energized. b) Defective. c) Control board defective.
2. Compressor	a) Start Relay/Capacitor defective. b) Open motor windings. c) Mechanical failure. d) Control board defective.
3. Evaporator	a) Dirty. b) Damaged or defective.
4. Refrigerant Line	a) Gas leak. b) Refrigerant line or component restricted.
5. Thermostatic Expansion Valve	a) Loose or misaligned bulb. b) Defective.
6. Drain Valve	a) Dirty, leaking by. b) Control board defective.
7. Water System	a) Water leaks.
8. Water Regulating Valve (MWH Models)	a) Set too high. b) Defective.
9. Headmaster (C.P.R. Valve) (MRH Models)	a) Defective.
Refill	
1. Float Switch See "II.E. Float Switch Check and Cleaning."	a) Dirty/sticking. b) Defective. c) Control board defective.
2. Inlet Water Valve	a) Screen or orifice clogged. b) Defective. c) Control board defective.
3. Water Supply	a) Water supply off or improper water pressure (10 to 113 PSIG). b) External water filters clogged.
4. Control Board See "II.C. Control Board Check."	a) Defective.
Shutdown	
1. Bin Control See "II.D. Bin Control Check."	a) Dirty or misaligned. b) Defective. c) Control board defective.
2. Control Board See "II.C. Control Board Check."	a) Defective.
Shutdown Drain Cycle	
1. Drain Water Valve	a) Screen or orifice clogged. b) Defective. c) Control board defective.
2. Control Board See "II.C. Control Board Check."	a) Defective.

III. Controls and Adjustments

- A Hoshizaki exclusive control board is employed in Hoshizaki icemakers.
- All models are pretested and factory adjusted.
- For a control board check procedure, see "II.C. Control Board Check."

<i>NOTICE</i>
<ul style="list-style-type: none">• Fragile, handle very carefully.• The control board contains integrated circuits, which are susceptible to failure due to static discharge. It is especially important to touch the metal part of the icemaker when handling or replacing the control board.• Do not touch the electronic devices on the control board or the back of the control board.• Do not change wiring and connections. Do not misconnect terminals.• Do not short out power supply to test for voltage.• Always replace the whole control board assembly if it goes bad.

A. Control Board Layout

"F-A" Control Board

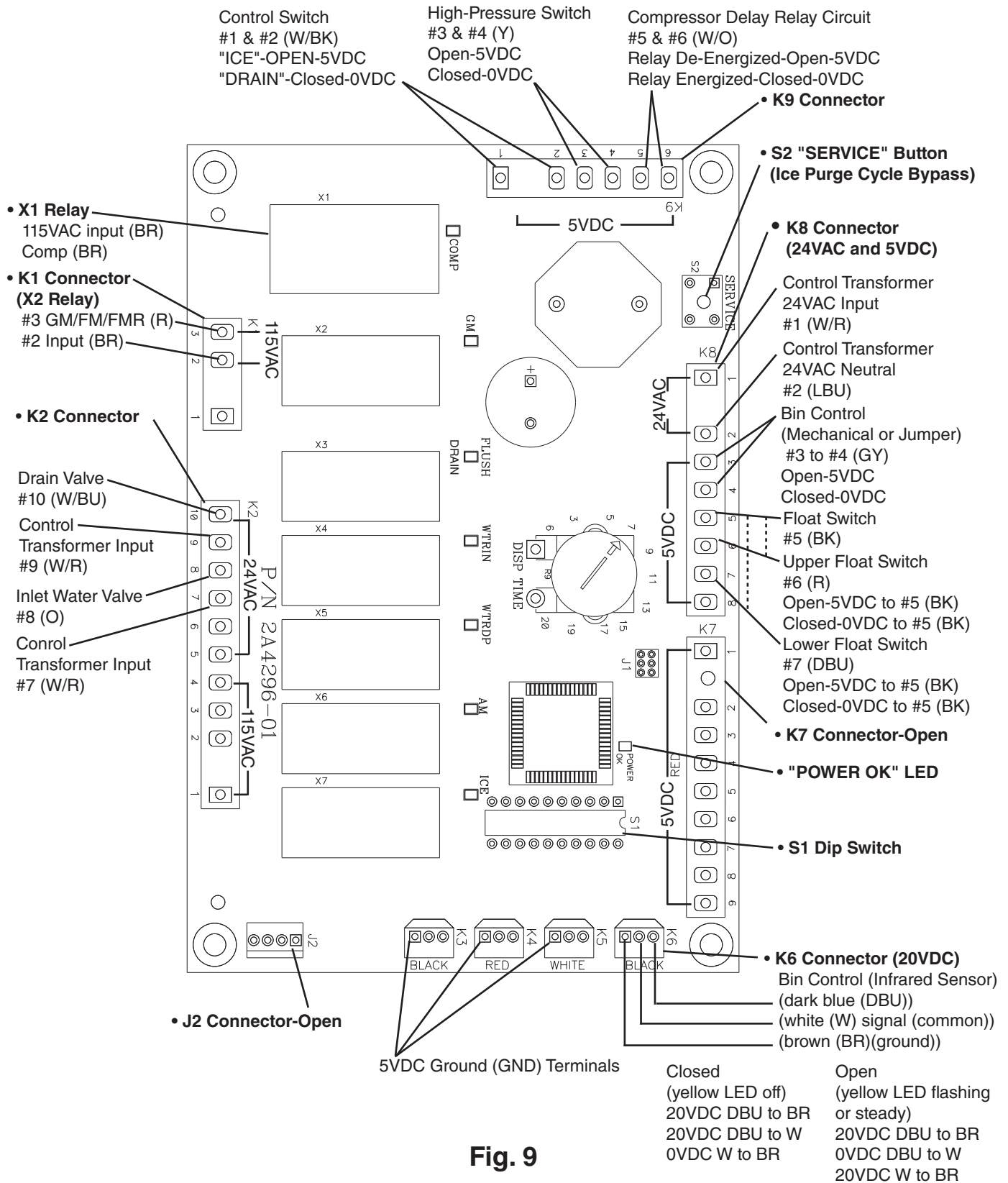


Fig. 9

B. LED Lights and Alarm Safeties

The "POWER OK" LED indicates proper control voltage and will remain on unless a control voltage problem occurs. For further details, see "II.B. Service Diagnosis."

