

# Hoshizaki America, Inc.

## Commercial Series Refrigerated Kitchen Equipment

Model  
Reach-In



“A Superior Degree  
of Reliability”

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

## SERVICE MANUAL



Number: 73179  
Issued: 6-18-2010

## **IMPORTANT**

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

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

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

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

Attn: Hoshizaki Technical Support Department

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

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

E-mail: techsupport@hoshizaki.com

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

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

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

## **IMPORTANT**

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

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## Important Safety Information

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

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

**CAUTION** Indicates a situation which could result in damage to the unit.

**IMPORTANT** Indicates important information about the use and care of the unit.

### **⚠ WARNING**

This unit 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 eventual damage caused by improper, incorrect, and unreasonable use.

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

- This unit requires an independent power supply. See the nameplate for proper voltage and breaker/fuse size. Failure to use a proper breaker or fuse can result in a tripped breaker, blown fuse, or damage to existing wiring. This could lead to heat generation or fire.
- **THIS UNIT MUST BE GROUNDED:** This unit is equipped with a 3-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.
- Do not use an extension cord.
- Make sure the power switch is in the "OFF" position before plugging in or unplugging the unit to reduce the risk of electric shock.
- Do not use a unit 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 unit, be sure to pull the plug, not the cord, and do not jerk the cord.
- To reduce the risk of electric shock, do not touch the plug or power switch with damp hands.
- This unit should be disassembled or repaired only by qualified service personnel to reduce the risk of electric shock, injury, or fire.
- Do not make any alterations to the unit. Alterations could result in electric shock, injury, fire, or damage to the unit.

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## I. Specifications

### A. Nameplate Ratings

Model	AC Supply Voltage	Amperes	Design Pressure (PSIG)		Refrigerant (oz.)	
			HIGH	LOW	R-134a	R-404A
CR1A-FS/HS	115/60/1	4.8	240	120	10.6	-
CF1A-FS/HS		8.1	450	250	-	13
CR2A-FS/HS		8	240	120	12.5	-
CF2A-FS/HS		12	450	250	-	16.9

See the nameplate for electrical and refrigeration specifications. The nameplate is located on the inner right side wall of the cabinet behind the front panel.

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

### B. Dimensions

#### 1. Refrigerated Volume and Shelf Space

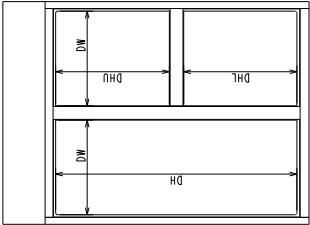
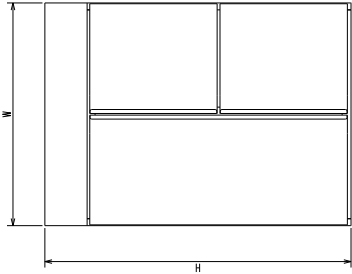
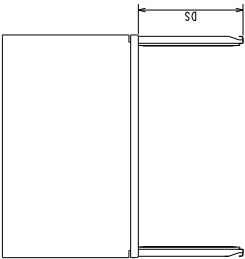
Model	Total Refrigerated Volume ft <sup>3</sup>	Total Shelf Space ft <sup>2</sup>
C_1A-FS/HS	20	11.5
C_2A-FS/HS	45	24.6

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

2. One Section/Two Section

Unit: mm (in.)

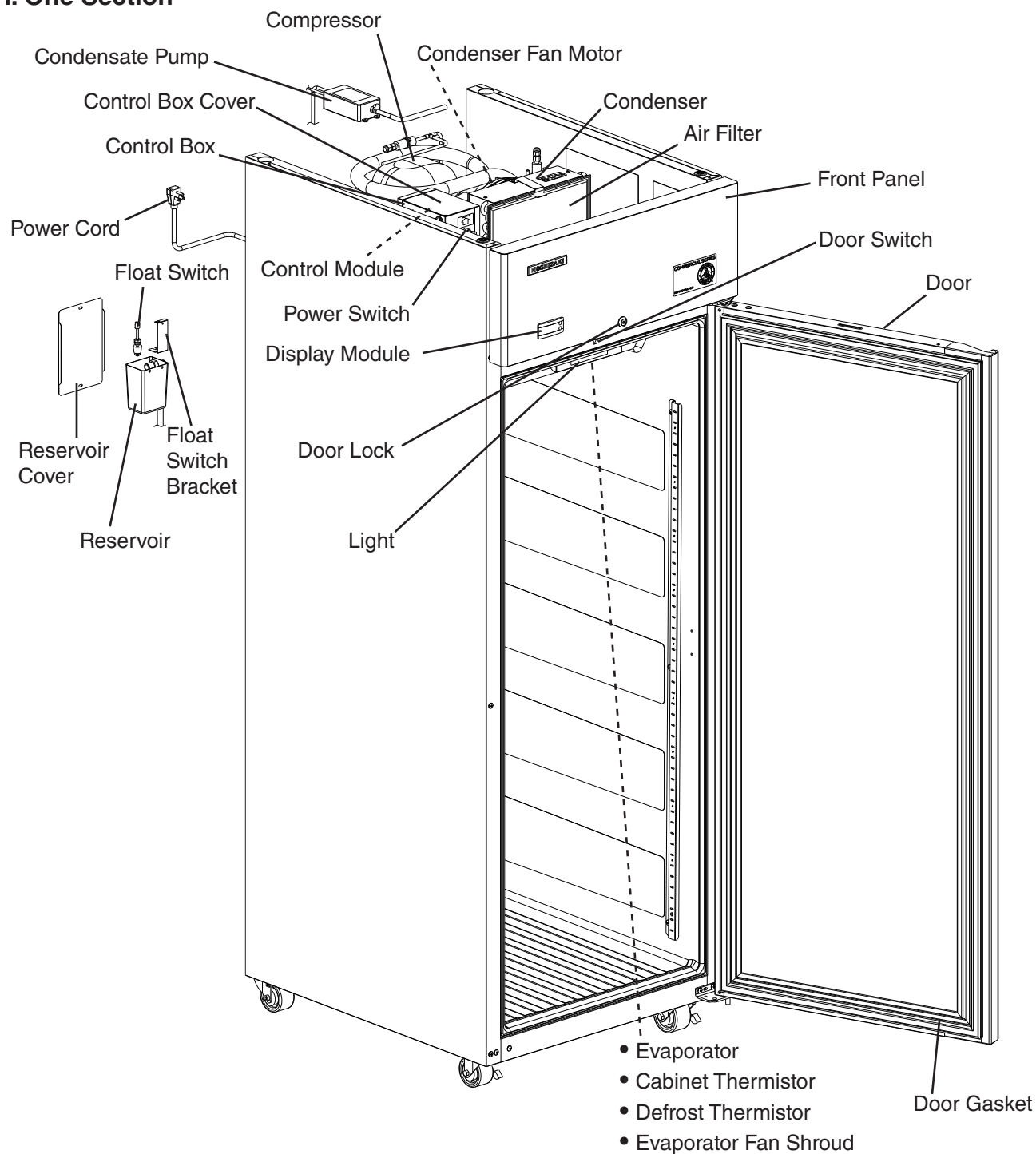
MODELS	EXTERIOR WIDTH (W)	EXTERIOR HEIGHT (H)	EXTERIOR DEPTH (D)	INTERIOR WIDTH	INTERIOR HEIGHT	INTERIOR DEPTH	DOOR OPENING WIDTH (DW)	DOOR OPENING HEIGHT (DH)	DOOR OPENING HEIGHT (DHU/DHL)	DOOR SWING (DS)	DOOR STAY OPEN POSITION	CASTER HEIGHT	LEG HEIGHT (OPTIONAL)
COMMERCIAL 1 SEC	698.5 (27.5)	1920.5 (75.61)	852.9 (33.58)	579 (22.80)	1513.6 (59.59)	711.2 (28)	579 (22.80)	1513.6 (59.59)	713.3 / 710.3 (28.08) / (27.96)	659 (25.94)	132.5°	101.6 (4)	153 ±28.6 (6.02 ±1.13)
COMMERCIAL 2 SEC	1397 (55)			1277.5 (50.30)			593.7 (23.37)						



