

# Hoshizaki America, Inc.

## Self-Contained Flaker

Models

F-330BAH(-C)



“A Superior Degree  
of Reliability”

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

## SERVICE MANUAL



Number: 73151  
Issued: 8-2-2007  
Revised: 4-22-2013

**⚠ 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](http://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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**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 serviced. 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 this 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.
- To reduce the risk of electric shock, do not touch the appliance power switch or plug with damp hands.
- Make sure the appliance power switch is in the "OFF" position before plugging in or unplugging the appliance.
- Before servicing, move the power switch to the "OFF" position. Unplug the appliance from the electrical outlet.
- The appliance 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 fuses, damage to existing wiring, or component failure. This could lead to heat generation or fire.
- **THE APPLIANCE MUST BE GROUNDED.** The appliance is equipped with a NEMA 5-15 three-prong grounding plug  to reduce the risk of potential shock hazards. It must be plugged into a properly grounded, independent 3-prong wall outlet. If the outlet is a 2-prong outlet, it is your personal responsibility to have a qualified electrician replace it with a properly grounded, independent 3-prong wall outlet. Do not remove the ground prong from the power cord and do not use an adapter plug. Failure to properly ground the appliance could result in death or serious injury.
- Do not make any alterations to the appliance. Alterations could result in electric shock, injury, fire, or damage to the appliance.

**⚠ WARNING, continued**

- Do not use an extension cord.
- Do not use an appliance with a damaged power cord. The power cord should not be altered, jerked, bundled, weighed down, pinched, or tangled. Such actions could result in electric shock or fire. To unplug the appliance, be sure to pull the plug, not the cord, and do not jerk the cord.
- The GREEN ground wire in the factory-installed power cord is connected to the appliance. If it becomes necessary to remove or replace the power cord, be sure to connect the power cord's ground wire.
- Do not place fingers or any other objects into the ice discharge opening.
- 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 this 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.

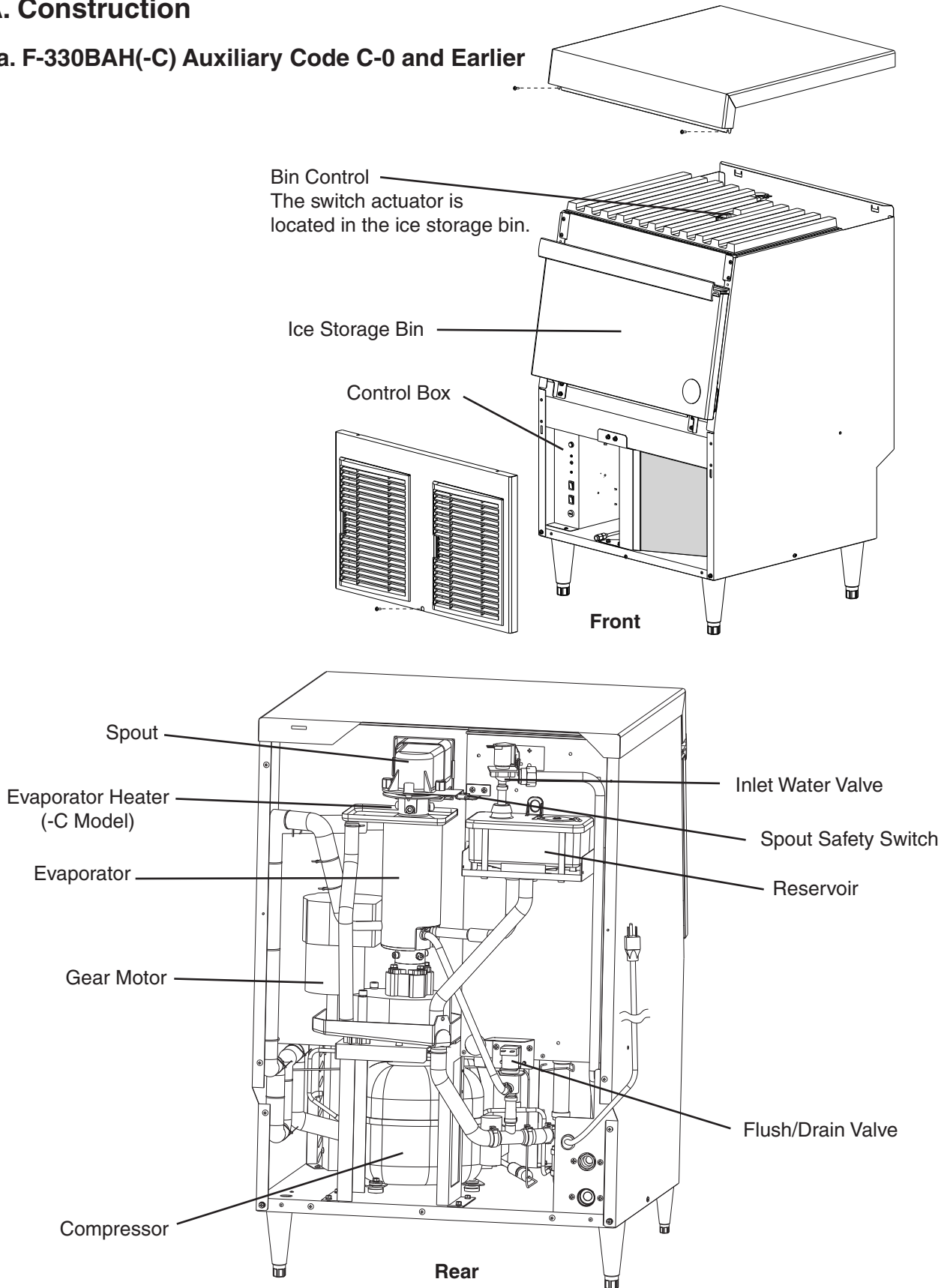
**NOTICE**

- 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 appliance on during extended periods of non-use, extended absences, or in sub-freezing temperatures. To properly prepare the appliance for these occasions, follow the instructions in "VI.C. Preparing the Appliance for Periods of Non-Use."
- Do not place objects on top of the appliance.
- The ice storage bin is for ice use only. Do not store anything else in the ice storage bin.

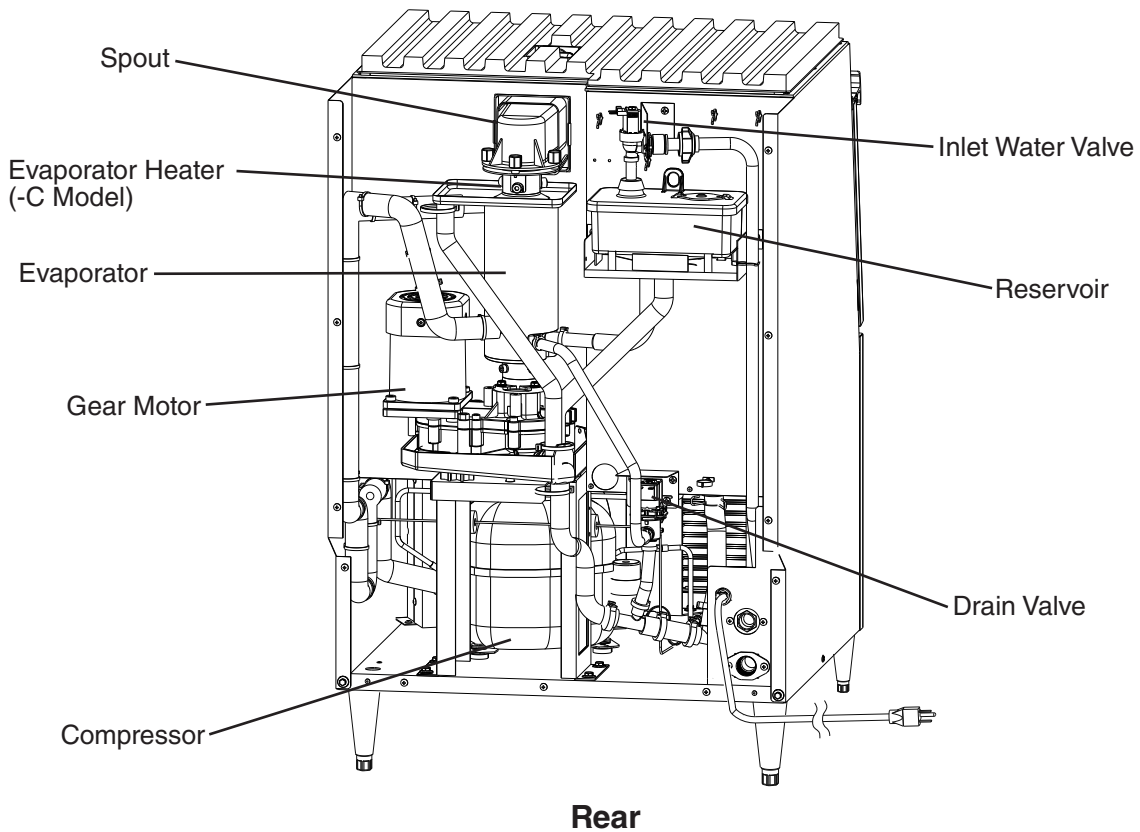
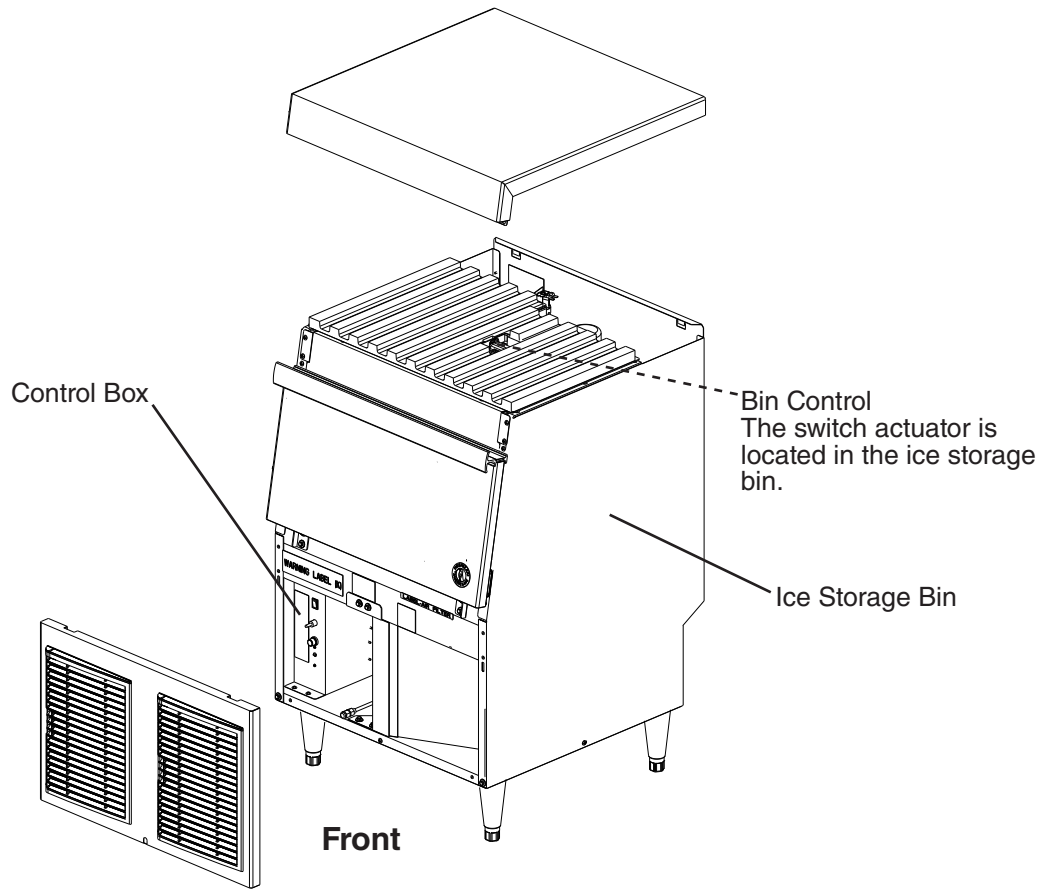
# I. Construction and Water/Refrigeration Circuit Diagram