Sequence Step	LED	Energized Components	Min.	Max.
Fill Cycle	WTRIN	WV	-	-
Ice Purge Cycle	GM	GM, FM/FMR	5 min.	5 min.
Freeze Cycle (with refill)	GM, WTRIN* (refill), COMP	GM, Comp, FM/FMR, WV* (refill)	-	*On until UF/S closes. Alarm sounds after 90 sec.
Drain Cycle	FLUSH (Drain)	DV	2 sec.	10 min.

The built-in alarm safeties shut down the unit.

No. of Beeps (every 5 sec.)	Type of Alarm	Reset Options
1	Low Water Safety UFS open > 90 seconds after WV energized.	Automatic reset once water supply is restored and UF/S closes.
2	Control Switch In "DRAIN" position longer than 15 minutes.	Automatic reset once the control switch is moved to the "ICE" position.
3	High-Pressure Switch First and second activation in 1 hour.	Automatic reset once pressure drops below the high-pressure threshold and the high-pressure switch closes.
4	High-Pressure Switch Third activation in 1 hour.	Call for service. To avoid possible catastrophic failure, it is recommended to leave the icemaker off until this alarm is resolved. Manual reset. Turn power off and on again.
5	Freeze Timer WV off > 30 minutes since last WV activation.	Manual reset. Turn power off and on again.
6	Low Voltage (92Vac \pm 5% or less)	"POWER OK" LED turns off if voltage protection operates.
7	High Voltage (147Vac \pm 5% or more)	The control voltage safeties automatically reset when voltage is corrected.
8	Gear Motor CDR contacts fail to close.	Manual reset. Turn power off and on again.
9	Bin Control: Mechanical Backup to Infrared Sensor (S1 dip switch 7). Not used this model.	Manual reset. Turn power off and on again.

Legend: **Comp**—compressor; **CDR**—compressor delay relay; **DV**—drain valve; **FM**—fan motor; **FMR**—fan motor-remote; **GM**—gear motor; **UFS**—float switch; **WV**—inlet water valve

C. Settings and Adjustments

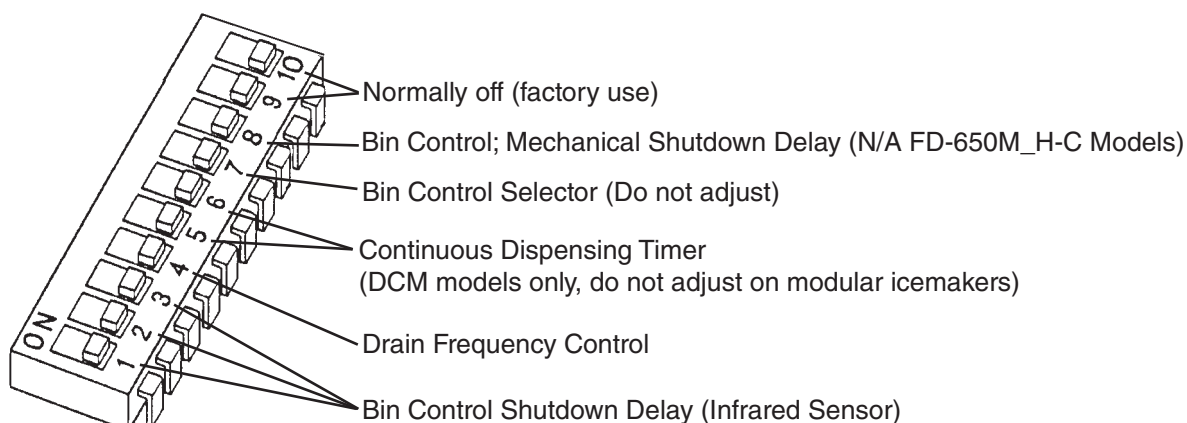
NOTICE

Dip switches are factory set. Failure to maintain factory settings may adversely affect performance and warranty coverage. For more information, contact your Hoshizaki Certified Service Representative.