## II. General Information

### A. Construction

#### 1. One Section

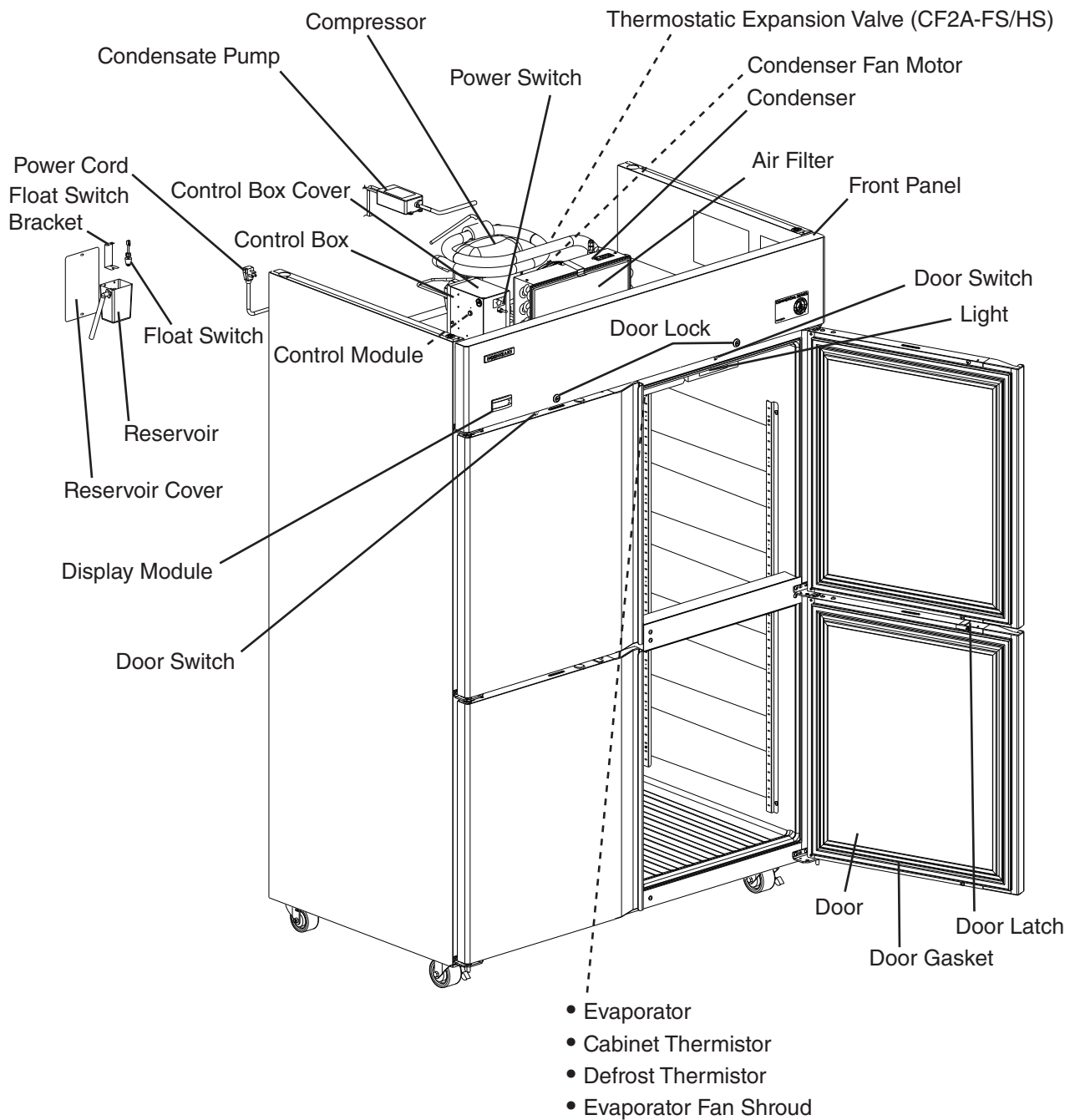


Model Shown: CR1A-FS

Models
CR1A-FS/HS and CF1A-FS/HS



## 2. Two Section



**Model Shown: CF2A-HS**

Models
CR2A-FS/HS and CF2A-FS/HS

## B. Sequence of Operation

### 1. Sequence Cycles and Shutdown

The steps in the sequence are as outlined below.

Note: 1. There is a slight delay at startup.

2. There is a 2-minute minimum Comp on time and a 2-minute minimum Comp off time.
3. EvapFM de-energizes when door is opened on FS and when upper door is opened on HS.
4. A float-switch controlled condensate pump (located on top of the unit) is used to pump evaporator condensation to the condensate pan.
5. On freezers, EvapFM is de-energized during defrost.