## A. Construction

### 1a. F-330BAH(-C) Auxiliary Code C-0 and Earlier



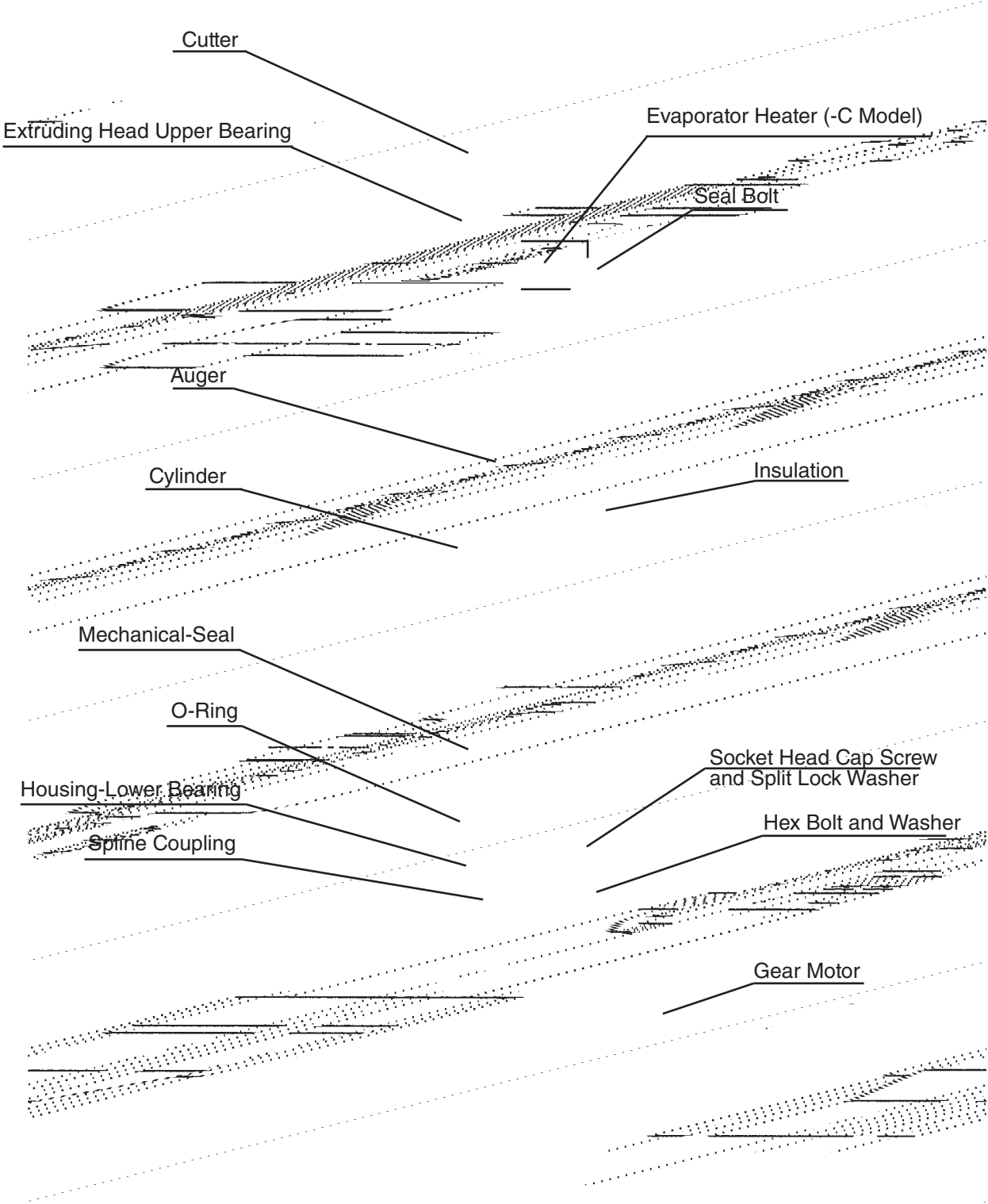
# 1b. F-330BAH(-C) Auxiliary Code C-1 and Later



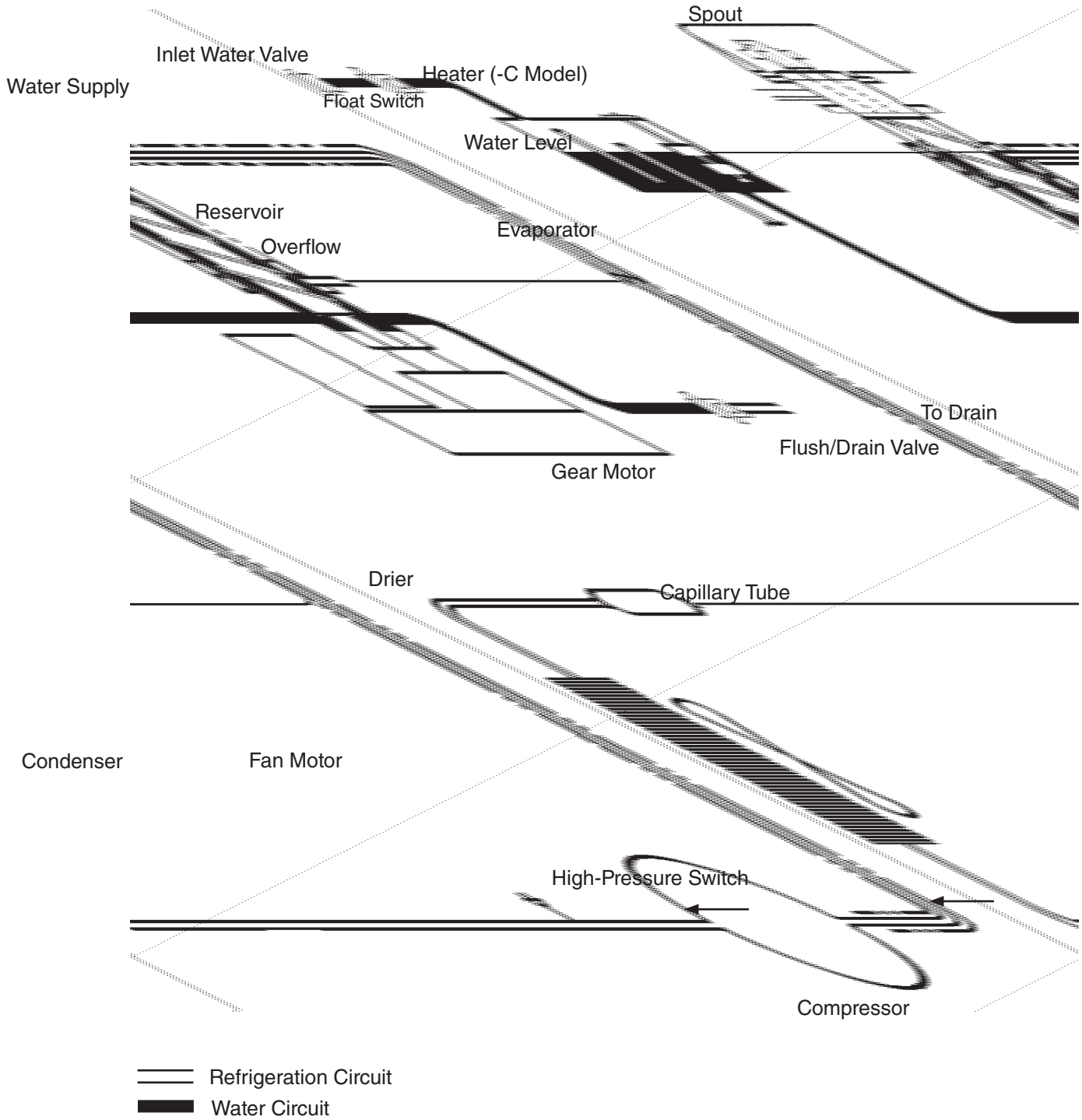


# B. Ice Making Appliance

## 1. F-330BAH(-C)



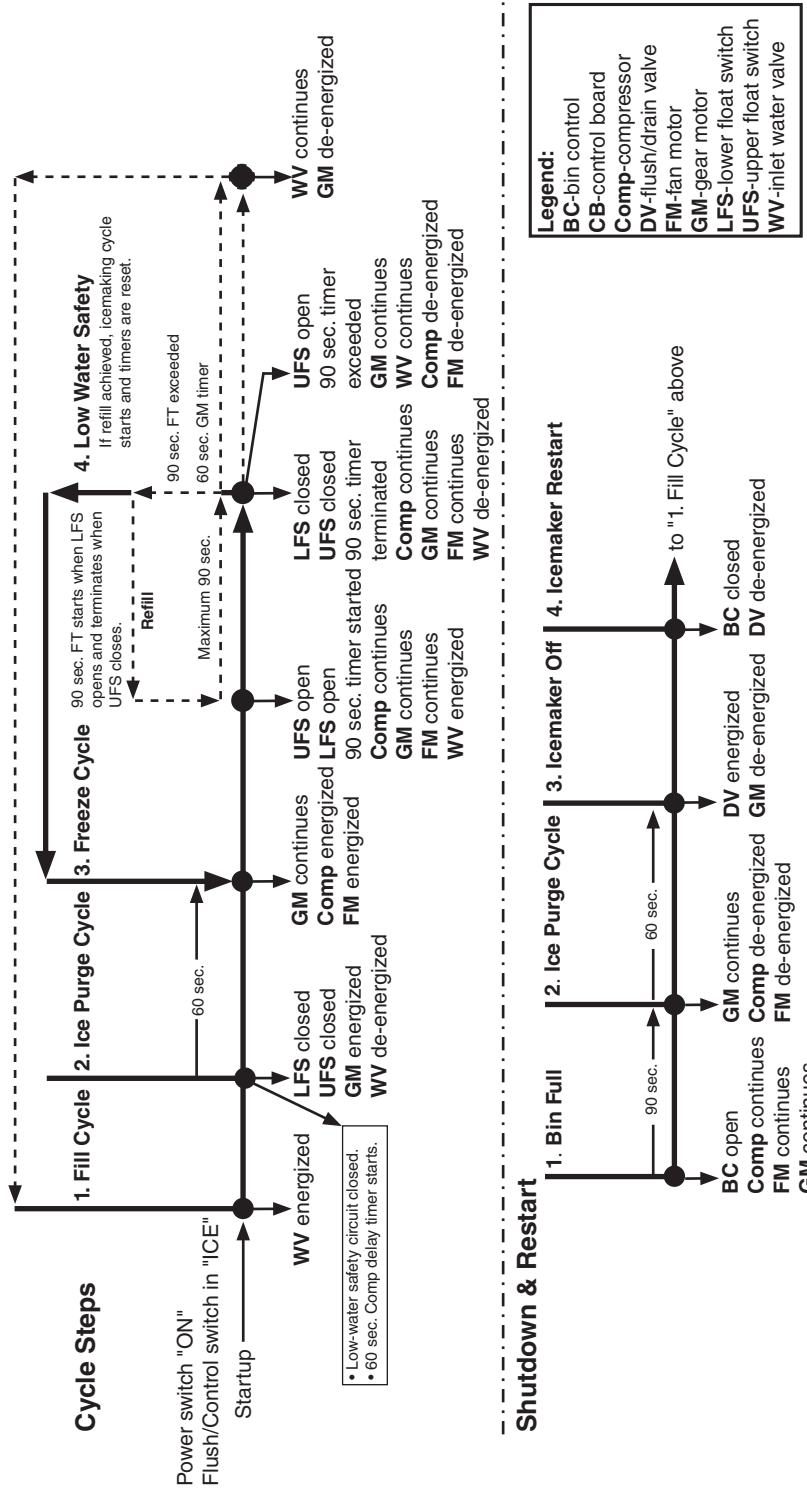
# C. Water/Refrigeration Circuit Diagram



## II. Sequence of Operation and Service Diagnosis

### A. Sequence of Operation Flow Chart

#### F-330BAH(-C) Sequence Flow Chart



**Flush/Control Switch in the "FLUSH" or "DRAIN" Position**  
When the flush/control switch is in the "FLUSH" or "DRAIN" position, 24VAC is supplied to the flush/drain valve through the X3 and X5 relays for C-0 and earlier and X10 and X12 relays for C-1 and later.

**Bin Control Switch Open**  
When the bin control opens and the icemaker shuts down, the flush/drain valve energizes continuously through the X3 and X5 relays for C-0 and earlier and X10 and X12 relays for C-1 and later.

## 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.
- Moving parts (e.g., fan blade or auger) 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 ice storage bin.
- Make sure all food zones in the icemaker and 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 to the performance data charts found in "VIII.B. Performance Data Sheet."

### 2a. Diagnostic Procedure Auxiliary Code C-0 and Earlier

This diagnostic procedure is a sequence check that allows you to diagnose the electrical system and components. Before proceeding, check for correct installation, adequate water supply (minimum of 10 PSIG, maximum of 113 PSIG), and proper voltage per appliance nameplate. Check that the 24VAC 1A fuse is good, safety switch is open, and GM external protector is closed. When checking for high-voltage (115VAC), always choose a white (W) neutral wire to establish a good neutral connection. When checking for low-voltage (secondary) (24VAC), always choose a light blue (LBU) neutral wire to establish a good neutral connection.

Note: • DV energizes when BC opens.

- On -C model, EH energizes when X12 relay energizes.

- 1) Confirm the appliance is plugged into the electrical outlet, supply voltage is correct per nameplate.
- 2) Remove the front panel.
- 3) Confirm the power switch is in the "ON" position, then move the flush switch to the "FLUSH" position. **DV Diagnosis:** If DV does not energize, check for 24VAC at X6 relay #5 (BK) to neutral (LBU) and at X6 relay #1 (W/O) to neutral (LBU). If 24VAC is present at #5 (BK) and not at #1 (W/O), X6 relay is energized (safety switch closed) or contacts sticking. Replace as needed. If 24VAC is present at X6 relay #1 (W/O) and DV does not energize, check for 24VAC at X5 relay #6 (W/O) to neutral (LBU). If 24VAC is not present, X5 relay is energized or contacts are sticking. Replace as needed. If 24VAC is present, check DV coil continuity. If open, replace DV.