1. Default Dip Switch Settings

The S1 dip switch settings are factory-set to the following positions:

Dip Switch No.	1	2	3	4	5	6	7	8	9	10
FD-650M_H(-C)	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF



2. Bin Control Shutdown Delay (infrared sensor) (S1 dip switch 1, 2, 3)

BC shutdown delay is the delay between the sensor detecting ice (yellow LED flashing or steady) and the start of the shutdown sequence. For dispenser unit applications, the ice level at shutoff may need to be adjusted depending on the dispenser agitation or dispense method. Increasing the shutdown delay setting allows for a higher level of ice in the bin before the icemaker shuts down. For a typical dispenser unit application, a 100-second shutdown delay is recommended. When used with a standard Hoshizaki ice storage bin, any shutdown delay setting is acceptable. **WARNING! Increasing the shutdown delay allows a higher level of ice in the dispenser unit/ice storage bin before shutdown. This could lead to icemaker movement or ice overflow.**

S1 Dip Switch Setting			Bin Control Shutdown Delay (infrared sensor)
No. 1	No. 2	No. 3	
OFF	OFF	OFF	0 Seconds
ON	OFF	OFF	100 Seconds (1.6 minutes) (Factory Default)
OFF	ON	OFF	1100 Seconds (18.3 minutes)
OFF	OFF	ON	1650 Seconds (27.5 minutes)
ON	ON	OFF	2200 Seconds (36.7 minutes)
OFF	ON	ON	0 Seconds
ON	ON	ON	0 Seconds

3. Drain Frequency Control (S1 dip switch 4)

This unit is factory set for optimum performance with the 1-in-1 drain cycle (S1 dip switch 4 in the "OFF" position). This setting allows for removal of sediment from the evaporator without interrupting the icemaking process. An optional 1-in-12 drain cycle is available.

S1 Dip Switch Setting	Drain Timer Interval	Drain Valve Open
No. 4		
OFF (1-in-1)	1 Hour	2 Seconds
ON (1-in-12)	11 Hours 45 Minutes	10 Minutes

4. Continuous Dispensing Timer (S1 dip switch 5 & 6)

DCM models only. The dispense mode switch on DCMs must be in the "CONTINUOUS" position for this setting to apply. The factory setting allows ice to be dispensed continuously as long as the dispense solenoid is activated.

S1 Dip Switch Setting		Dispense Time
No. 5	No. 6	
OFF	OFF	No Limit
ON	OFF	20 Seconds
OFF	ON	60 Seconds
ON	ON	No Limit

5. Bin Control Selector (S1 dip switch 7)

FD-650M_H-C is factory set for bin control infrared sensor operation. No adjustment is required. **WARNING! Do not place S1 dip switch 7 in the "OFF" position or the unit will not shut down by bin control.**

S1 Dip Switch Setting	Bin Control Application	Gear Motor Delay
No. 7		
OFF	Mechanical Bin Control (N/A for these models)	5 seconds
ON	Infrared Sensor	30 seconds

6. Bin Control Shutdown Delay (mechanical) (S1 dip switch 8)

N/A for FD-650M_H-C. Do not adjust.

S1 Dip Switch Setting	Bin Control Shutdown Delay (mechanical)
No. 8	
OFF	0.25 Seconds
ON	6.7 Seconds

7. Factory Use (S1 dip switch 9 & 10)

Factory set for optimum performance. Do not adjust.

D. Switches

The power switch and the control switch are used to control the icemaker. They are located on the control box.

1. Power Switch

The power switch has 2 positions: "OFF" and "ON."

2. Control Switch

The control switch has 2 positions: "ICE" and "DRAIN."

IV. Refrigeration Circuit and Component Service Information

WARNING

- This appliance should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- Move the power switch to the "OFF" position and turn off the power supply before servicing. Place the disconnect (if applicable) in the off position. Lockout/Tagout to prevent the power supply from being turned back on inadvertently. Power switch in "OFF" position does not de-energize all loads.
- **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after the appliance is serviced. Make sure that none have fallen into the dispenser unit/ice storage bin.
- Make sure all food zones in the icemaker and dispenser unit/ice storage bin are clean after service.

A. Refrigeration Circuit Service Information

WARNING

- Repairs requiring the refrigeration circuit to be opened must be performed by properly trained and EPA-certified service personnel.
- Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). Do not use R-404A as a mixture with pressurized air for leak testing.

NOTICE

- Always recover the refrigerant and store it in an approved container. Do not discharge the refrigerant into the atmosphere.
- Do not leave the system open for longer than 15 min. when replacing or servicing parts. The Polyol Ester (POE) oils used in R-404A applications can absorb moisture quickly. Therefore it is important to prevent moisture from entering the system when replacing or servicing parts.
- 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. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
- When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

1. Refrigerant Recovery

Using proper refrigerant practices, recover the refrigerant. Recover via the access valves. Store the refrigerant in an approved container. Do not discharge the refrigerant into the atmosphere.

2. Brazing

⚠ WARNING

- R-404A itself is not flammable at atmospheric pressure and temperatures up to 176°F (80°C).
- R-404A itself is not explosive or poisonous. However, when exposed to high temperatures (open flames), R-404A can be decomposed to form hydrofluoric acid and carbonyl fluoride both of which are hazardous.
- Do not use silver alloy or copper alloy containing arsenic.

- 1) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG.

NOTICE

- 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. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
- When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

- 2) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). Do not use R-404A as a mixture with pressurized air for leak testing.

3. Evacuation and Recharge (R-404A)

- 1) Attach a vacuum pump to the system. Be sure to connect the charging hoses to both high and low-side refrigerant access valves.

IMPORTANT

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

- 2) Turn on the vacuum pump, then open the gauge manifold valves. Never allow the oil in the vacuum pump to flow backwards.
- 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 gauge manifold.
- 5) Disconnect the gauge manifold hose from the vacuum pump and attach it to a refrigerant service cylinder. Remember to loosen the connection and purge the air from the hose. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge. For remote models, see the rating label inside the icemaker. Hoshizaki recommends only virgin refrigerant or reclaimed refrigerant which meets ARI Standard 700 (latest edition) be used.