#### a) Refrigerator

##### 1. Startup/Cool Down

EvapFM, MH, and PH energize. There is a slight delay before cabinet temperature appears on DM and Comp and ConFM energize.

##### 2. Cool Down Achieved

CM monitors cooling of the cabinet via CTh. CTh cools to 3°F (1.7°C) below setpoint. EvapFM, MH, and PH continue. Comp and ConFM de-energize.

##### 3. Cool Down Restart

CTh warms to 3°F (1.7°C) above setpoint. EvapFM, MH, and PH continue. Comp and ConFM energize.

##### 4. Defrost

"dEF" is displayed during defrost. There is a 20-minute minimum defrost time and a 1-hour maximum defrost time.

- a) Temperature Initiation: When DTh cools to 8.6°F (-13°C) defrost begins. EvapFM, MH, and PH continue. Comp and ConFM de-energize.
- b) Manual Initiation: Manual defrost may be initiated by pressing and holding the lower button until "dEF" appears on DM. EvapFM, MH, and PH continue. Comp and ConFM de-energize.
- c) Termination: DTh warms to 40°F (4.4°C). EvapFM, MH, and PH continue. Comp and ConFM energize, 2-minute temperature display delay timer starts.  
2-minute temperature display delay timer terminates and temperature display returns to DM.

Note: There is a 2-hour minimum defrost interval.

Legend: **CM**—control module; **Comp**—compressor; **ConFM**—condenser fan motor; **CTh**—cabinet thermistor; **DM**—display module; **DTh**—defrost thermistor; **EvapFM**—evaporator fan motor; **MH**—mullion heater; **PH**—perimeter heater

## **b) Freezer**

### **1. Startup/Cool Down**

MH and PH energize. There is a slight delay before cabinet temperature appears on DM and Comp, ConFM, and EvapFM energize.

### **2. Cool Down Achieved**

CM monitors cooling of the cabinet via CTh. CTh cools to 3°F (1.7°C) below setpoint. EvapFM, MH, and PH continue. Comp and ConFM de-energize.

### **3. Cool Down Restart**

CTh warms to 2°F (1.1°C) above setpoint. EvapFM, MH, and PH continue. Comp and ConFM energize.

### **4. Defrost**

"dEF" is displayed during defrost. There is a 5-minute minimum defrost time and a 1-hour maximum defrost time.

a) Temperature/Time Initiation: DTh cools to 32°F (0°C), then a 4-hour cumulative Comp run timer starts. Once 4-hour cumulative Comp run timer terminates and DTh is at or below 32°F (0°C), defrost begins. DH energizes, MH and PH continue, Comp, ConFM, and EvapFM de-energize.

b) Manual Initiation: Manual defrost may be initiated by pressing and holding the lower button until "dEF" appears on DM. MH and PH continue. DH energizes, Comp, ConFM, and EvapFM de-energize.

#### **c) Termination**

(1) After Temperature/Time Initiation: DTh warms to 59°F (15°C). 3-minute Comp delay timer starts, 8-minute EvapFM delay timer starts, and 13-minute temperature display delay timer starts. MH and PH continue, DH de-energizes.

3-minute Comp delay timer terminates. Comp and ConFM energize. 5 minutes later, 8-minute EvapFM delay timer terminates and EvapFM energizes. 5 minutes after EvapFM energizes, 13-minute temperature display delay timer terminates and cabinet temperature returns to DM.

(2) After Manual Initiation: DTh warms to 59°F (15°C). MH and PH continue, DH de-energizes. 3-minute Comp/EvapFM delay timer starts, 13-minute temperature display delay timer starts.

3-minute Comp delay timer terminates. Comp, ConFM, and EvapFM energize. 10 minutes later, 13-minute temperature display delay timer terminates and cabinet temperature returns to DM.

Note: There is a 4-hour minimum defrost interval.

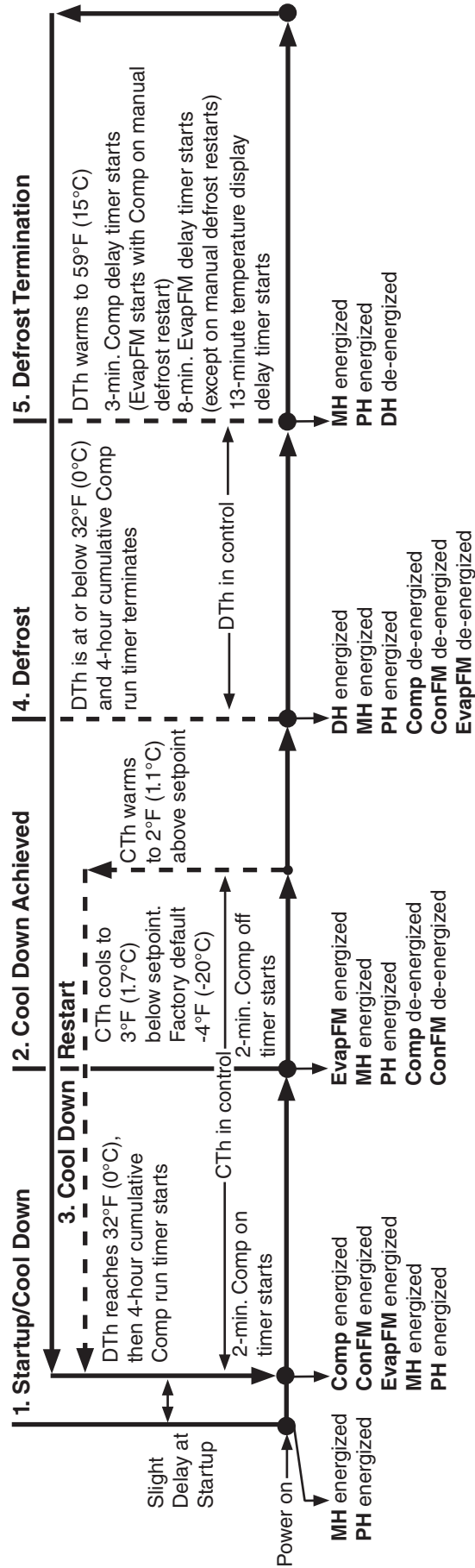
Legend: **CM**—control module; **Comp**—compressor; **ConFM**—condenser fan motor; **CTh**—cabinet thermistor; **DH**—defrost heater; **DM**—display module; **DTh**—defrost thermistor; **EvapFM**—evaporator fan motor; **MH**—mullion heater; **PH**—perimeter heater

**a) Refrigerator**



b) Freezer

Freezer Sequence Flow Chart



Note:

- a) EvapFM de-energizes when door is opened on FS and when upper door is opened on HS.
- b) 2-minute minimum Comp on timer starts when Comp energizes.
- c) 2-minute minimum Comp off timer starts when Comp de-energizes.
- d) 3-minute Comp delay timer starts when defrost termination temperature is met.
- e) 8-minute EvapFM delay timer starts when defrost termination temperature is met.
- f) 13-minute temperature display delay timer starts when defrost termination temperature is met.
- g) 5-minute minimum defrost time.
- h) 1-hour maximum defrost time.