- 4) **Startup/Fill Cycle**—Move any ice away from the BC actuator paddle (located at the top of the bin). Move the flush switch to the "ICE" position. X5 relay and WV energize. Reservoir fills, LFS closes, nothing happens at this time. The reservoir continues to fill. **X5 Relay Diagnosis:** Check that WV energizes and fills the reservoir. If not, confirm BC is closed. See "II.D. Bin Control Check." Confirm flush switch is in the "ICE" position and switch is closed. Next, check for 24VAC at X5 #7 (V) to X5 relay #8 (LBU). If 24VAC is present, check for 24VAC at X5 relay #5 (W/R) to neutral (LBU) and at #3 (R) to neutral (LBU). If 24VAC is present at #5 (W/R) and not at #3 (R), replace X5 relay. If 24VAC is present at X5 relay #3 (R), check X4 relay. **X4 Relay Diagnosis:** Check for 24VAC at X4 relay #5 (R) to neutral (LBU) and at #1 (O) to neutral (LBU). If 24VAC is present at X11 relay #5 (R) and not at #1 (O), confirm X4 relay is de-energized. If X4 relay is energized, check for sticking UFS. See "II.E. Float Switch Check and Cleaning." If X4 relay is de-energized, replace X4 relay. **WV Diagnosis:** If 24VAC is present at X4 #1 (O), check WV coil continuity. If open, replace WV.
- 5) **Ice Purge Cycle**—UFS closes, X4 relay energizes, WV de-energizes, and low-water safety circuit (CB #3 and #4) closes. GM and X3 relay energize, 60 sec. Comp delay timer starts. If HPS is open, CB does not get 24VAC control voltage and 35VDC supply is not present for low-water safety circuit. **HPS Diagnosis:** If HPS is open, check that the condenser air filter and coil are not clogged or restricted. Check that there are no restrictions in the refrigeration circuit (capillary tube or drier). Let refrigeration circuit pressures equalize. If HPS does not reset and pressures are equalized, replace HPS. If pressures are not equalized, reclaim refrigerant and diagnose refrigeration circuit restriction. **X4 Relay Diagnosis:** Check for 35VDC at X4 relay #4 (DBU) to #6 (BR). If 35VDC is present, X4 relay is de-energized or bad. Replace as necessary. If 0VDC is present, GM energizes. **GM Diagnosis:** If GM does not energize and 0VDC is read at CB #3 (BR) to CB #4 (DBU), check for 115VAC at CB #7 (BR) to neutral (W) and CB #8 (W/BR) to neutral (W). If 115VAC is present on CB #7 (BR) and not on CB #8 (W/BR), replace CB. If 115VAC is present on CB #8 (W/BR), check GM external protector and GM winding. If GM starts but the auger does not turn, check coupling between auger and GM. **X3 Relay Diagnosis:** X3 relay energizes and starts 60 sec. Comp delay timer in CB (CB #10 (W/BK) and #11 (W/O)). After 60 sec. timer terminates, confirm Comp energizes. If not, check for 115VAC at X3 relay #7 (R) to X3 relay #8 (W). If 115VAC is not present, check GM external protector and GM winding. If 115VAC is present, check for 35VDC at X3 relay #4 (W/O) to X3 relay #6 (W/BK). If 35VDC is present, replace X3 relay. If 0VDC is present and Comp does not energize, replace CB. See "II.C. Control Board Check."
- 6) **Freeze Cycle**—GM and X3 relay continue. Comp and FM energize. X4 relay energizes and de-energizes as needed through LFS/UFS. Ice production begins 4 to 6 minutes after Comp and FM start depending on ambient and water conditions. **Diagnosis:** Check that Comp and FM energize. If not, check for 115VAC at CB X2 relay #4 (BR) to neutral (W) and CB X2 relay #3 (O) to neutral (W). If 115VAC is present at CB X2 relay #4 (BR) and not at CB X2 relay #3 (O), replace CB. If 115VAC is present at CB X2 relay #3 (O) and Comp and FM do not energize, for Comp check Comp winding, start capacitor, and start relay. For FM, check FM windings and fan blade for binding.

7) **Refill/Low-Water Safety Cycle**—As ice is produced, water level in the reservoir drops. UFS opens, nothing happens at this time. LFS opens and refill begins. X4 relay de-energizes, low water safety circuit opens (X4 relay #4 (DBU) and #6 (BR), and CB #3 (BR) and #4 (DBU)), CB 90 sec. low-water safety timer starts. WV energizes. Comp, FM, GM, and X3 relay continue. UFS must close before 90 sec. low-water safety timer terminates. Otherwise, shutdown cycle is initiated. Once UFS closes, X4 relay energizes, WV de-energizes, and low-water safety circuit closes, terminating 90 sec. low-water safety timer.

**Diagnosis** – Check that WV energizes. If not, confirm LFS status (open), X4 relay de-energized. If not, see step 5 above.

8) **Shutdown**—Ice fills ice storage bin and presses BC actuator to open BC. Comp, FM, GM, and X3 relay continue. X5 relay and X4 relay de-energize. 90 sec. low-water safety timer starts. When 90 sec. low-water safety timer terminates, Comp and FM de-energize. GM and X3 relay continue. 60 sec. GM delay timer starts. Once 60 sec. GM delay timer terminates, GM and X3 relay de-energize. DV energizes. Reservoir and evaporator drain. DV remains energized until BC closes again.

**Diagnosis:** Check that BC actuator paddle is activated and not sticking. Confirm BC is open and X5 relay de-energizes. If not, see "II.D. Bin Control Check." Next, confirm X4 relay de-energizes. If not, check for 24VAC at X5 relay #3 (R) to neutral (LBU). If 24VAC is present, replace X5 relay. If X4 relay is de-energized, after 90 sec. confirm Comp and FM de-energize. If not, check for 35VDC at CB #3 (BR) to CB #4 (DBU). If 0VDC is present, replace X4 relay. If 35VDC is present and Comp and FM remain energized, replace CB. 60 sec. after Comp and FM de-energize, confirm that GM and X3 relay de-energize. If not, replace CB. Next, confirm DV energizes. If not, check for 24VAC at X5 relay #6 (W/O) to neutral (LBU). If 24VAC is not present, check for 24VAC at X5 relay #2 (W/R) to neutral (LBU). If 24VAC is present at X5 relay #2 (W/R) and not at #6 (W/O), replace X5 relay. If 24VAC is present at X5 relay #6 (W/O) to neutral (LBU) and DV is not energized, check for 24VAC at X5 relay #6 (W/O) to X3 relay #5 (LBU) and X5 #6 (W/O) to X3 relay #1 (Y). If 24VAC is present at X3 relay #5 (LBU) and not at #1 (Y), replace X3 relay. If 24VAC is present, check DV coil continuity and replace as necessary. If DV coil is good, check for crimped drain hose or clogged drain line.

Legend: **BC**—bin control; **CB**—control board; **Comp**—compressor; **CT**—control transformer; **DV**—drain valve; **FM**—fan motor; **GM**—gear motor; **HPS**—high-pressure switch; **LFS**—lower float switch; **UFS**—upper float switch; **WV**—inlet water valve; **X3**—compressor delay relay; **X4**—water control relay; **X5**—control relay; **X6**—safety relay

## 2b. Diagnostic Procedure Auxiliary Code C-1 and Later

This diagnostic procedure is a sequence check that allows you to diagnose the electrical system and components. Before proceeding, check for correct installation, adequate water supply (minimum of 10 PSIG, maximum of 113 PSIG), and proper voltage per appliance nameplate. Check that the 24VAC 1A fuse is good and GM external protector is closed. When checking for high-voltage (115VAC), always choose a white (W) neutral wire to establish a good neutral connection. When checking for low-voltage (secondary) (24VAC), always choose a light blue (LBU) neutral wire to establish a good neutral connection.

Note: • DV energizes when BC opens.

• On -C model, EH energizes when X12 relay energizes.

- 1) Confirm the appliance is plugged into the electrical outlet, supply voltage is correct per nameplate.
- 2) Remove the front panel.
- 3) Confirm the power switch is in the "ON" position, then move the control switch to the "DRAIN" position. **DV Diagnosis:** If DV does not energize, check for 24VAC at HPS red (R) wire to neutral (LBU) and HPS white/red (W/R) wire to neutral (LBU). If 24VAC is not present on HPS red (R) wire to neutral (W), check CT continuity. Replace if open. If 24VAC is present on HPS red (R) wire and not on HPS white/red (W/R) wire, HPS is open. If 24VAC is present at HPS white/red (W/R) and DV does not energize, check for 24VAC at X12 relay terminal #1 (V). If 24VAC is not present, X12 relay is energized or contacts are sticking. Replace as needed. If 24VAC is present, check for 24VAC at X10 relay #6 (W/BK). If 24VAC is not present, X10 relay is energized or contacts are sticking. Replace as needed. If 24VAC is present, check DV coil continuity. If open, replace DV.  
**HPS Diagnosis:** Check that the condenser air filter and coil are not clogged or restricted. Check that there are no restrictions in the refrigeration circuit (capillary tube or drier). Let refrigeration circuit pressures equalize. If HPS does not reset and pressures are equalized, replace HPS. If pressures are not equalized, reclaim refrigerant and diagnose refrigeration circuit restriction.
- 4) **Startup/Fill Cycle**—Move any ice away from the BC actuator paddle (located at the top of the bin). Move the control switch to the "ICE" position. X10 relay and WV energize. Reservoir fills, LFS closes, nothing happens at this time. The reservoir continues to fill. **X10 Relay Diagnosis:** Check that WV energizes and fills the reservoir. If not, confirm BC is closed. See "II.D. Bin Control Check." Confirm control switch is in the "ICE" position and switch is closed. Next, check for 24VAC at X10 relay #7 (V) to X10 relay #8 (LBU). If 24VAC is present, check for 24VAC at X10 relay #5 (R) to neutral (LBU). Next, check for 24VAC at X10 relay #3 (R) to neutral (LBU). If 24VAC is present at #5 (R) and not at #3 (R), replace X10 relay. If 24VAC is present on X10 relay #3 (R), check X11 relay. **X11 Relay Diagnosis:** Check for 24VAC at X11 relay #5 (R) to neutral (LBU). Next, check for 24VAC at X11 relay #1 (O) to neutral (LBU). If 24VAC is present at X11 relay #5 (R) and not at #1 (O), confirm X11 relay is de-energized. If X11 relay is energized, check for sticking UFS. See "II.E. Float Switch Check and Cleaning." If X11 relay is de-energized, replace X11 relay. **WV Diagnosis:** If 24VAC is present on X11 relay #1 (O), check WV coil continuity. If open, replace WV.

- 5) **Ice Purge Cycle**—UFS closes, X11 relay energizes, WV de-energizes, and low-water safety circuit (CB #3 and #4) closes. GM and X12 relay energize, 60 sec. Comp delay timer starts. **X11 Relay Diagnosis:** Check for 35VDC at X11 relay #4 (DBU) to #6 (BR). If 35VDC is present, X11 relay is de-energized or bad. Replace as necessary. If 0VDC is present, GM energizes. **GM Diagnosis:** If GM does not energize and 0VDC is read at CB #3 (BR) to CB #4 (DBU), check for 115VAC at CB #7 (BR) to neutral (W) and CB #8 (W/BR) to neutral (W). If 115VAC is present on CB #7 (BR) and not on CB #8 (W/BR), replace CB. If 115VAC is present on CB #8 (W/BR), check GM external protector and GM winding. If GM starts but the auger does not turn, check coupling between auger and GM.
- X12 Relay Diagnosis:** X12 relay energizes and starts 60 sec. Comp delay timer in CB (CB #10 (W/BK) and #11 (W/O)). After 60 sec. timer terminates, confirm Comp energizes. If not, check for 115VAC at X12 relay #7 (R) to X12 relay #8 (W). If 115VAC is not present, check GM external protector and GM winding (internal protector). If 115VAC is present, check for 35VDC at X12 relay #4 (W/BK) to X12 relay #6 (W/O). If 35VDC is present, replace X12 relay. If 0VDC is present and Comp does not energize, replace CB. See "II.C. Control Board Check."
- On -C models, EH energizes when X12 relay energizes. If not, check for 24VAC at X12 relay #5 (W/R) to neutral (LBU). Next, check for 24VAC at X12 relay #3 (P) to neutral (LBU). If 24VAC is present on X12 relay #5 (W/R) and not on X12 relay #3 (P), replace X12 relay.
- 6) **Freeze Cycle**—GM, X12 relay, and EH (-C model) continue. Comp and FM energize. X11 relay energizes and de-energizes as needed through LFS/UFS. Ice production begins 4 to 6 minutes after Comp and FM start depending on ambient and water conditions. **Diagnosis:** Check that Comp and FM energize. If not, check for 115VAC at CB X2 relay #4 (BR) to neutral (W) and CB X2 relay #3 (BK) to neutral (W). If 115VAC is present at CB X2 relay #4 (BR) and not at CB X2 relay #3 (BK), replace CB. If 115VAC is present at CB X2 relay #3 (BK) and Comp and FM do not energize, for Comp check Comp winding, start capacitor, and start relay. For FM, check FM windings and fan blade for binding.
- 7) **Refill/Low-Water Safety Cycle**—As ice is produced, water level in the reservoir drops. UFS opens, nothing happens at this time. LFS opens and refill begins. X11 relay de-energizes, low-water safety circuit opens (X11 relay #4 (DBU) and #6 (BR), and CB #3 (BR) and #4 (DBU)), CB 90 sec. low-water safety timer starts. WV energizes. Comp, FM, GM, and X12 relay continue. UFS must close before 90 sec. low-water safety timer terminates. Otherwise, shutdown cycle is initiated. Once UFS closes, X11 relay energizes, WV de-energizes, and low water safety circuit closes, terminating 90 sec. low-water safety timer.
- Diagnosis** – Check that WV energizes. If not, confirm LFS status (open), X11 relay de-energized. If not, see step 5 above.