- 6) A liquid charge is required when charging an R-404A system (to prevent fractionation). Place the service cylinder on the scales; if the service cylinder is not equipped with a dip tube, invert the service cylinder, then place it on the scales. Open the high-side valve on the gauge manifold.
- 7) Allow the system to charge with liquid until the proper charge weight is met.
- 8) If necessary, add any remaining charge to the system through the low-side.
NOTICE! To prevent compressor damage, use a throttling valve or liquid dispensing device to add the remaining liquid charge through the low-side refrigerant access valve with the icemaker running.
- 9) Close the high and low-side gauge manifold valves, then disconnect the gauge manifold hoses.
- 10) Cap the refrigerant access valves to prevent a possible leak.

B. Component Service Information

NOTICE

- When replacing a component listed below, see the notes to help ensure proper operation.
- When replacing evaporator assembly and water circuit components, make sure there are no water leaks after the repair is complete.
- Seal bolts must be replaced once removed because seal material is one-time use only. If new seal bolts do not have preapplied threadlocker, apply Loctite 243 or equivalent threadlocker to seal bolt threads. Tighten to the torque values listed below.

Torque for F-1001 and Smaller: 11.1 ft-lb/15 N·m

Torque for F-1500 and Larger: 25.8 ft-lb/35 N·m Tighten 2 times. Allow at least 5 sec. in between each tightening.

Component	Notes
Compressor	<ul style="list-style-type: none"> • Install a new drier, start capacitor, and start relay.
Upper and Lower Bearings	<ul style="list-style-type: none"> • Inspect the upper bearing for wear. See "IV.B.1. Upper Bearing Wear Check." Replace if necessary. • When replacing the upper bearing it is advised to also change the lower bearing at the same time.
Evaporator	<ul style="list-style-type: none"> • Install a new drier. • Inspect the mechanical seal and O-ring prior to installing the new evaporator. If worn, cracked, or scratched, the mechanical seal should also be replaced.
Gear Motor	<ul style="list-style-type: none"> • Install a new gear motor capacitor.

Evaporator Assembly

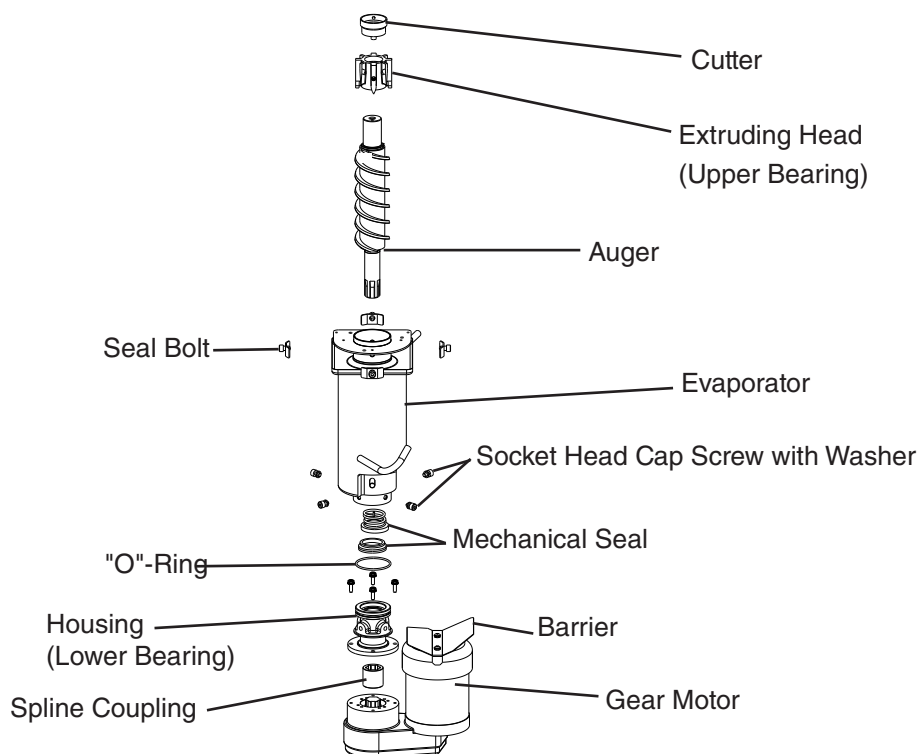


Fig. 10

1. Upper Bearing Wear Check

To ensure that the bearing inside the extruding head does not exceed the wear tolerance of .02", follow the instructions below. See Fig. 11.

- 1) Turn off the power supply.
- 2) Remove the front and top panels.
- 3) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 4) Remove the cutter from the auger.
- 5) Grasp the top of the auger and move the auger towards you and then try to insert a .02" round stock or pin gauge in between the back side of the auger shaft and the bearing surface. Check several locations around the auger shaft. If the gauge goes between the shaft and the bearing at any point or if the bearing is scratched or cracked, both the top bearing in the extruding head and the lower bearing in the housing should be replaced. Instructions for removing the extruding head and housing are located later in this procedure.

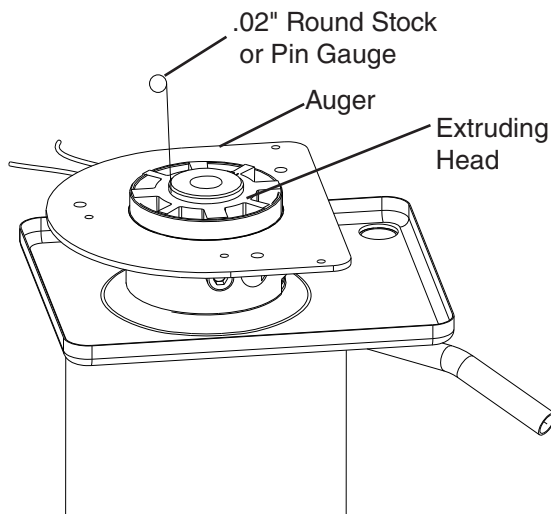


Fig. 11

Note: Replacing the bearing requires a bearing press adaptor. If one is not available, replace the whole extruding head and housing.