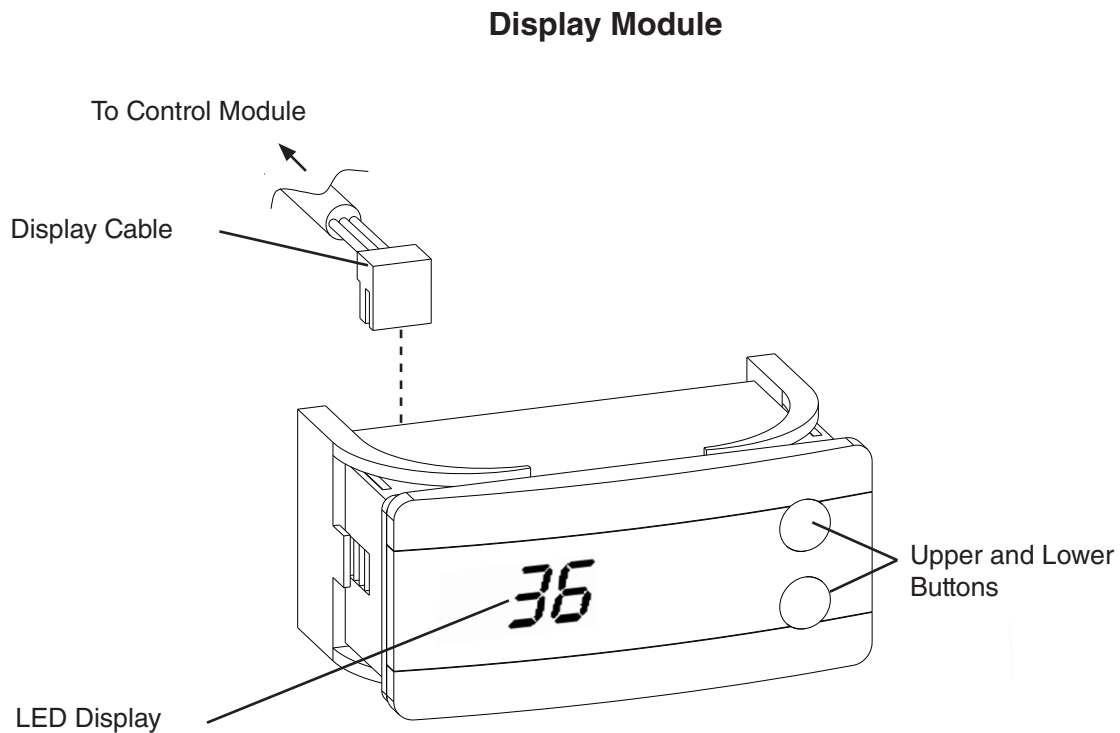
Legend:

- Comp-compressor
- ConFM-condenser fan motor
- CTh-cabinet thermostat
- DH-defrost heater
- DTh-defrost thermostat
- EvapFM-evaporator fan motor
- MH-mullion heater
- PH-perimeter heater

## C. Display Module

When the power switch is moved to the "ON" position there is a slight delay, then the current cabinet temperature is displayed. From the display module, the cabinet setpoint and temperature display scale can be changed. For further details, see "II.C.2. Controls and Adjustments."

### 1. Display Module Layout



**Fig. 1**

## **2. Controls and Adjustments**

### **a) Default Settings**

1. Temperature Setting: Refrigerator: 36°F (3°C).  
Freezer: -4°F (-20°C).
2. Temperature Display Scale: F.

### **b) Temperature Setpoint**

The temperature setpoint is the value for the average cabinet temperature. The temperature differential for the compressor to turn on and off is  $\pm 3^{\circ}\text{F}$  ( $\pm 1.7^{\circ}\text{C}$ ) of the temperature setpoint for refrigerators and  $+2^{\circ}\text{F}/-3^{\circ}\text{F}$  ( $+1.1^{\circ}\text{C}/-1.7^{\circ}\text{C}$ ) of the temperature setpoint for freezers. For example, for a refrigerator temperature setpoint of 36°F (2°C), the compressor comes on at 39°F (3.7°C), and the compressor goes off at 33°F (0.3°C). If necessary, adjust the temperature setpoint as follows:

- 1) Press and hold the upper or lower button briefly, then release. The current temperature setpoint flashes. Press the upper or lower button until the desired value is displayed. After a few seconds, the display returns to the current cabinet temperature and the temperature setpoint is saved.
  - For refrigerators, the temperature setpoint is adjustable between 33°F and 52°F (-1°C and 11°C). Factory default is 36°F (3°C).
  - For freezers, the temperature setpoint is adjustable between -16°F and +12°F (-27°C and -11°C). Factory default is -4°F (-20°C).

### **c) Changing the Temperature Display Scale (F or C)**

To change the temperature display scale, press the upper button for 5 seconds. The current setting is displayed. Press the upper button to change the scale. After a few seconds, the display returns to the current cabinet temperature and the setting is saved. The factory default is F.

Note: Pressing the upper and lower button at the same time for 5 seconds (or until "- - -" appears on the display module), turns the compressor, condenser fan motor, and evaporator fan motor (freezer) off. To turn the unit on again, press the upper and lower button together for 5 seconds until the cabinet temperature appears on the display module.

### **d) Manual Defrost**

Manual defrost may be initiated by pressing and holding the lower button for 5 seconds. "dEF" appears in the display. For further details, see "II.B.1. Sequence Cycles and Shutdown."