8) **Shutdown**—Ice fills ice storage bin and presses BC actuator to open BC. Comp, FM, GM, and X12 relay continue. X10 relay and X11 relay de-energize. 90 sec. low-water safety timer starts. When 90 sec. low-water safety timer terminates, Comp and FM de-energize. GM and X12 relay continue. 60 sec. GM delay timer starts. Once 60 sec. GM delay timer terminates, GM, X12 relay, and EH on -C model de-energize. DV energizes. Reservoir and evaporator drain. DV remains energized until BC closes again.

**Diagnosis:** Check that BC actuator paddle is activated and not sticking. Confirm BC is open and X10 relay de-energizes. If not, see "II.D. Bin Control Check." Next, confirm X11 relay de-energizes. If not, check for 24VAC at X10 relay #3 (R) to neutral (LBU). If 24VAC is present, replace X10 relay. If X11 relay is de-energized, after 90 sec. confirm Comp and FM de-energize. If not, check for 35VDC at CB #3 (BR) to CB #4 (DBU). If 0VDC is present, replace X11 relay. If 35VDC is present and Comp and FM remain energized, replace CB. 60 sec. after Comp and FM de-energize, confirm that GM and X12 relay de-energize. If not, replace CB. Next, confirm DV energizes. If not, check for 24VAC at X12 relay #5 (W/R) to neutral (LBU) and X12 relay #1 (V) to neutral (LBU). If 24VAC is present at X12 relay #5 (W/R) and not at #1 (V), replace X12 relay. If 24VAC is present at X12 relay #1 (V) and DV is not energized, check for 24VAC at X10 relay #6 (W/BK) to neutral (LBU) and X10 relay #2 (V) to neutral (LBU). If 24VAC is present at X10 relay #2 (V) and not at #6 (W/BK), replace X10 relay. If 24VAC is present, check DV coil continuity and replace as necessary. If DV coil is good, check for crimped drain hose or clogged drain line.

Legend: **BC**—bin control; **CB**—control board; **Comp**—compressor; **CT**—control transformer; **DV**—drain valve; **FM**—fan motor; **GM**—gear motor; **HPS**—high-pressure switch; **LFS**—lower float switch; **UFS**—upper float switch; **WV**—inlet water valve; **X10**—control relay; **X11**—water control relay; **X12**—compressor delay relay

## 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.

- 1) **Startup:** Move the power switch to the "OFF" position, then unplug the appliance. Access CB and remove the wires from CB #3, 4, 5, 6, 10, and 11. Plug the appliance back in. Confirm the flush/control switch is in the "ICE" position, then move the power switch to the "ON" position. Check for 24VAC at CB #1 (W/R) to CB #2 (LBU). If 24VAC is not present, see "II.B.2. Diagnostic Procedure." If 24VAC is present, check for 35VDC at CB #3 to CB #4, CB #5 to CB #6, and CB #10 to #11. If 35VDC is not present on a circuit, replace CB.
- 2) Move the power switch to the "OFF" position, then unplug the appliance. Reconnect the wires to their correct positions on CB. Plug the appliance into the electrical outlet, then move the power switch to the "ON" position. **Relay Diagnosis:** Once UFS closes, relay energizes (X4 (C-0 and earlier) or X11 (C-1 and later)). CB #3 (BR) and CB #4 (DBU) close, CB #7 (BR) and CB #8 (W/BR) close (GM energizes). If not, replace CB. Once GM energizes, X3 (C-0 and earlier) or X12 (C-1 and later) relay energizes, closing CB #10 (W/BK) and CB #11 (W/O) circuit and starting 90-sec. Comp delay timer. When 90-sec. Comp delay timer terminates, CB X2 relay energizes, energizing Comp. If not, replace CB.

Legend: **CB**—control board; **Comp**—compressor; **GM**—gear motor; **UFS**—upper float switch;  
**X4 (C-0 and earlier) or X11 (C-1 and later)**—water control relay;  
**X3 (C-0 and earlier) or X12 (C-1 and later)**—compressor delay relay

## D. Bin Control Check

- 1) Remove the front, top, and rear panels.
- 2) Move the power switch to the "OFF" position.
- 3) Unplug the appliance from the electrical outlet.
- 4) Disconnect the BC connector located at the back of the appliance.
- 5) Move ice away from the BC actuator in the bin.
- 6) Check continuity across BC connector terminals. If BC actuator is not engaged, BC is closed. If not, replace BC.
- 7) Press and hold BC actuator paddle located at the top of the ice storage bin. While BC actuator is engaged, check continuity across BC. If BC actuator is engaged, BC is open. If not, replace BC.
- 8) Reconnect BC connector.
- 9) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position. Confirm the flush/control switch is in the "ICE" position to start the automatic icemaking process.

Legend: **BC**—bin control

## **E. Float Switch Check and Cleaning**

### **1. Float Switch Check**

- 1) Remove the front panel, then move the flush/control switch to the "FLUSH/DRAIN" position.
- 2) After 3 min. move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) Remove the top and rear panels.
- 4) Remove bell connectors from FS black (BK), blue (BU), and red (R) wires. Check for open continuity between black (BK) (common) and red (R) (UFS) and between black (BK) (common) and blue (BU) (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.
- 5) Cap the FS appliance wires. Black (BK), red (R), and white/blue (W/BU).
- 6) Move the flush/control switch to the "ICE" position.
- 7) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 8) Once reservoir overflows, move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 9) 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 blue (BU) (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.
- 10) Reconnect the FS wires to the appropriate appliance wires. Black (BK) to black (BK), red (R) to red (R), and blue (BU) to white/blue (W/BU).
- 11) Replace the rear and top panels in their correct positions.
- 12) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position to start the automatic icemaking process.
- 13) Replace the front panel in its correct position.

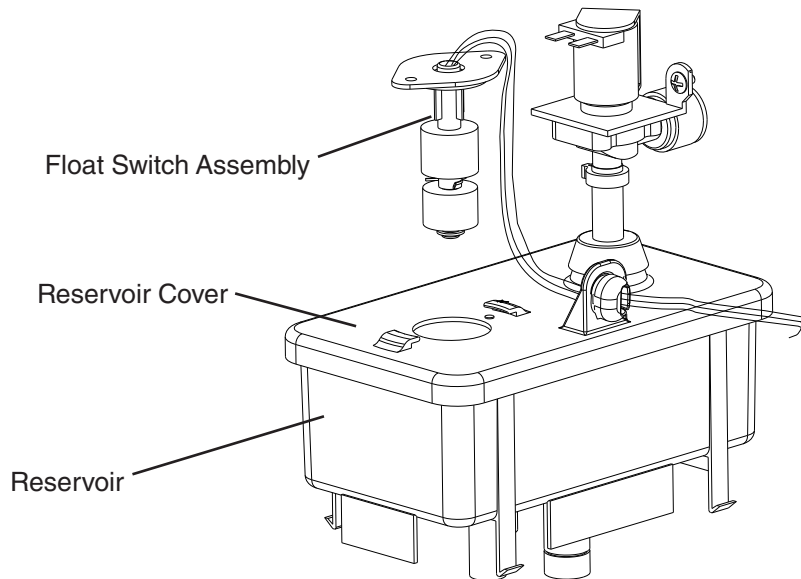
### **2. Float Switch Cleaning**

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

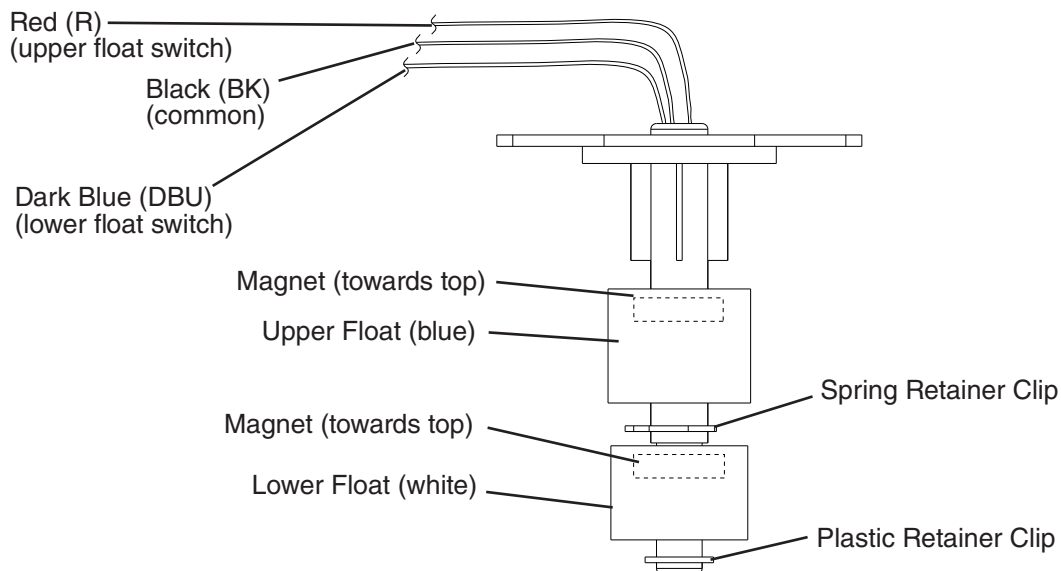
- 1) Remove the front panel.
- 2) Move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) If not already removed, remove the top and rear panels.
- 4) Remove FS assembly from the reservoir cover. See Fig. 1.
- 5) Wipe down FS assembly with a mixture of 1 part Hoshizaki "Scale Away" and 25 parts warm water.

- 6) 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 (UFS) and the white float is on bottom (LFS). The floats must be installed with the magnets inside them towards the top of the switch. See Fig. 2. Installing the floats upside down will affect the timing of FS operation.
- 7) Rinse the float switch assembly thoroughly with clean water and replace in its correct position.
- 8) Replace the rear and top panels in their correct positions.
- 9) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position to start the automatic icemaking process.
- 10) Replace the front panel in its correct position.

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



**Fig. 1**



**Fig. 2**

## 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

<b>No Ice Production - Possible Cause</b>	
<b>Startup</b>	
1. Power Supply	a) Unplugged, 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 clogged.
3. Power Switch	a) "OFF" position.
4. Control Transformer (115V/24V)	a) Coil winding open or shorted.
5. Safety Switch (C-0 and earlier)	a) Engaged. Reset. b) Defective.
6. X6 Relay (safety relay) (C-0 and earlier)	a) Defective.
7. Fuse (1A)	a) Blown.
8. Bin Control See "II.D. Bin Control Check."	a) Open. b) Defective.
9. Flush/Control Switch	a) In "FLUSH" (C-0 and earlier) or "DRAIN" (C-1 and later) position. b) Defective.
10. X5 Relay (C-0 and earlier) or X10 Relay (C-1 and later)	a) Defective.
11. Evaporator Heater (-C model)	a) C-0 and earlier: Defective.
<b>Startup/Fill Cycle (reservoir empty)</b>	
1. X4 Relay (C-0 and earlier) or X11 Relay (C-1 and later)	a) Defective.
2. Inlet Water Valve	a) Screen or orifice clogged. b) Defective.
<b>Startup/Ice Purge Cycle (reservoir full)</b>	
1. Float Switch See "II.E. Float Switch Check and Cleaning."	a) Float does not move freely. b) Defective.
2. High-Pressure Switch	a) Dirty air filter or condenser. b) Condenser fan motor defective. c) Refrigerant overcharge. d) Refrigerant lines or components plugged.
3. Control Board See "II.C. Control Board Check."	a) Defective (#3 and #4).
4. X4 Relay (C-0 and earlier) or X11 Relay (C-1 and later)	a) Defective.
5. Gear Motor	a) External or internal protector open. b) Gear motor winding open. c) Mechanical failure.