- 6) Replace the cutter and spout in their correct positions.
- 7) Replace the panels in their correct positions.
- 8) Turn on the power supply.

2. Removal and Replacement of Extruding Head

- 1) Remove the front and top panels.
- 2) Move the control switch to the "DRAIN" position and drain the water from the evaporator. After the water has drained, move the power switch to the "OFF" position, then turn off the power supply.
- 3) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 4) Remove the cutter.
- 5) Remove the extruding head seal bolts and discard. **NOTICE! The seal bolts are not reusable. New seal bolts must be used.**
- 6) Lift off the extruding head.
- 7) Place the new extruding head in place and tighten down with new seal bolts.
- 8) Replace the cutter and spout in their correct positions.
- 9) Move the power switch to the "ON" position.
- 10) Replace the panels in their correct positions, then turn on the power supply to start the automatic icemaking process.

3. Removal and Replacement of Auger

- 1) Remove the front and top panels.
- 2) Move the control switch to the "DRAIN" position and drain the water from the evaporator. After the water has drained, move the power switch to the "OFF" position, then turn off the power supply.
- 3) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 4) Loosen the cutter. Do not remove at this time.
- 5) Remove the extruding head seal bolts and discard. **NOTICE! The seal bolts are not reusable. New seal bolts must be used.**
- 6) Using the cutter, lift out the auger assembly.
- 7) Remove the cutter, extruding head, and upper part of the mechanical seal from the auger and place on the new auger. **NOTICE! To help prevent water leaks, be careful not to damage the surfaces of the O-ring or mechanical seal.**
- 8) Install the new auger assembly with the upper part of the mechanical seal attached. Secure the auger assembly using new seal bolts.
- 9) Replace the spout and strap in their correct positions.
- 10) Move the control switch to the "ICE" position and the power switch to the "ON" position.
- 11) Turn on the power supply to start the automatic icemaking process.
- 12) Check for water leaks.
- 13) If no water leaks are detected, replace the panels in their correct positions.

4. Removal and Replacement of Evaporator

NOTICE
<ul style="list-style-type: none">• 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.• Install the new drier with the arrow on the drier in the direction of the refrigerant flow.• When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

- 1) Remove the front and top panels.
- 2) Move the control switch to the "DRAIN" position and drain the water from the evaporator. After the water has drained, move the power switch to the "OFF" position, then turn off the power supply.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 5) Disconnect the water hoses.
- 6) Remove the seal bolts securing the extruding head. Using the cutter, lift out the auger assembly. **NOTICE! The seal bolts are not reusable. New seal bolts must be used.**

- 7) Remove the insulation and the thermostatic expansion valve bulb on the suction line.
- 8) Disconnect the inlet and outlet tubing.
- 9) Remove the allen head cap screws securing the evaporator to the lower housing.
- 10) Lift off the evaporator.
- 11) Inspect the mechanical seal and O-ring prior to installing the new evaporator. The mechanical seal consists of two parts. One moves along with the auger, and the other is fixed on the lower housing. **NOTICE! If the contact surfaces of these two parts are worn, cracked, or scratched, the mechanical seal may cause water leaks and should be replaced.** Instructions for removing the mechanical seal and lower housing are located later in this procedure.
- 12) Make sure the lower mechanical seal is in place, then place the evaporator in position. Secure the evaporator to the lower housing using the allen head cap screws.
- 13) Remove the drier, then place the new drier in position.
- 14) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG.
- 15) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). DO NOT use R-404A as a mixture with pressurized air for leak testing.
- 16) Evacuate the system, and charge it with refrigerant. For air-cooled and water-cooled models, see the nameplate for the required refrigerant charge. For remote models, see the rating label inside the icemaker.
- 17) Install the auger assembly with the upper part of the mechanical seal attached. Secure the auger assembly using new seal bolts.
- 18) Reconnect the water hoses, spout, and strap.
- 19) Move the control switch to the "ICE" position and the power switch to the "ON" position.
- 20) Turn on the power supply to start the automatic icemaking process.
- 21) Check for water leaks.
- 22) If no water leaks are detected, replace the panels in their correct positions.

5. Removal and Replacement of Mechanical Seal and Lower Housing

5a. Mechanical Seal

- 1) Remove the front and top panels.
- 2) Move the control switch to the "DRAIN" position and drain the water from the evaporator. After the water has drained, move the power switch to the "OFF" position, then turn off the power supply.
- 3) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 4) Loosen the cutter. Do not remove at this time.
- 5) Remove the extruding head seal bolts and discard. **NOTICE! The seal bolts are not reusable. New seal bolts must be used.**
- 6) Using the cutter, lift out the auger assembly.
- 7) The mechanical seal consists of two parts. One moves along with the auger, and the other is fixed on the lower housing. **NOTICE! If the contact surfaces of these two parts are worn, cracked, or scratched, the mechanical seal may cause water leaks and should be replaced.**
- 8) Remove the allen head cap screws securing the evaporator to the lower housing.
- 9) Raise the evaporator up to access the lower housing.
- 10) Remove the mechanical seal from the housing. If only replacing the mechanical seal, proceed to step 12. **NOTICE! To help prevent water leaks, be careful not to damage the surfaces of the O-ring or mechanical seal.**