## D. Control Module

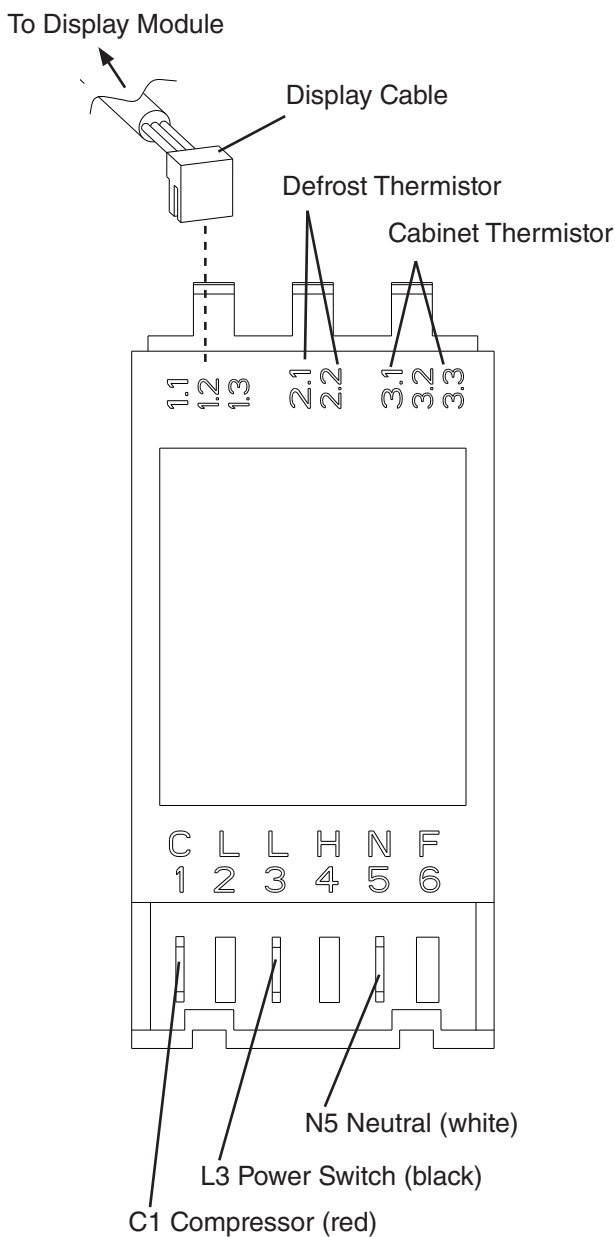
All models are pretested and factory set.

### CAUTION

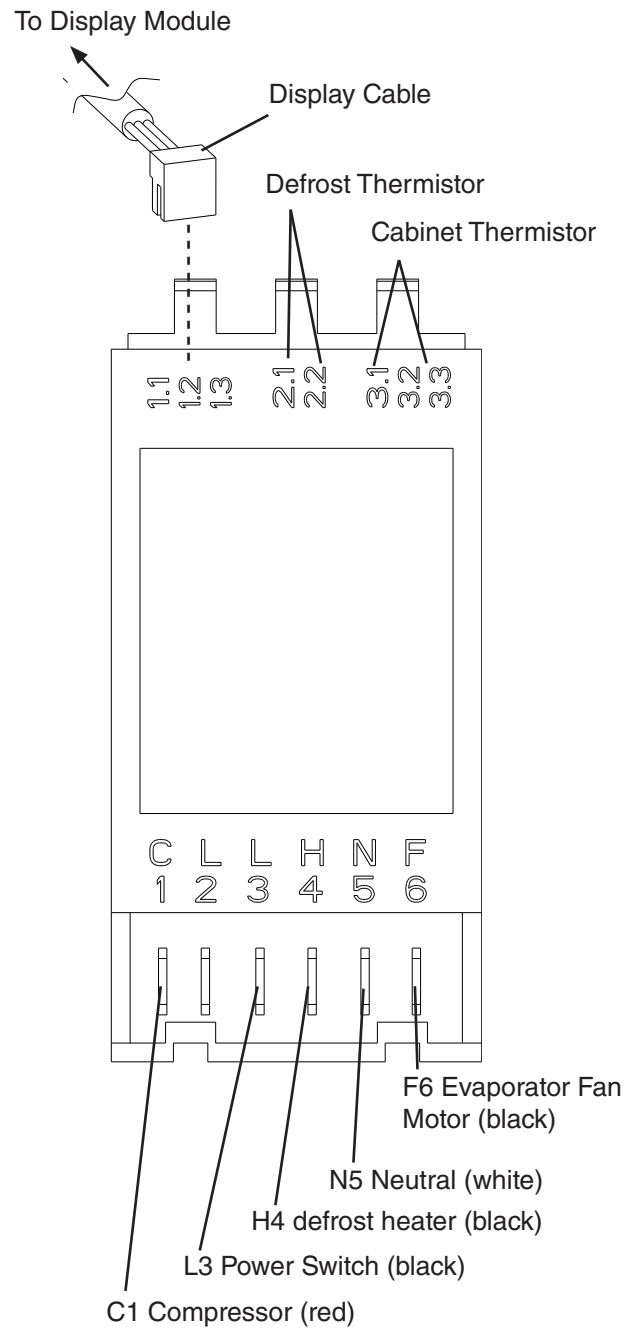
1. The control module is fragile, handle very carefully.
2. Do not change wiring and connections. Never misconnect terminals.
3. Do not short out power supply to test for voltage.

### 1. Control Module Layout

#### Refrigerator Control Module



#### Freezer Control Module



**Fig. 2**



## 2. Alarm Safeties

Alarm signals are designed to protect the unit and food product. These alarms give information or warnings in the event the unit is operating out of acceptable parameters. Should one of the alarms occur, follow the instructions in the table below to address the alarm. The alarm code flashes once every second with audible alarm.

Alarm Signals		
Alarm Code	Problem	Corrective Action/Reset Details
E1	Cabinet Thermistor Malfunction Alarm  Cabinet thermistor has failed.	Cabinet thermistor disconnected, shorted, or open. Check connection and continuity. Reconnect or replace as needed.  E1 flashes with audible alarm every second. Unit cycles 5 min. on, 5-min. off.
E2	Defrost Thermistor Malfunction Alarm  Defrost thermistor has failed.	Defrost thermistor disconnected, shorted, or open. Check connection and continuity. Reconnect or replace as needed.  E2 flashes with audible alarm every second. Unit cycles on and off with cabinet thermistor.
UHi	High Voltage Alarm (135VAC $\pm$ 5% or more)	The compressor de-energizes if voltage protection operates. The voltage safeties automatically reset when voltage is corrected.
ULo	Low Voltage Alarm (96VAC $\pm$ 5% or less)	
E13	Communication Error Alarm  Communication between the control module and the display module has been interrupted or disconnected.	Check the connections at the control module and the display module. If connections are good, the control module and display module must be replaced.  The unit operates on a set 5-minutes on, 5-minutes off cycle until communication is restored.
" _ _ _ "	Compressor Off	Unit (compressor) off.  Press and hold the upper and lower buttons until the temperature appears on the display.