<b>No Ice Production - Possible Cause</b>	
<b>Freeze Cycle</b>	
1. Control Board See "II.C. Control Board Check."	a) Defective.
2. X3 Relay (C-0 and earlier) or X12 Relay (C-1 and later)	a) Defective.
3. Start Relay/Capacitor	a) Defective.
4. Compressor	a) Open motor windings.
	b) Mechanical Failure.
5. Fan Motor	a) Open motor windings.
	b) Mechanical failure or fan blade binding.
6. Evaporator	a) Dirty.
	b) Damaged or defective.
7. Refrigerant Charge	a) Low.
8. Drain Valve	a) Dirty, leaking by.
9. Water System	a) Water leaks.
10. Evaporator Heater (-C model)	a) C-1 and later: X12 relay defective.
	b) Defective.
<b>Refill</b>	
1. Float Switch See "II.E. Float Switch Check and Cleaning."	a) Dirty/sticking.
	b) Defective.
2. Inlet Water Valve	a) Screen or orifice clogged.
	b) Defective.
3. Water Supply	a) Water supply off or improper water pressure (10 to 113 PSIG).
	b) External water filters clogged.
4. X4 Relay (C-0 and earlier) or X11 Relay (C-1 and later)	a) Defective.
5. Control Board See "II.C. Control Board Check."	a) Defective.
<b>Shutdown</b>	
1. Bin Control See "II.D. Bin Control Check."	a) Proximity switch stuck closed.
	b) Actuator paddle does not move freely.
2. X5 Relay (C-0 and earlier) or X10 Relay (C-1 and later)	a) Defective.
3. Control Board See "II.C. Control Board Check."	a) Defective.
<b>Shutdown Drain Cycle</b>	
1. X3 Relay (C-0 and earlier) or X12 Relay (C-1 and later)	a) Defective.
2. X5 Relay (C-0 and earlier) or X10 Relay (C-1 and later)	a) Defective.
3. X4 Relay (C-0 and earlier) or X11 Relay (C-1 and later)	a) Defective.
4. Control Board See "II.C. Control Board Check."	a) Defective.
5. Drain Valve	a) Defective.

### III. Controls and Relays

The F-330BAH(-C) is controlled by a control board and 5 relays. X1 and X2 relays are located on the control board and control GM, Comp, and FM operation. X10, X11, and X12 relays are independent relays located in the control box. X10 relay controls the icemaking process and DV operation. X11 relay controls WV operation, GM ice purge timer, and low water safety circuit. X12 relay controls EH operation (-C models), Comp delay timer, and DV operation.

#### A. Control Board

The control board operates on 24VAC provided at CB #1 (W/R) and #2 (LBU). There are three 35VDC circuits that open/close to control operation.

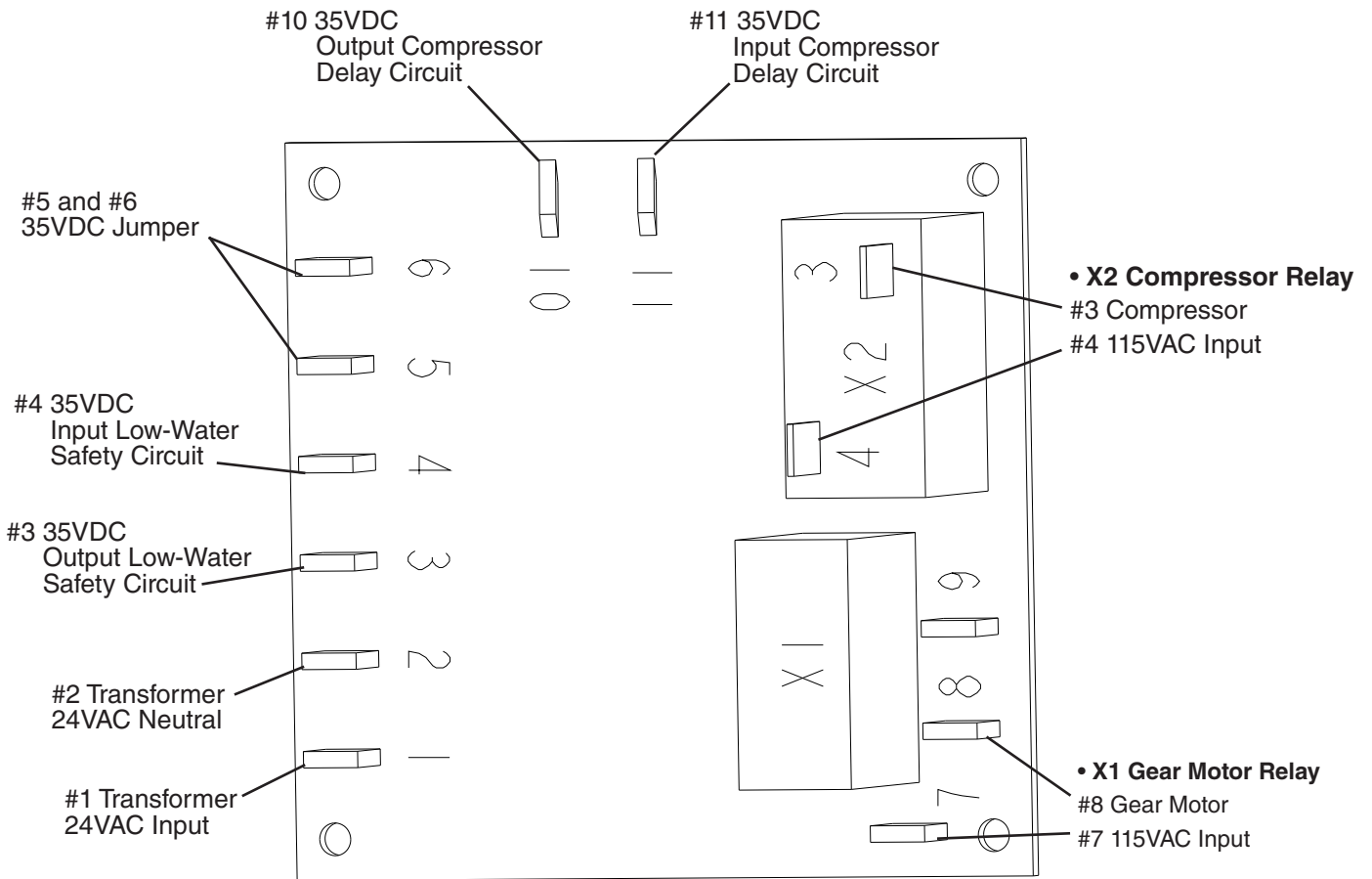
##### 1. Control Board 35VDC Circuits:

- 1–*Water confirmation for GM activation.* X11 relay terminals #4 (DBU) and #6 (BR) must close to complete the CB 35VDC circuit between CB #3 (BR) and #4 (DBU). Once this circuit closes, CB energizes X1 relay and GM starts. If open longer than 90 sec., appliance shuts down.
- 2–*Jumper.* The jumper between CB #5 (P) and #6 (P) must be in place for CB operation.
- 3–*Gear Motor confirmation and 90 sec. Comp delay timer initiation.* X12 relay #4 (W/BK) and #6 (W/O) must close to complete the CB 35VDC circuit between CB #10 (W/BK) and #11 (W/O). Once this circuit closes, 90 sec. Comp delay timer starts. When 90 sec. Comp delay timer terminates, CB energizes X2 relay, energizing Comp and FM.

##### 2. Control Board Relays:

- X1- Gear Motor Relay: X1 relay energizes after the reservoir fills, UFS closes energizing X11 relay. Once energized, X11 relay closes a 35VDC circuit between CB terminals #3 (BR) and #4 (DBU). Once CB 35VDC circuit closes between terminals #3 (BR) and #4 (DBU), X1 relay energizes, energizing GM and X12 relay.
- X2- Compressor Relay: X2 relay energizes after CB 90 sec. Comp delay timer terminates. CB 90 sec. compressor delay timer starts after X12 relay energizes and closes a 35VDC circuit between CB #10 (W/BK) and #11 (W/O).

## B. Control Board Layout





## C. Relays

X5 (C-0 and earlier) and X10 (C-1 and later)- Control Relay: Relay energizes when power switch is "ON," safety switch closed (if applicable), safety relay (if applicable) de-energized, BC closed, and flush/control switch in "ICE" position. Once energized, relay allows 24VAC to X4 relay (C-0 and earlier) or X11 relay (C-1 and later) for WV initiation and prevents DV from energizing during icemaking process.

X4 (C-0 and earlier) and X11 (C-1 and later)- Water Control Relay: Relay allows WV to energize when relay is de-energized. As water fills the reservoir, UFS closes, energizing relay. Once energized, relay de-energizes WV and closes CB 35VDC circuit between CB #3 (BR) and #4 (DBU) for GM operation.

X3 (C-0 and earlier) and X12 (C-1 and later)- Compressor Delay Relay: Relay energizes with GM and starts the 90 sec. Comp delay timer (35VDC circuit at CB #10 (W/BK) and #11 (W/O)) and on C-1 and later models, energizes the evaporator heater (#5 (W/R) and #3 (P)) during the icemaking process. When de-energized, relay allows for DV operation during off cycles. This prevents DV from energizing during the icemaking process.

X6 (C-0 and earlier)- Relay energizes when safety switch closes, de-energizing X5 relay and energizing lamp until the safety switch is reset (opened).

Legend: **BC**—bin control; **CB**—control board; **Comp**—compressor; **DV**—drain valve; **EH**—evaporator heater; **FM**—fan motor; **GM**—gear motor; **UFS**—upper float switch; **WV**—inlet water valve

## D. Switches

2 switches are used to control the operation of the appliance. These switches are referred to as the power switch and flush/control switch. They are located on the control box.

### 1. Power Switch

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

### 2. Flush/Control Switch

The flush/control switch has 2 positions:

Flush Switch C-0 and Earlier: "ICE" and "FLUSH."

Control Switch C-1 and Later: "ICE" and "DRAIN."

In the "ICE" position, X5 (C-0 and earlier) or X10 (C-1 and later) relay is energized, DV is de-energized and the icemaking process begins.

In the "FLUSH" or "DRAIN" position, X5 (C-0 and earlier) or X10 (C-1 and later) is de-energized and flush/drain valve is energized. 90 sec. shutdown sequence starts if moved from "ICE" with power switch "ON."

## 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, then unplug the appliance from the electrical outlet before servicing.
- **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 ice storage bin.
- Make sure all food zones in the icemaker and 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 the required refrigerant charge, see the nameplate. 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 shutoff 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.

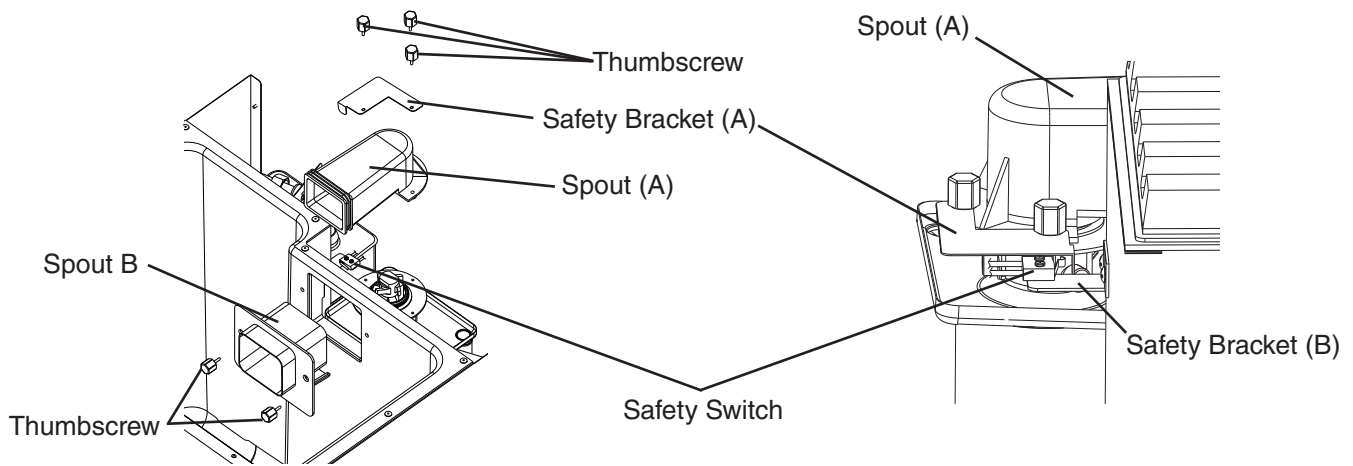
## B. Component Service Information

### **NOTICE**

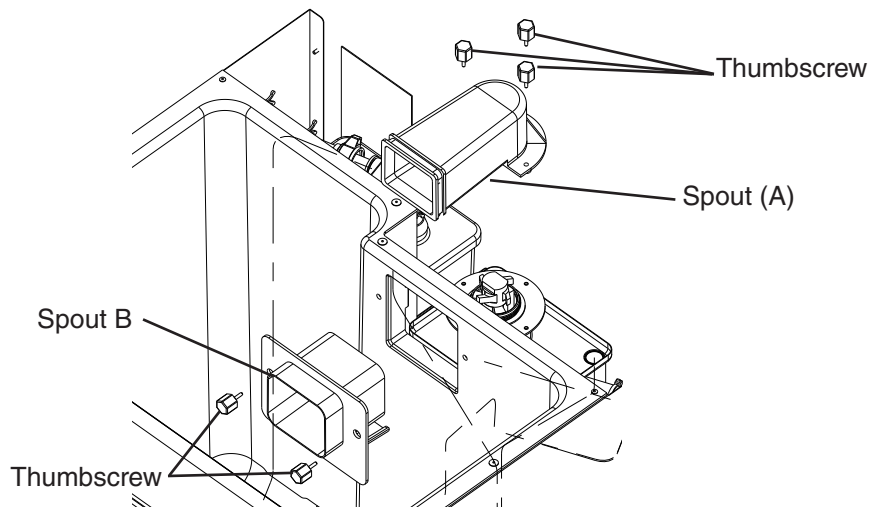
- When replacing a component listed below, see the notes to help ensure proper operation.
- When replacing evaporator assembly and water circuit components, make sure there are no water leaks after the repair is complete.