5b. Lower Housing

- 11) Remove the O-ring and the bolts securing the housing to the gear motor and remove the housing from the gear motor. If inspection of the upper bearing inside the extruding head (see "IV.B.1. Upper Bearing Wear Check") indicates that it is out of tolerance, replace both it and the bearing inside the lower housing.
Note: Replacing the bearing requires a bearing press adaptor. If one is not available, replace the whole extruding head and housing.
- 12) Install the O-ring and mount the lower housing on the gear motor.
- 13) Install the lower part of the mechanical seal on the lower housing.
- 14) Lower the evaporator down and secure it to the lower housing.
- 15) Install the auger assembly with the upper part of the mechanical seal attached. Secure the auger assembly using new seal bolts.
- 16) Replace the spout and strap in their correct positions.
- 17) Move the control switch to the "ICE" position, then move the power switch to the "ON" position.
- 18) Turn on the power supply to start the automatic icemaking process.
- 19) Check for water leaks.
- 20) If no water leaks are detected, replace the panels in their correct positions.

6. Removal and Replacement of Gear Motor

NOTICE! Hoshizaki recommends that the gear motor capacitor be replaced at the same time as the gear motor.

- 1) Remove the front and top panels.
- 2) Move the control switch to the "DRAIN" position and drain the water from the evaporator. After the water has drained, move the power switch to the "OFF" position, then turn off the power supply.
- 3) Remove the strap connecting the spout to the chute assembly, then remove the spout.
- 4) Remove the bolts securing the lower housing to the gear motor. Lift the evaporator up slightly.
- 5) Remove the bolts securing the gear motor.
- 6) Disconnect the gear motor wiring, then remove the gear motor.
- 7) Remove the spline coupling from the old gear motor and attach to the new gear motor.
- 8) Install the new gear motor and connect the electrical wires.
- 9) Lower the evaporator down and secure it to the gear motor.
- 10) Replace the spout and strap in their correct positions.
- 11) Move the control switch to the "ICE" position, then move the power switch to the "ON" position.
- 12) Turn on the power supply to start the automatic icemaking process.
- 13) Check for water leaks.
- 14) If no water leaks are detected, replace the panels in their correct positions.

V. Maintenance

The maintenance schedule below is a guideline. More frequent maintenance may be required depending on water quality, the appliance's environment, and local sanitation regulations.

WARNING

- Only qualified service technicians should service the appliance.
- To reduce the risk of electric shock, do not touch the icemaker power switch or control switch with damp hands.
- **Before Servicing:** Move the icemaker's power switch to the "OFF" position. Turn off the power supply. Place the disconnect (if applicable) in the off position. Lockout/Tagout to prevent the power supply from being turned back on inadvertently.
- **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after any maintenance is done to the appliance. Make sure that none have fallen into the dispenser unit/ice storage bin.
- Do not place fingers or any other objects into the ice discharge opening.

Maintenance Schedule		
Frequency	Area	Task
Daily	Scoop	Clean the ice scoop using a neutral cleaner. Rinse thoroughly after cleaning.
Bi-Weekly	Air Filters	Inspect. Wash with warm water and neutral cleaner if dirty.
Monthly	External Water Filters	Check for proper pressure and change if necessary.
	Icemaker Exterior	Wipe down with a clean, soft cloth. Use a damp cloth containing a neutral cleaner to wipe off oil or dirt build up. Clean any chlorine staining (rust colored spots) using a non-abrasive cleanser.
	Infrared Sensor Lens; Underside of Icemaker and Top Kits; Bin Door and Snout	Wipe down with a clean cloth and warm water.

Maintenance Schedule (continued)		
Every 6 Months	Icemaker and Dispenser Unit/Ice Storage Bin	Clean and sanitize per the cleaning and sanitizing instructions provided in the instruction manual or maintenance label on the icemaker.
	Evaporator Condensate Drain Pan and Gear Motor Drain Pan	Wipe down with a clean cloth and warm water. Slowly pour one cup of sanitizing solution (prepare as outlined in the sanitizing instructions in this manual) into the evaporator condensate drain pan and then slowly pour one cup into the gear motor drain pan. Be careful not to overflow the pans. Repeat with a cup of clean water to rinse.
	Icemaker and Dispenser Unit/Ice Storage Bin Drains	Check to make sure they are clear.
	Extruding Head Seal Bolts	Inspect for leakage around seal bolts. Tighten (see torque values below) or replace as necessary. Seal bolts must be replaced once removed because seal material is one-time use only. If new seal bolts do not have preapplied threadlocker, apply Loctite 243 or equivalent threadlocker to seal bolt threads. <ul style="list-style-type: none"> • <i>Torque for F-1001 and Smaller:</i> 11.1 ft-lb/15 N·m • <i>Torque for F-1500 and Larger:</i> 25.8 ft-lb/35 N·m Tighten 2 times. Allow at least 5 sec. in between each tightening.
Yearly	Inlet Water Valve and Drain Valve	Close the water supply line shut-off valve and drain the water system. Clean the inlet water valve screen and clean and inspect the drain valve.
	Water Hoses	Inspect the water hoses and clean/replace if necessary.
	Condenser	Inspect. Clean if necessary by using a brush or vacuum cleaner.
	Icemaker	Inspect for oil spots, loose components, fasteners, and wires.
	Upper Bearing (extruding head)	Check for wear using .02" round stock or pin gauge. Replace both upper bearing and lower bearing if wear exceeds factory recommendations. See the Service Manual for details.
After 3 Years, then Yearly	Upper Bearing (extruding head); Lower Bearing and O-Ring (lower housing); Mechanical Seal; Evaporator Cylinder; Auger	Inspect. Replace both upper bearing and lower bearing if wear exceeds factory recommendations. Replace the mechanical seal if the seal's contact surfaces are worn, cracked, or scratched. See the Service Manual for details.