## **F. Compressor Overload and Short Cycle Protection**

### **1. Compressor Overload**

#### **a) Refrigerator**

The refrigerator compressor is protected by an external compressor overload and a high-pressure switch (2-section). When the compressor temperature or amperage value is above the limit specified by the compressor manufacturer, the external compressor overload activates, turning off the compressor. The compressor restarts when the external overload resets.

- If the condenser fan motor is operating and the compressor is off, it is most likely that the external compressor overload opened.

#### **b) Freezer**

The 1-section freezer compressor is protected by an internal compressor overload and a high-pressure switch. The 2-section freezer is protected by an external compressor overload and a high-pressure switch. When the compressor temperature or amperage value is above the limit specified by the compressor manufacturer, the compressor overload activates, turning off the compressor. The compressor restarts when the overload resets. When the refrigerant pressures exceed the high-pressure switch value, the compressor relay is de-energized, turning off the compressor. The compressor restarts when the high-pressure switch resets and energizes the compressor relay.

- If the condenser fan motor is operating and the compressor is off, it is most likely that the compressor overload opened. If both the compressor and condenser fan motor are off, it is most likely the unit is off or the high-pressure switch has opened. For further details, see "IV. Service Diagnosis."

### **2. Short Cycle Protection**

There is a 2-minute minimum compressor off timer for any restart after 1-minute of compressor run time.

There is also a 2-minute minimum compressor on timer.

Note: Time may vary with high-pressure switch or compressor overload activation.

## **G. Mullion/Perimeter Heater**

Some models are equipped with perimeter and/or mullion heaters. The heaters are energized as soon as the power switch is turned on.

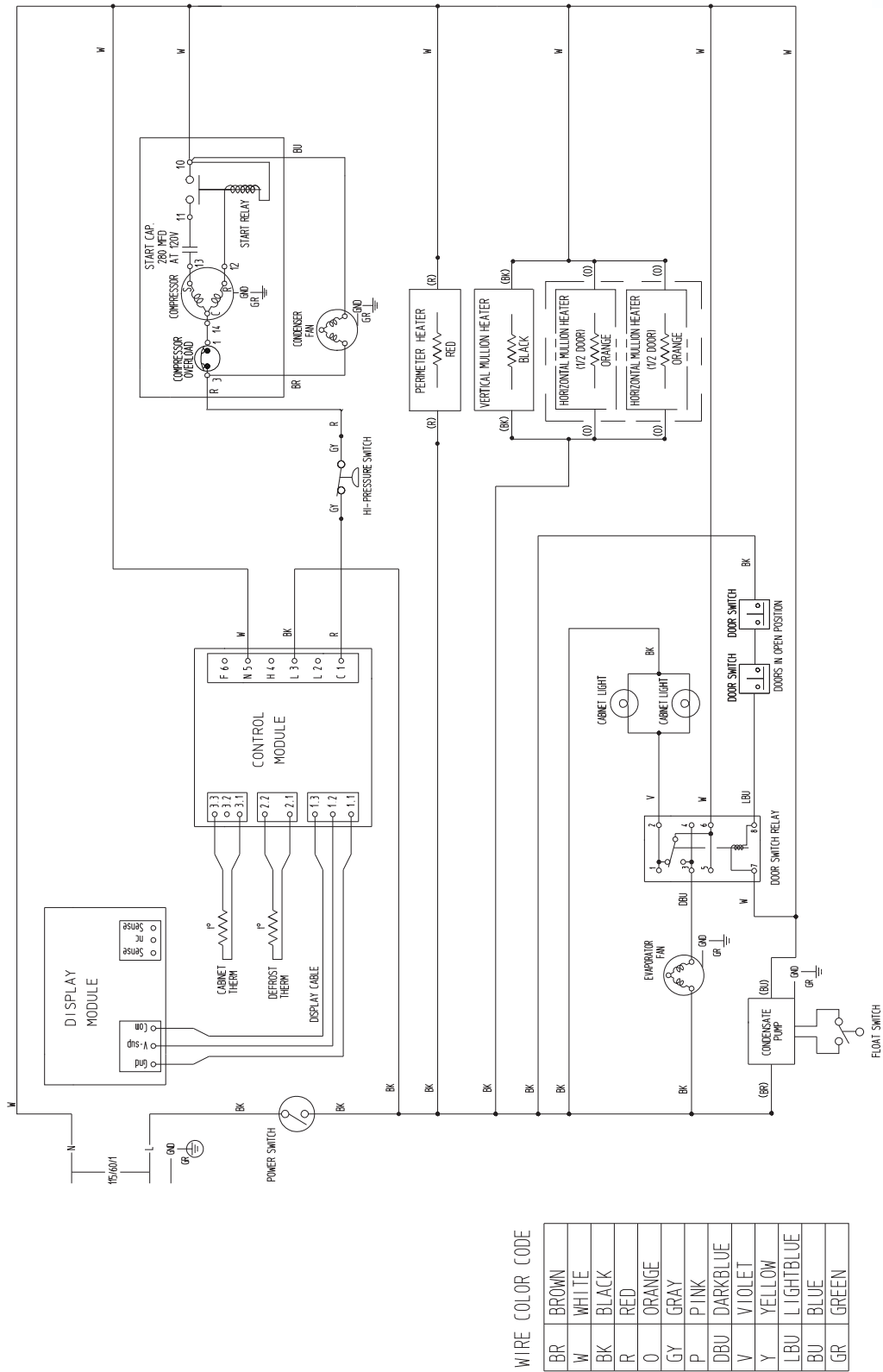
## **H. Thermistors**

The cabinet thermistor is used for cabinet temperature control and the defrost thermistor is used for defrost cycle initiation and termination. Thermistor resistance varies depending on temperature. The control module monitors the resistance to control system operation. No adjustment is required. For further details, see "IV.C. Thermistor Check."