<b>Component</b>	<b>Notes</b>
Compressor	<ul style="list-style-type: none"><li>• Install a new drier, start capacitor, and start relay.</li></ul>
Upper and Lower Bearings	<ul style="list-style-type: none"><li>• Inspect the upper bearing for wear. See "IV.B.1. Upper Bearing Wear Check." Replace if necessary.</li><li>• When replacing the upper bearing it is advised to also change the lower bearing at the same time.</li></ul>
Evaporator	<ul style="list-style-type: none"><li>• Install a new drier.</li><li>• 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.</li></ul>
Gear Motor	<ul style="list-style-type: none"><li>• Install a new gear motor capacitor.</li></ul>

### Spout Assembly C-0 and Earlier

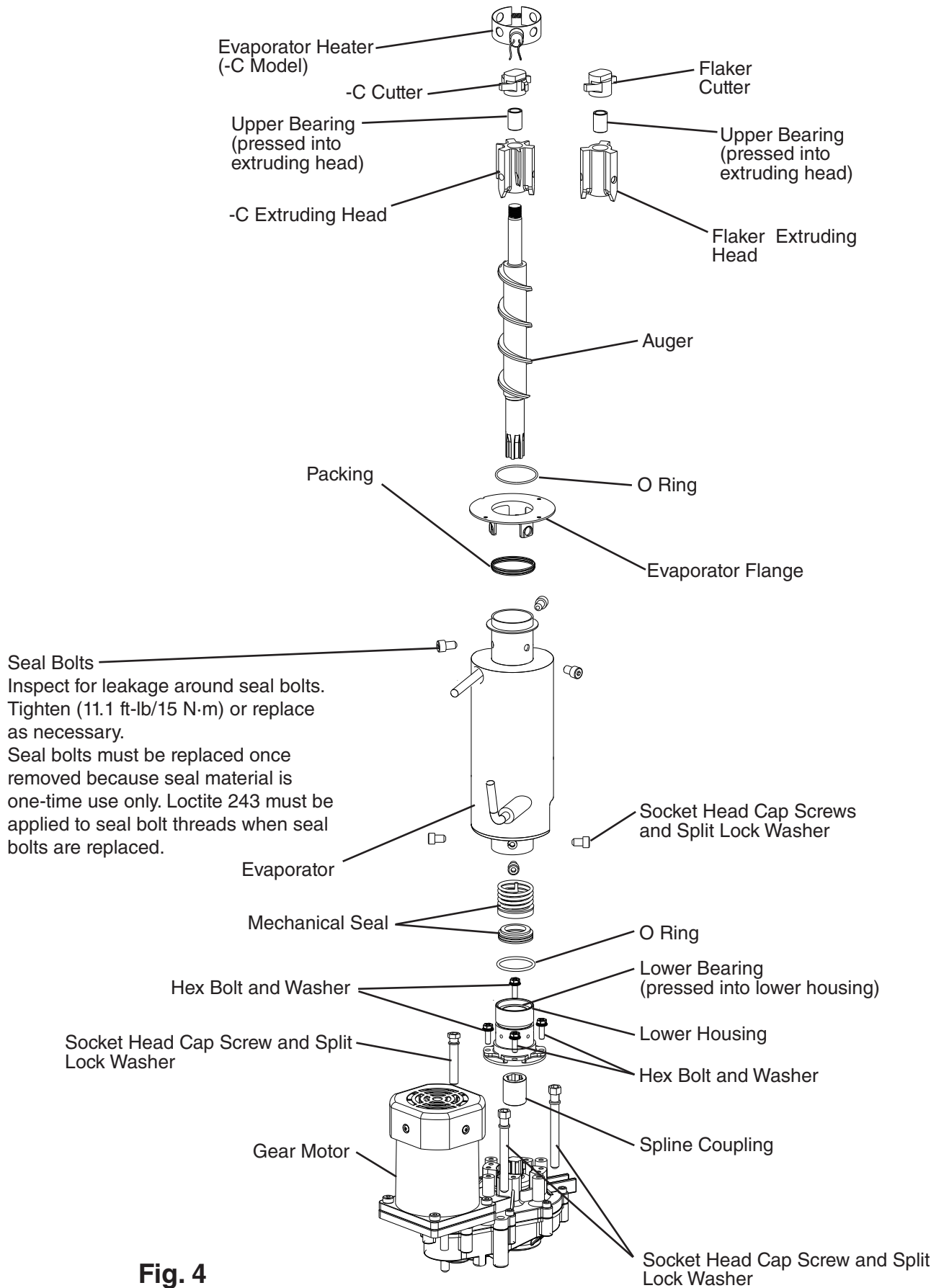


### Spout Assembly C-1 and Later



**Fig. 3**

# Evaporator Assembly

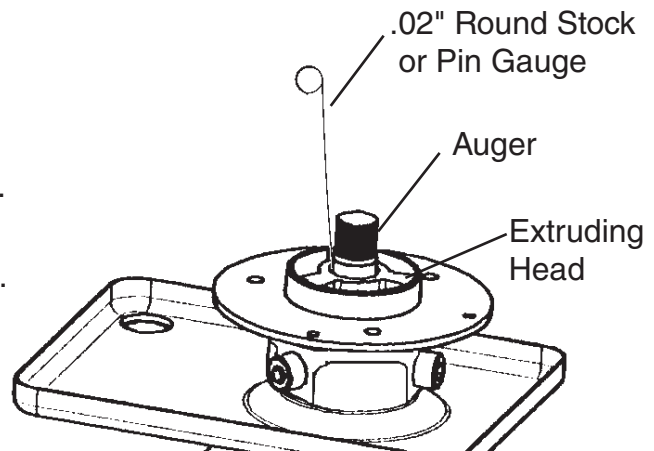


**Fig. 4**

## 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.

- 1) Remove the front panel. Move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 2) Remove top panel and top insulation panel.
- 3) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B). See Fig. 3.
- 4) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable). See Fig. 3.



**Fig. 5**

- 5) Loosen the cutter with a wrench and remove it.
- 6) 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. See Fig. 5. 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.

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

- 7) Replace the cutter in its correct position.
- 8) Replace the spouts in their correct positions. If applicable, make sure the safety switch components are in position. See Fig. 3.
- 9) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 10) Replace the panels in their correct positions.



## **2. Removal and Replacement of Cutter**

- 1) Remove the front panel. Move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 2) Remove the top panel and top insulation panel.
- 3) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B).  
See Fig. 3.
- 4) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).  
See Fig. 3.
- 5) Loosen the cutter with a wrench and remove it.
- 6) Install the new cutter.
- 7) Replace the spouts in their correct positions. If applicable, make sure the safety switch components are in position. See Fig. 3.
- 8) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 9) Replace the panels in their correct positions.

## **3. Removal and Replacement of Extruding Head**

- 1) Remove the front panel. Move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 2) Remove the top panel and top insulation panel.
- 3) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B).  
See Fig. 3.
- 4) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).  
See Fig. 3.
- 5) Loosen the cutter with a wrench and remove it.
- 6) Remove the evaporator heater (-C model).
- 7) Remove the seal bolts and lift off the extruding head.
- 8) Place the new extruding head in place, then place and tighten down the new seal bolts.  
Tighten seal bolts to 11.1 ft-lb/15 N·m.
- 9) Replace the evaporator heater (-C model), cutter, and spouts in their correct positions.  
If applicable, make sure the safety switch components are in position. See Fig.3.
- 10) Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 11) Replace the panels in their correct positions.

#### 4. Removal and Replacement of Auger

- 1) Remove the front panel, then move the flush/control switch to the "FLUSH" or "DRAIN" position.
- 2) After 2 min., move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) Remove the top panel and top insulation panel.
- 4) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B).  
See Fig. 3.
- 5) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).  
See Fig. 3.
- 6) Loosen the cutter with a wrench.
- 7) Remove the seal bolts securing the extruding head. Using the cutter, lift out the auger assembly.
- 8) Remove the cutter and extruding head from the auger and place them on the new auger.
- 9) Install the new auger assembly. **NOTICE! Seal bolts must be replaced once removed because seal material is one-time use only. Loctite 243 must be applied to seal bolt threads when seal bolts are replaced. Tighten seal bolts to 11.1 ft-lb/15 N·m.**
- 10) Replace the removed parts in the reverse order of which they were removed.  
If applicable, make sure the safety switch components are in position. See Fig. 3.
- 11) Move the flush/control switch to the "ICE" position. Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 12) Replace the panels in their correct positions.

## 5. Removal and Replacement of Evaporator

### ***IMPORTANT***

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

- 1) Remove the front panel. Move the flush/control switch to the "FLUSH" or "DRAIN" position.
- 2) After 2 min., move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) Recover the refrigerant and store it in an approved container.
- 4) Remove the top panel and top insulation panel.
- 5) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B). See Fig. 3.
- 6) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).
- 7) Disconnect the water hoses.
- 8) Remove seal bolts securing the extruding head. Using the cutter, lift out the auger assembly.
- 9) Disconnect the inlet and outlet tubing.
- 10) Remove the allen head cap screws securing the evaporator to the lower housing.
- 11) Lift off the evaporator.
- 12) 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. 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.
- 13) 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.
- 14) Remove the drier, then place the new drier in position.
- 15) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG.
- 16) Check for leaks using nitrogen gas (140 PSIG) and soap bubbles.
- 17) Evacuate the system, and charge it with refrigerant. See the nameplate for the required refrigerant charge.
- 18) Replace the removed parts in the reverse order of which they were removed. If applicable, make sure the safety switch components are in position.  
**NOTICE! Seal bolts must be replaced once removed because seal material is one-time use only. Loctite 243 must be applied to seal bolt threads when seal bolts are replaced. Tighten seal bolts to 11.1 ft-lb/15 N·m.**

- 19) Move the flush/control switch to the "ICE" position. Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 20) Replace the panels in their correct positions.

## **6. Removal and Replacement of Mechanical Seal and Lower Housing**

### **6a. Mechanical Seal**

- 1) Remove the front panel. Move the flush/control switch to the "FLUSH" or "DRAIN" position.
- 2) After 2 min., move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) Remove the top panel and top insulation panel.
- 4) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B). See Fig. 3.
- 5) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).
- 6) Remove the seal bolts securing the extruding head. 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. 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 socket 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.

<b>⚠ WARNING</b>
To help prevent water leaks, be careful not to damage the surfaces of the O-ring or mechanical seal.

### **6b. 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 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.

- 16) Replace the removed parts in the reverse order of which they were removed.  
If applicable, make sure the safety switch components are in position.
- 17) Move the flush/control switch to the "ICE" position. Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 18) Replace the panels in their correct positions.

## **7. Removal and Replacement of Gear Motor**

- 1) Remove the front panel. Move the flush/control switch to the "FLUSH" or "DRAIN" position.
- 2) After 2 min., move the power switch to the "OFF" position, then unplug the appliance from the electrical outlet.
- 3) Remove the top panel and top insulation panel.
- 4) Remove the thumbscrews attaching spout (B) to the bin, then remove spout (B).  
See Fig. 3.
- 5) Remove the thumbscrews attaching spout (A) and safety bracket (A) (if applicable) to the evaporator assembly, then remove spout (A) and safety bracket (A) (if applicable).
- 6) Remove the socket head cap screws securing the lower housing to the gear motor. Lift the evaporator up slightly.
- 7) Remove the socket head cap screws securing the gear motor.
- 8) Remove the wiring from the gear motor, then remove the gear motor.
- 9) Attach spline coupling from the old gear motor to the new gear motor.
- 10) Replace the removed parts in the reverse order of which they were removed.  
If applicable, make sure safety switch components are in position.
- 11) Move the flush/control switch to the "ICE" position. Plug the appliance into the electrical outlet, then move the power switch to the "ON" position.
- 12) Replace the panels in their correct positions.

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## V. Maintenance

This appliance must be maintained in accordance with the instruction manual and labels provided. Consult with your local Hoshizaki Certified Service Representative about maintenance service.

### **WARNING**

- Only qualified service technicians should service the appliance.
- To reduce the risk of electric shock, do not touch the appliance power switch or flush/control switch with damp hands.
- **Before Servicing:** Move the appliance's power switch to the "OFF" position. Turn off the power supply. Unplug the appliance from the electrical outlet 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 ice storage bin.

## A. Maintenance Schedule

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.

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 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 cleaner.
Every 6 Months	Icemaker and Storage Bin	Clean and sanitize per the cleaning and sanitizing instructions on the appliance or in the instruction manual.
	Evaporator Condensate Drain Pan and Gear Motor Drain Pan	Wipe down with clean cloth and warm water. Slowly pour one cup of sanitizing solution (prepare as outlined in the sanitizing instructions on the appliance or in the instruction manual) into the evaporator condensate drain pan. Be careful not to overflow the pan. The solution will flow down to the gear motor drain pan and out the drain line to sanitize these areas. Repeat with a cup of clean water to rinse.
	Icemaker, Storage Bin, and Drains	Check to make sure they are clear.
	Extruding Head Seal Bolts	Inspect for leakage around seal bolts. Tighten (11.1 ft-lb/15 N·m) or replace as necessary. Seal bolts must be replaced once removed because seal material is one-time use only. Loctite 243 must be applied to seal bolt threads when seal bolts are replaced.
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.
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.