VI. Preparing the Icemaker for Periods of Non-Use

<i>NOTICE</i>

When storing the icemaker for an extended time or in sub-freezing temperatures, follow the instructions below to prevent damage.
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When the icemaker is not used for two or three days under normal conditions, it is sufficient to only move the power switch to the "OFF" position. When storing the appliance for extended time or in sub-freezing temperatures, follow the instructions below.

1. Remove the water from the icemaker water supply line:

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

2. Drain the evaporator:

- 1) Turn off the power supply, then remove the front panel.
- 2) Move the control switch to the "DRAIN" position, then replace the front panel in its correct position.
- 3) Turn on the power supply and allow the water system to drain for 5 minutes.
- 4) Turn off the power supply, then remove the front panel. Move the power switch to the "OFF" position.
- 5) Remove the evaporator drain line hose from the evaporator and attach a compressed air or carbon dioxide supply to the hose.
- 6) Turn on the power supply, then move the power switch to the "ON" position. Blow out the evaporator drain line using the compressed air or carbon dioxide supply until water stops coming out.
- 7) Move the power switch to the "OFF" position, then turn off the power supply. Reconnect the evaporator drain line hose.
- 8) Move the control switch to the "ICE" position. Replace the front panel in its correct position.
- 9) Remove all ice from the dispenser unit/ice storage bin. Clean the dispenser unit/ice storage bin liner using a neutral cleaner. Rinse thoroughly after cleaning.

3. On water-cooled models, remove the water from the water-cooled condenser:

- 1) Make sure the power supply is off, then remove the front, top, and right side panels.
- 2) Close the condenser water supply line shut-off valve. If connected to a closed loop system, also close the condenser return line shut-off valve.
- 3) Open the condenser water supply line drain valve. If connected to a closed loop system, also open the condenser return line drain valve.
- 4) Attach a compressed air or carbon dioxide supply to the condenser water supply line drain valve.
- 5) Open the water regulating valve by using a screwdriver to pry up on the spring retainer underneath the spring. While holding the valve open, blow out the condenser using the compressed air or carbon dioxide supply until water stops coming out.
- 6) Close the drain valve(s).
- 7) Replace the panels in their correct positions.

VII. Disposal

The appliance contains refrigerant and must be disposed of in accordance with applicable national, state, and local codes and regulations. Refrigerant must be recovered by properly certified service personnel.

VIII. Technical Information

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

A. Specification and Performance Data

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

1. FD-650MAH-C (air-cooled)

Specification Sheet

AC SUPPLY VOLTAGE	115/60/1						
COMPRESSOR	115V	7.9 RLA	54.5 LRA				
GEAR MOTOR	120 V	2.3 FLA	1/4 HP				
FAN MOTOR	115 V	1.0 FLA	1/15 HP				
OTHER	115V	0.03A					
MAXIMUM FUSE SIZE	20 A						
MAX. HACR BREAKER (USA ONLY)	20 A						
MAX. CIRC. BREAKER (CANADA ONLY)	20 A						
MINIMUM CIRCUIT AMPACITY	20 A						
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day)	Ambient Temp.(°F)	WATER TEMP. (°F)					
Reference without *marks		50		70		90	
	70	*650	*(295)	627	(284)	593	(269)
	80	576	(261)	523	(237)	490	(222)
	90	490	(222)	*474	*(215)	439	(199)
	100	423	(192)	418	(189)	*380	*(172)
SHAPE OF ICE	Cubelet						
ICE QUALITY	Approx. 86%, Ice (90/70°F, Conductivity 200 µs/cm)						
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F					
ELECTRIC W (kWH/100 lbs.)	1036	(5.35)	971	(3.64)			
POTABLE WATER	57	(12.0)	78	(12.0)			
gal./24HR (gal./100 lbs.)							

Performance Data Sheet

APPROXIMATE ICE PRODUCTION PER 24 HR.	Ambient Temp. (°F)	Water Temp. °F (°C)					
		50 (10)		70 (21)		90 (32)	
lbs./day (kg/day)	70 (21)	*650	*(295)	627	(284)	593	(269)
	80 (26)	576	(261)	523	(237)	490	(222)
	90 (32)	490	(222)	*474	*(215)	439	(199)
	100 (38)	423	(192)	418	(189)	*380	*(172)
APPROXIMATE ELECTRIC CONSUMPTION	70 (21)	*971	--	980	--	990	--
	80 (26)	999	--	1008	--	1017	--
	90 (32)	1027	--	*1036	--	1047	--
watts	100 (38)	1057	--	1068	--	*1078	--
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70 (21)	*78	*(295)	75	(284)	71	(269)
	80 (26)	69	(261)	63	(237)	59	(222)
	90 (32)	59	(222)	*57	*(215)	53	(199)
gal./day (l/day)	100 (38)	51	(192)	50	(189)	*46	*(172)
EVAPORATOR OUTLET TEMP.	70 (21)	*19	*(-7)	19	(-7)	19	(-7)
	80 (26)	19	(-7)	23	(-5)	23	(-5)
	90 (32)	23	(-5)	*23	*(-5)	25	(-4)
°F (°C)	100 (38)	25	(-4)	25	(-4)	*25	*(-4)
HEAD PRESSURE	70 (21)	*250	*(17.6)	263	(18.5)	273	(19.2)
	80 (26)	282	(19.8)	291	(20.4)	300	(21.1)
	90 (32)	310	(21.8)	*319	*(22.4)	327	(23)
PSIG (kg/cm²G)	100 (38)	337	(23.7)	348	(24.5)	*358	*(25.2)
SUCTION PRESSURE	70 (21)	*41	*(2.9)	41	(2.9)	41	(2.9)
	80 (26)	43	(3)	43	(3)	43	(3)
	90 (32)	45	(3.2)	*45	*(3.2)	46	(3.2)
PSIG (kg/cm²G)	100 (38)	47	(3.3)	47	(3.3)	*47	*(3.3)
TOTAL HEAT OF REJECTION	6800 BTU/h (AT 90°F /WT 70°F)						