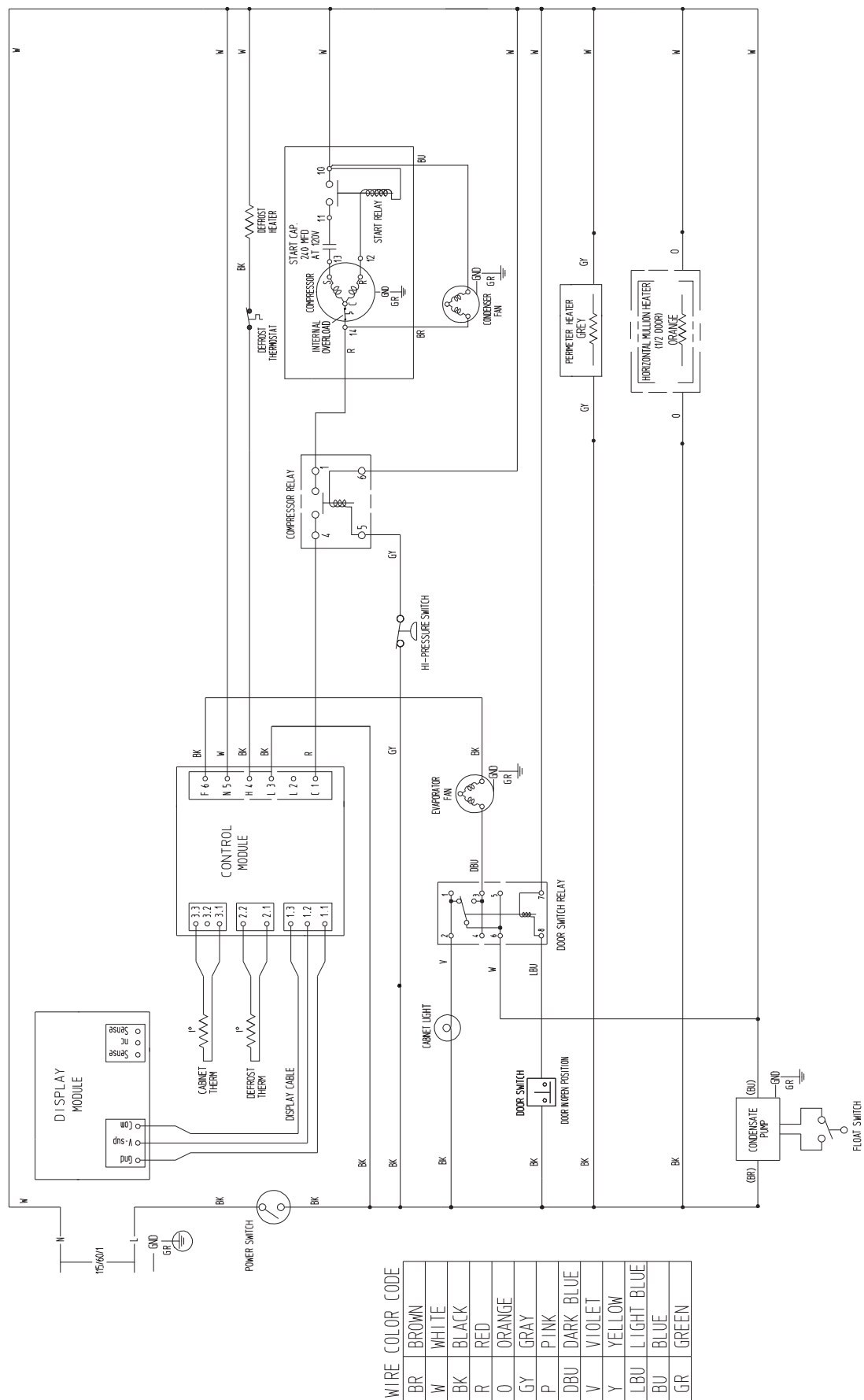
## 1. CR1A-FS/HS



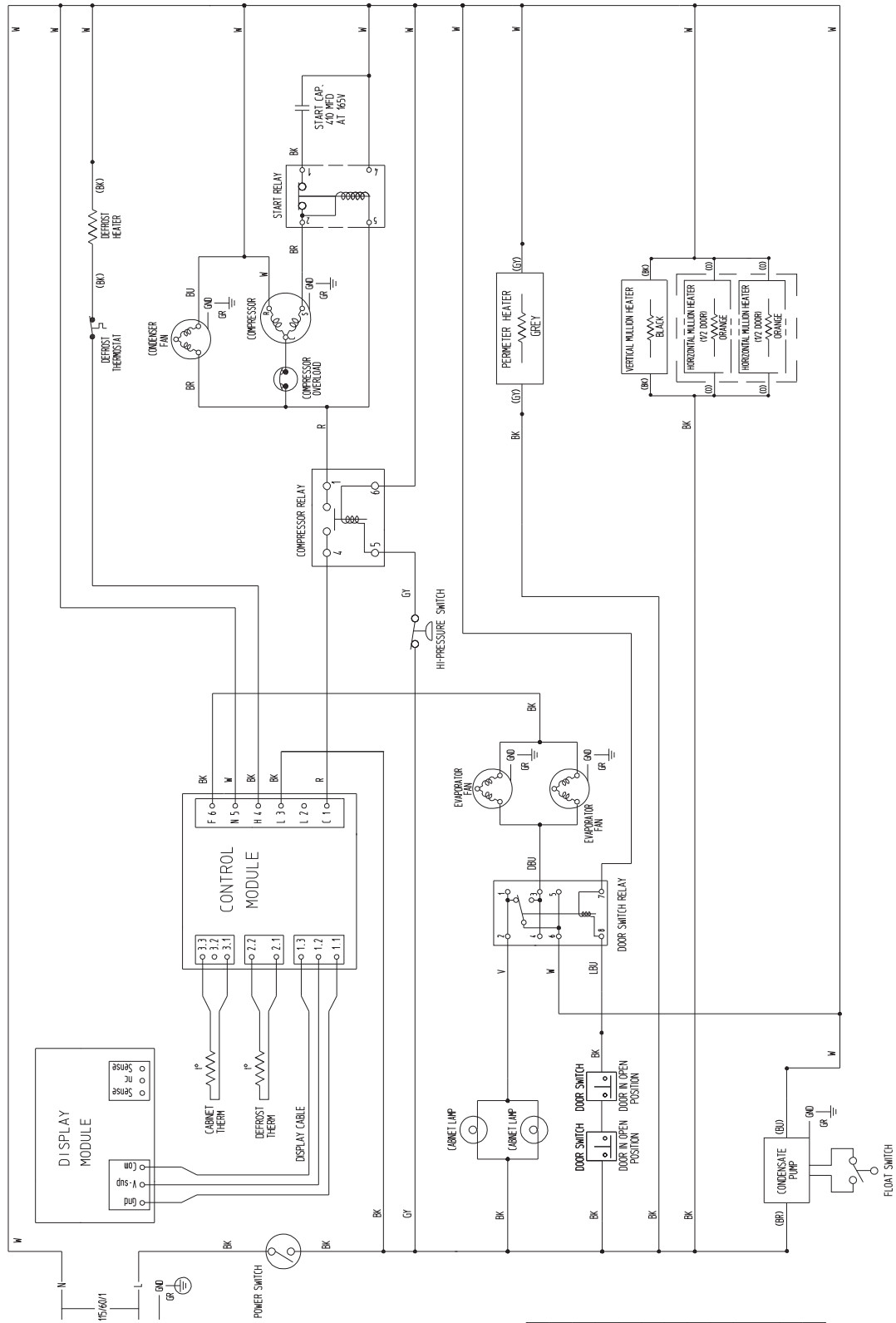
# 2. CR2A-FS/HS



### 3. CF1A-FS/HS



## 4. CF2A-FS/HS



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

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## IV. Service Diagnosis

### WARNING

1. This unit should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
2. Risk of electric shock. Use extreme caution and exercise safe electrical practices.
3. Moving parts (e.g., fan blade) can crush and cut. Keep hands clear.
4. Make sure all food zones are clean after the unit is serviced. For cleaning procedures, see "VI. Cleaning Instructions."

## A. Diagnostic Procedure

### WARNING

The evaporator fan motor and cabinet light have a constant 115VAC supplied to them. These 2 components switch on and off through the operation of the door switch relay. When the door switch relay de-energizes (door open), relay contact terminals 6 (white (W)) and 2 (violet (V)) close to complete the neutral wire (white (W)) circuit to the cabinet light. When the door switch relay energizes (door closed), relay contact terminals 6 (white (W)) and 3 (dark blue (DBU)) close to complete the neutral wire (white (W)) circuit to the evaporator fan motor. This switching of the neutral wire differs from conventional switching of the power wire.

The diagnostic procedure is basically a sequence check that allows you to diagnose the electrical system and components. Before proceeding, check for correct installation and proper voltage per unit nameplate. As you go through the diagnostic procedure, check to assure the components energize and de-energize correctly. If not, those components or controls are suspect. Always choose a white (W) neutral wire to establish a good neutral connection when checking high voltages. If the display module is in alarm, see "II.D.2. Alarm Safeties." For further details, see "IV.B. Control Module Check." For factory default settings, see "II.C.2.a) Default Settings."

### **IMPORTANT**

The maximum allowable voltage variation is 10 percent of the nameplate rating. 115VAC is used as a reference voltage when checking voltage to components. Voltage may vary depending on power supply.

- 1) Move the power switch to the "OFF" position.
- 2) Unplug the unit from the electrical outlet.
- 3) Remove the control box cover.
- 4) Plug the unit back into the electrical outlet.
- 5) Move the power switch to the "ON" position.
- 6) Confirm proper supply voltage (115VAC) to the power switch.

Continue to "IV.A.1. Refrigerator" or "IV.A.2. Freezer."

## 1. Refrigerator

7) **Startup/Cool Down**—EvapFM, MH, and PH energize. There is a slight delay, then Comp and ConFM energize and cabinet temperature appears on DM.