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## VI. Preparing the Appliance for Periods of Non-Use

<b><i>NOTICE</i></b>
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When storing the appliance for an extended time or in sub-freezing temperatures, follow the instructions below to prevent damage.
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When the appliance is not used for two or three days under normal conditions, it is sufficient to 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) Run the appliance with the potable water supply line shut-off valve closed. Allow the appliance to make ice until it stops automatically.
- 2) Open the potable water supply line drain valve and blow the line out using compressed air or carbon dioxide.
- 3) Remove the front panel and move the flush/control switch to the "FLUSH" or "DRAIN" position to drain out the remaining water from the appliance.
- 4) After the water has drained, move the power switch to the "OFF" position and unplug the appliance.
- 5) Replace the front panel in its correct position.
- 6) Close the potable water supply line drain valve.
- 7) Remove all ice from the storage bin and clean the bin.



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## **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

### A. Specification Sheet

#### 1. F-330BAH

AC SUPPLY VOLTAGE	115/60/1		
AMPERAGE	6.7A ( AT 104°F/ WT 80°F )		
MINIMUM CIRCUIT AMPACITY	N/A		
MAXIMUM FUSE SIZE	N/A		
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient Temp.(°F)	WATER TEMP. (°F)	
		50	70
	70	* 330(150)	315(143)
	80	290(132)	280(127)
	90	* 255(116)	* 250(114)
	100	230(104)	*205(93)
SHAPE OF ICE	Flake		
ICE QUALITY	Approx. 80%, Ice (90/70°F, Conductivity 200 µs/cm)		
APPROXIMATE STORAGE CAPACITY	80 lbs.		
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F	
ELECTRIC W (kWH/100 lbs.)	606(5.8)	562(4.1)	
POTABLE WATER gal./24HR (gal./100 lbs.)	30(12)	38(12)	
EXTERIOR DIMENSIONS (WxDxH)	24" x 26" x 33" (610 x 660 x 838 mm)		
EXTERIOR FINISH	Galvanized Steel (Rear,Bottom) Stainless Steel (Top,Front,Side)		
WEIGHT	Net 147 lbs. (67 kg), Shipping 178 lbs. (81 kg)		
CONNECTIONS - ELECTRIC	Cord Connection		
- WATER SUPPLY	Inlet 1/2" FPT		
- DRAIN	Drain 3/4" FPT		
ICE MAKING SYSTEM	Auger type		
HARVESTING SYSTEM	Direct Driven Auger (80W Gear Motor)		
ICE MAKING WATER CONTROL	Float Switch		
COOLING WATER CONTROL	N/A		
BIN CONTROL SYSTEM	Mechanical Bin Control (Proximity Sw.)		
COMPRESSOR	Hermetic, Model NF7CLX		
CONDENSER	Air-cooled, Fin and tube type		
EVAPORATOR	Copper Tube on Cylinder		
REFRIGERANT CONTROL	Capillary Tube		
REFRIGERANT CHARGE	R-404A, 7.1 oz. (200 g)		
DESIGN PRESSURE	High 470 PSIG, Low 230 PSIG		
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-Off Relay		
COMPRESSOR PROTECTION	Auto-Reset Overload Protector		
GEAR MOTOR PROTECTION	Manual Reset Circuit Breaker		
REFRIGERANT CIRCUIT PROTECTION	Auto-Reset High Pressure Control Switch		
LOW WATER PROTECTION	Float Switch and Timer		
ACCESSORIES - SUPPLIED	Ice Scoop, Legs, Spare Fuse		
OPERATING CONDITIONS	VOLTAGE RANGE	104 - 127 V	
	AMBIENT TEMP.	45 - 100° F	
	WATER SUPPLY TEMP.	45 - 90° F	
	WATER SUPPLY PRESSURE	10 - 113 PSIG	

## 2. F-330BAH-C

AC SUPPLY VOLTAGE	115/60/1		
AMPERAGE	7.4A (AT 104°F/ WT 80°F)		
MINIMUM CIRCUIT AMPACITY	N/A		
MAXIMUM FUSE SIZE	N/A		
APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient Temp.(°F)	WATER TEMP. (°F)	
		50	70
	70	* 320(145)	300(136)
	80	275(125)	265(120)
	90	240(109)	* 230(104)
	100	210(95)	*190(86)
SHAPE OF ICE	Cubelet		
ICE QUALITY	Approx. 90%, Ice (90/70°F, Conductivity 200 µs/cm)		
APPROXIMATE STORAGE CAPACITY	80 lbs.		
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F	
ELECTRIC W (kWH/100 lbs.)	650(6.7)	607(4.5)	
POTABLE WATER gal./24HR (gal./100 lbs.)	28(12)	38(12)	
EXTERIOR DIMENSIONS (WxDxH)	24" x 26" x 33" (610 x 660 x 838 mm)		
EXTERIOR FINISH	Galvanized Steel (Rear,Bottom) Stainless Steel (Top,Front,Side)		
WEIGHT	Net 147 lbs. (67 kg), Shipping 178 lbs. (81 kg)		
CONNECTIONS - ELECTRIC	Cord Connection		
- WATER SUPPLY	Inlet 1/2" FPT		
- DRAIN	Drain 3/4" FPT		
ICE MAKING SYSTEM	Auger type		
HARVESTING SYSTEM	Direct Driven Auger ( 80W Gear Motor )		
ICE MAKING WATER CONTROL	Float Switch		
COOLING WATER CONTROL	N/A		
BIN CONTROL SYSTEM	Mechanical Bin Control ( Proximity Sw. )		
COMPRESSOR	Hermetic, Model NF7CLX		
CONDENSER	Air-Cooled, Fin and Tube Type		
EVAPORATOR	Copper Tube on Cylinder		
REFRIGERANT CONTROL	Capillary Tube		
REFRIGERANT CHARGE	R-404A, 7.1 oz. (200 g)		
DESIGN PRESSURE	High 470 PSIG, Low 230 PSIG		
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-Off Relay		
COMPRESSOR PROTECTION	Auto-Reset Overload Protector		
GEAR MOTOR PROTECTION	Manual Reset Circuit Breaker		
REFRIGERANT CIRCUIT PROTECTION	Auto-Reset High Pressure Control Switch		
LOW WATER PROTECTION	Float Switch and Timer		
ACCESSORIES - SUPPLIED	Ice Scoop, Legs, Spare Fuse		
OPERATING CONDITIONS	VOLTAGE RANGE	104 - 127 V	
	AMBIENT TEMP.	45 - 100° F	
	WATER SUPPLY TEMP.	45 - 90° F	
	WATER SUPPLY PRESSURE	10 - 113 PSIG	

## B. Performance Data Sheet

### 1. F-330BAH

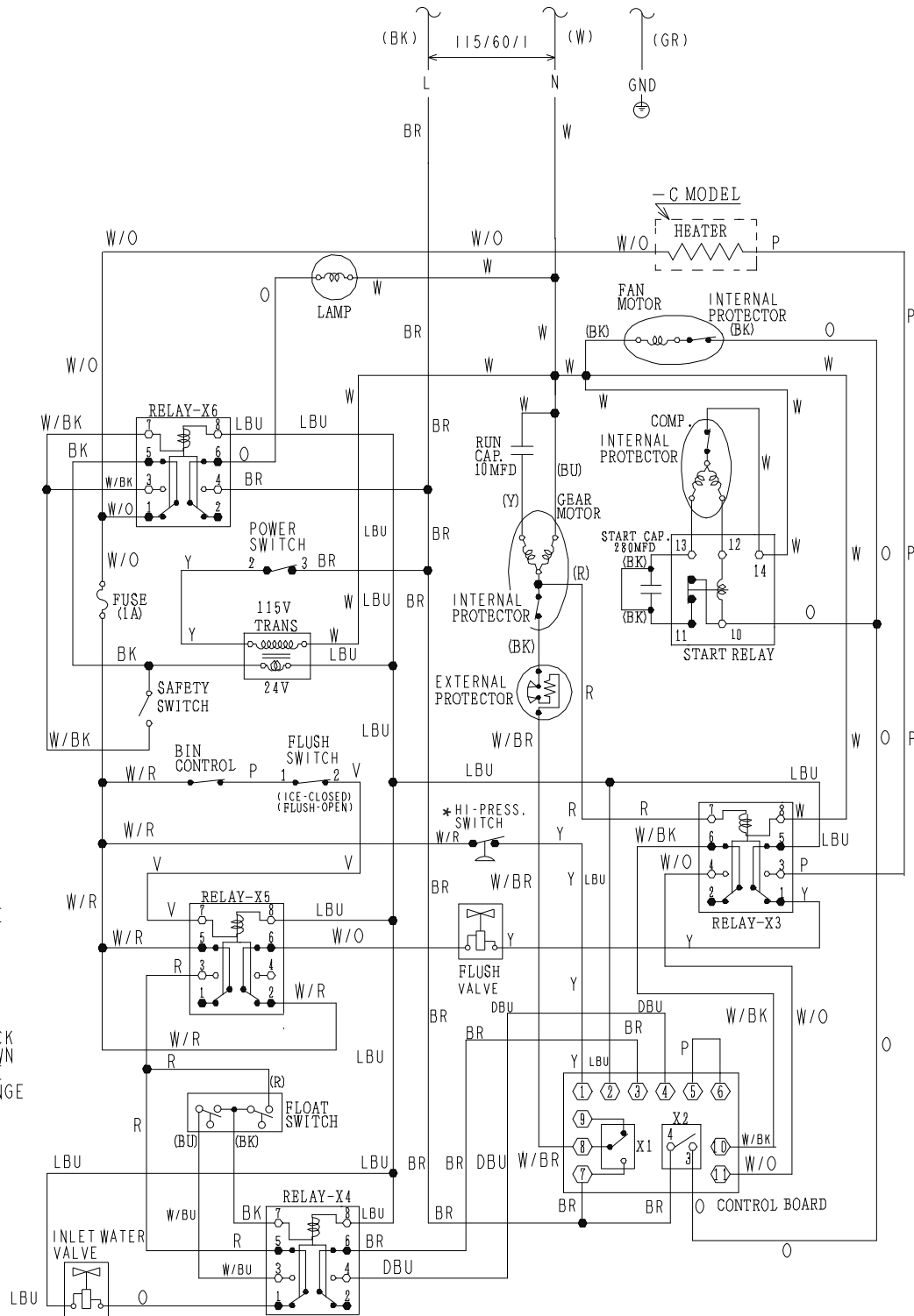
APPROXIMATE ICE PRODUCTION PER 24 HR.	Ambient Temp. (°F)	Water Temp. (°F)					
		50		70		90	
	70	*330	*(150)	315	(143)	300	(136)
	80	290	(132)	280	(127)	270	(123)
	90	255	(116)	*250	*(113)	235	(107)
lbs./day (kg/day)	100	230	(104)	220	(100)	*205	*(93)
APPROXIMATE ELECTRIC CONSUMPTION	70	*562	--	568	--	574	--
	80	580	--	587	--	593	--
	90	599	--	*606	--	611	--
watts	100	617	--	623	--	*628	--
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70	*40	*(150)	38	(143)	36	(137)
	80	35	(132)	33	(126)	32	(121)
	90	31	(117)	*30	*(113)	28	(107)
gal./day (l/day)	100	27	(103)	26	(99)	*25	*(93)
EVAPORATOR OUTLET TEMP.	70	*16	*(-9)	16	(-9)	16	(-9)
	80	16	(-9)	13	(-10)	13	(-10)
	90	13	(-10)	*13	*(-10)	12	(-11)
°F (°C)	100	12	(-11)	12	(-11)	*12	*(-11)
HEAD PRESSURE	70	*320	*(22.5)	320	(22.5)	320	(22.5)
	80	299	(21.0)	299	(21.0)	299	(21.0)
	90	279	(19.6)	*279	*(19.6)	279	(19.6)
PSIG (kg/cm <sup>2</sup> G)	100	212	(14.9)	212	(14.9)	*212	*(14.9)
SUCTION PRESSURE	70	*36	*(2.6)	36	(2.6)	36	(2.6)
	80	39	(2.8)	39	(2.8)	39	(2.8)
	90	42	(3.0)	*42	*(3.0)	42	(3.0)
PSIG (kg/cm <sup>2</sup> G)	100	45	(3.2)	45	(3.2)	*45	*(3.2)
TOTAL HEAT OF REJECTION	3800 BTU/h (AT 90°F /WT 70°F)						