2. FD-650MWH-C (water-cooled)

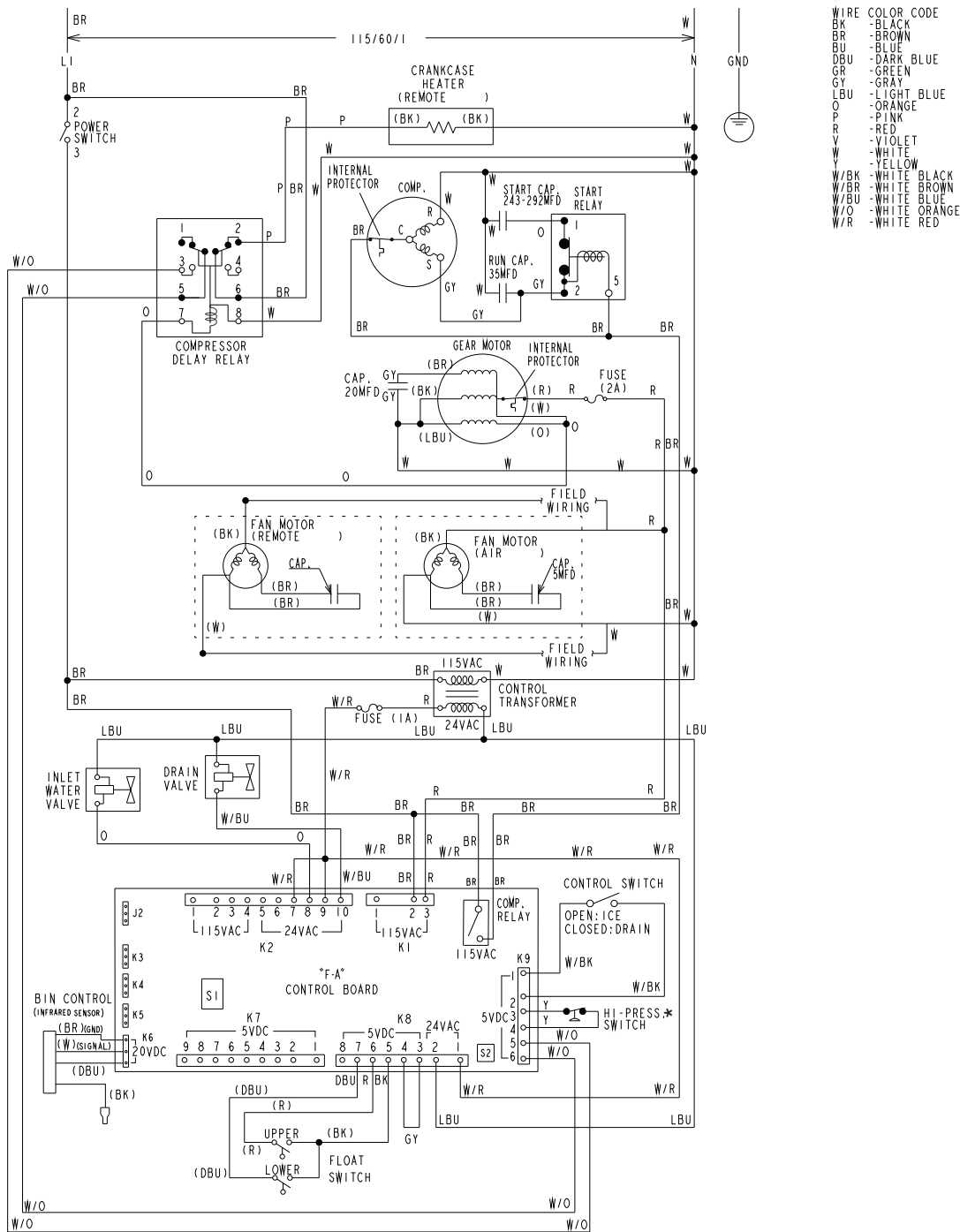
AWAITING DATA

3. FD-650MRH-C (remote air-cooled)

AWAITING DATA

B. Wiring Diagrams

FD-650MAH-C, FD-650MWH-C, FD-650MRH-C



SI DIP SWITCH SETTING	1	2	3	4	5	6	7	8	9	10
FD-650M_H-C	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF

* High Pressure Switch		
	Air-Cooled and Remote Models	Water-Cooled Models
Cut-out	412± ²¹ ₀ PSIG	384± ²¹ ₀ PSIG
Cut-in	327±21 PSIG	284±21 PSIG