## 2. F-330BAH-C

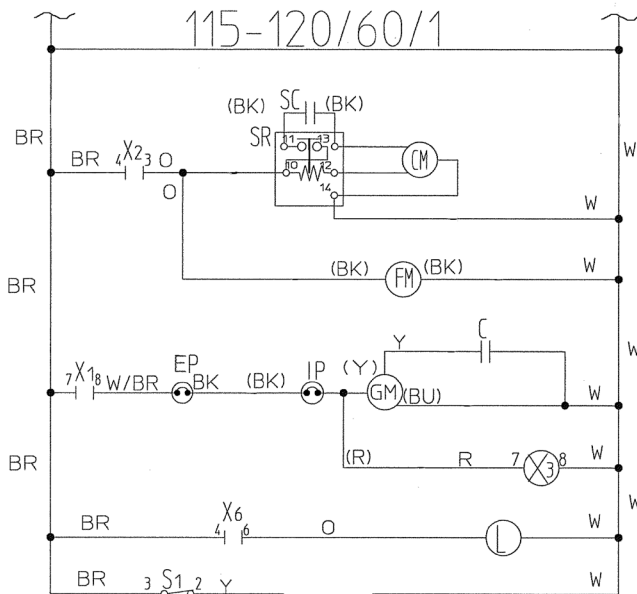
APPROXIMATE ICE PRODUCTION PER 24 HR.	Ambient Temp. (°F)	Water Temp. (°F)					
		50		70		90	
	70	*320	*(145)	300	(136)	290	(132)
	80	275	(125)	265	(120)	250	(114)
	90	240	(109)	*230	*(104)	220	(100)
lbs./day (kg/day)	100	210	(95)	200	(91)	*190	*(86)
APPROXIMATE ELECTRIC CONSUMPTION	70	*607	--	613	--	619	--
	80	625	--	632	--	638	--
	90	644	--	*650	--	654	--
watts	100	658	--	661	--	*665	--
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70	*38	*(145)	36	(137)	35	(131)
	80	33	(125)	32	(120)	30	(114)
	90	29	(109)	*28	*(104)	26	(100)
gal./day (l/day)	100	25	(95)	24	(91)	*23	*(86)
EVAPORATOR OUTLET TEMP.	70	*16	*(-9)	16	(-9)	16	(-9)
	80	16	(-9)	13	(-10)	13	(-10)
	90	13	(-10)	*13	*(-10)	12	(-11)
°F (°C)	100	12	(-11)	12	(-11)	*12	*(-11)
HEAD PRESSURE	70	*320	*(22.5)	320	(22.5)	320	(22.5)
	80	299	(21.0)	299	(21.0)	299	(21.0)
	90	279	(19.6)	*279	*(19.6)	279	(19.6)
PSIG (kg/cm <sup>2</sup> G)	100	212	(14.9)	212	(14.9)	*212	*(14.9)
SUCTION PRESSURE	70	*36	*(2.6)	36	(2.6)	36	(2.6)
	80	39	(2.8)	39	(2.8)	39	(2.8)
	90	42	(3.0)	*42	*(3.0)	42	(3.0)
PSIG (kg/cm <sup>2</sup> G)	100	45	(3.2)	45	(3.2)	*45	*(3.2)
TOTAL HEAT OF REJECTION	3800 BTU/h (AT 90°F /WT 70°F)						

# C. Wiring Diagrams

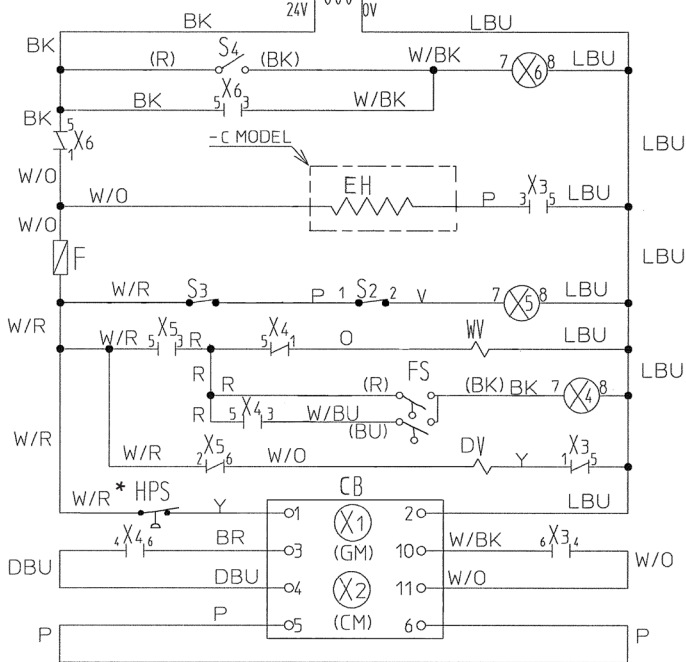
## 1a. F-330BAH(-C) Label Diagram Auxiliary Code C-0 and Earlier



# 1b. F-330BAH(-C) Ladder Diagram Auxiliary Code C-0 and Earlier

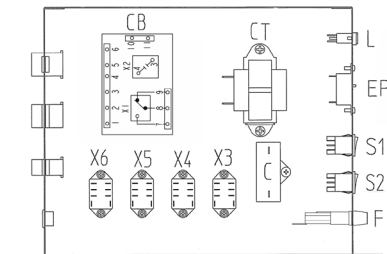


X1	GEAR MOTOR RELAY
X2	COMPRESSOR RELAY
X3	COMPRESSOR DELAY RELAY
X4	WATER CONTROL RELAY
X5	CONTROL RELAY
X6	SAFETY RELAY
CM	COMPRESSOR
GM	GEAR MOTOR
FM	FAN MOTOR
IP	INTERNAL PROTECTOR
EP	EXTERNAL PROTECTOR
L	LAMP
F	FUSE(1A)
S1	POWER SWITCH
S2	FLUSH SWITCH
S3	BIN CONTROL SWITCH
S4	SAFETY SWITCH
WV	INLET WATER VALVE
DV	FLUSH VALVE
FS	FLOAT SWITCH
HPS	HIGH PRESSURE SWITCH
CB	CONTROL BOARD
POWER	POWER CODE
EH	EVAPORATOR HEATER
SC	START CAPACITOR
SR	START RELAY
C	GEAR MOTOR CAPACITOR
CT	CONTROL TRANSFORMER

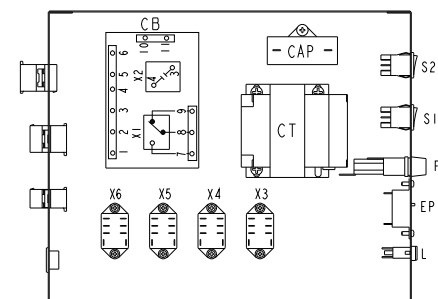


BK	BLACK
BR	BROWN
BU	BLUE
DBU	DARKBLUE
GR	GREEN
LBU	LIGHTBLUE
O	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW
W/BK	WHITE/BLACK
W/BR	WHITE/BROWN
W/BU	WHITE/BLUE
W/O	WHITE/ORANGE
W/R	WHITE/RED

## Auxiliary Code: S-0



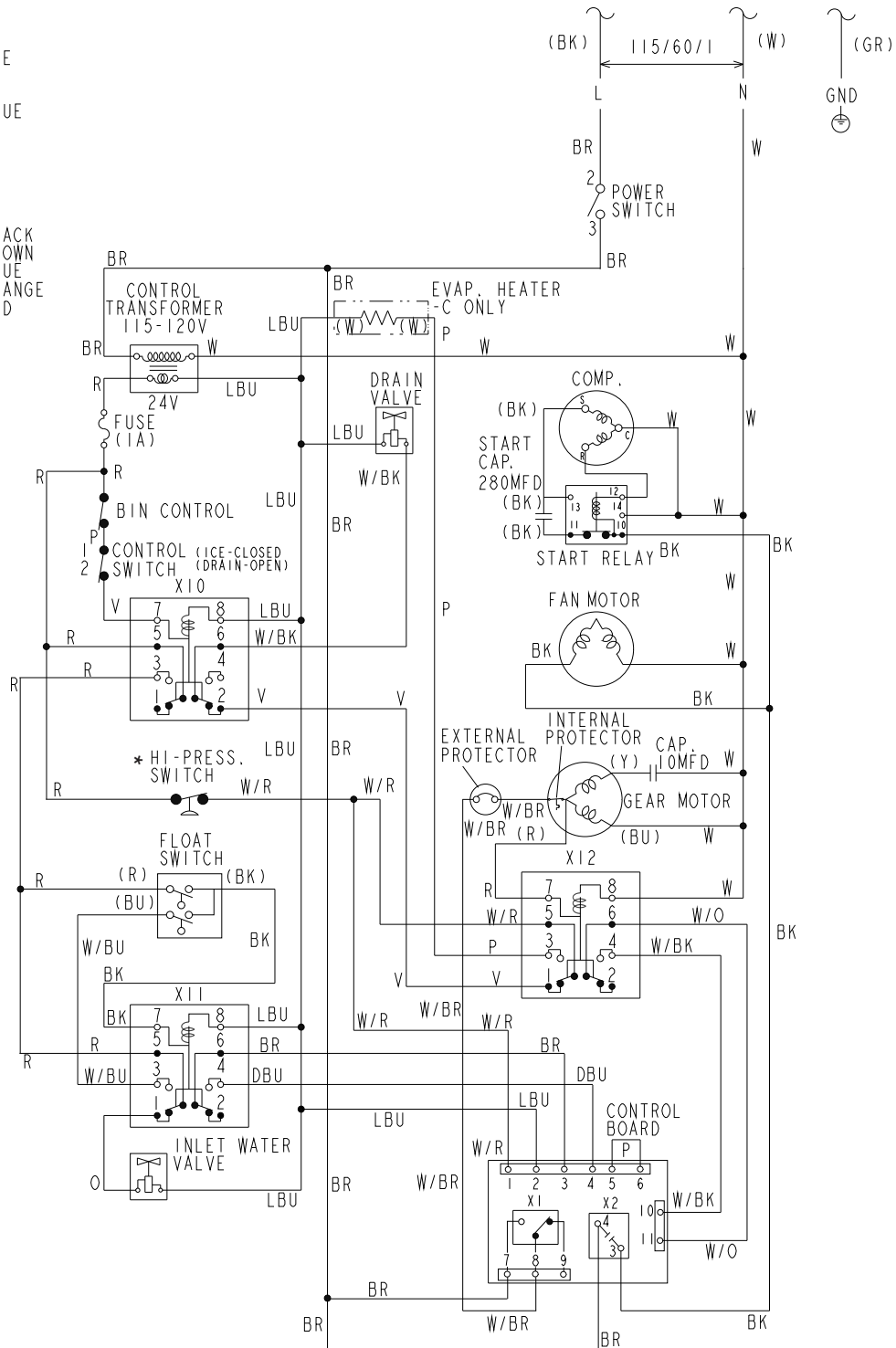
## Auxiliary Code: S-1 to C-0



*High-Pressure Switch	
Cut-out	426±22 PSIG
Cut-in	341±22 PSIG

## 2a. F-330BAH(-C) Label Diagram Auxiliary Code C-1 and Later

WIRE COLOR CODE  
 BK -BLACK  
 BR -BROWN  
 BU -BLUE  
 DBU -DARK BLUE  
 GR -GREEN  
 GY -GRAY  
 LBU -LIGHT BLUE  
 O -ORANGE  
 P -PINK  
 R -RED  
 V -VIOLET  
 W -WHITE  
 Y -YELLOW  
 W/BK -WHITE BLACK  
 W/BR -WHITE BROWN  
 W/BU -WHITE BLUE  
 W/O -WHITE ORANGE  
 W/R -WHITE RED



X1	GEAR MOTOR RELAY
X2	COMPRESSOR RELAY
X10	CONTROL RELAY
X11	WATER CONTROL RELAY
X12	COMPRESSOR DELAY RELAY

*High-Pressure Switch	
Cut-out	426±22 PSIG
Cut-in	341±22 PSIG



## 2b. F-330BAH(-C) Ladder Diagram Auxiliary Code C-1 and Later

WIRE	COLOR CODE
BK	-BLACK
BR	-BROWN
BU	-BLUE
DBU	-DARK BLUE
GR	-GREEN
GY	-GRAY
LBU	-LIGHT BLUE
O	-ORANGE
P	-PINK
R	-RED
V	-VIOLET
W	-WHITE
Y	-YELLOW
W/BK	-WHITE BLACK
W/BR	-WHITE BROWN
W/BU	-WHITE BLUE
W/O	-WHITE ORANGE
W/R	-WHITE RED

X1	GEAR MOTOR RELAY
X2	COMPRESSOR RELAY
X10	CONTROL RELAY
X11	WATER CONTROL RELAY
X12	COMPRESSOR DELAY RELAY

CAP	CAPACITOR (GEAR MOTOR)
CB	CONTROL BOARD
COMP	COMPRESSOR
CT	CONTROL TRANSFORMER
EP	EXTERNAL PROTECTOR
F	FUSE (1A)
FM	FAN MOTOR
FS	FLOAT SWITCH
GM	GEAR MOTOR
EH	EVAPORATOR HEATER
HPS	HIGH-PRESSURE SWITCH
IP	INTERNAL PROTECTOR
SC	START CAPACITOR
SR	START RELAY
S1	POWER SWITCH
S2	CONTROL SWITCH
S3	BIN CONTROL SWITCH
WV	INLET WATER VALVE
DV	DRAIN VALVE
X1	GEAR MOTOR RELAY
X2	COMPRESSOR RELAY
X10	CONTROL RELAY
X11	WATER CONTROL RELAY
X12	COMPRESSOR DELAY RELAY

*High-Pressure Switch	
Cut-out	426±22 PSIG
Cut-in	341±22 PSIG