a) **Startup Diagnosis:** Check that EvapFM energizes. If not, confirm that the door(s) are closed and DS contacts are closed. Check EvapFM blade for binding. Next, check for 115VAC at DSR (terminals 7 (white (W)) and 8 (light blue (LBU))). If 115VAC is not present, check DS continuity. If 115VAC is present, check DSR coil continuity and contact continuity between terminals 6 (white (W)) and 3 (dark blue (DBU))). If coil or contacts are open, DSR is bad and must be replaced. If DSR is good, check EvapFM continuity.

b) **Cool Down Diagnosis:** Confirm that Comp and ConFM energize and cabinet temperature appears on DM. If not, confirm 115VAC between CM L3 and CM N5. If 115VAC is not present, confirm wiring connections are secure for both the power wire (CM L3) and the neutral wire (CM N5). If 115VAC is present and DM is off, check that the display cable between CM and DM is not disconnected; reconnect if loose. If DM is still off, CM or DM may be bad, so replace both. Next, check that Comp and ConFM are energized. If not, check for 115VAC between CM C1 and CM N5. If 115VAC is present between CM L3 and CM N5 (above) and not between CM C1 and CM N5, check CTh status. See "IV.C.Thermistor Check." If CTh ohm reading is in proper range, CM is bad and must be replaced. If 115VAC is present between CM C1 and CM N5, check continuity of HPS (2-section). If open, allow time for HPS to reset. If HPS does not reset, replace HPS and diagnose reason for HPS activation. See "IV.A.1.7)c) HPS Activation (2-section)." Check for 115VAC at Comp terminals, Comp external overload, start components, and Comp and ConFM motor windings. Check Comp and ConFM motor winding continuity.

If Comp and ConFM are energized and the cabinet does not cool down, check for a restriction in the refrigeration circuit, and correct refrigerant charge.

c) **HPS Activation (2-section):** Confirm ConFM is energized and fan blade turns freely. Check that the condenser coil is not clogged or restricted. Check that there are no restrictions in the refrigeration circuit (drier).

Confirm that the location meets factory requirements:

- This unit is not intended for outdoor use. Normal operating ambient temperature should be within 45°F to 100°F (7°C to 38°C).
- The unit should not be located next to ovens, grills, or other high heat producing equipment.
- The unit should not be located in a corrosive environment.
- The unit should be a minimum of 4" (11 cm) from side walls.
- A minimum of 10" (25 cm) overhead clearance should be provided for proper ventilation.

8) **Cool Down Achieved**—CTh cools to 3°F (1.7°C) below setpoint. EvapFM, MH, and PH continue. Comp and ConFM de-energize. **Diagnosis:** If Comp and ConFM do not de-energize, confirm CTh status. See "IV.C.Thermistor Check." If CTh ohm reading is in range and Comp and ConFM do not de-energize, CM is defective and must be replaced.



## 9) Defrost

*Temperature-Initiated Defrost:* DTh cools to 8.6°F (-13°C). EvapFM, MH, and PH continue. Comp and ConFM de-energize.

*Defrost Termination:* DTh warms to 40°F (4.4°C). EvapFM, MH, and PH continue. Comp and ConFM energize. 2-minute temperature display delay timer starts. 2 minutes later, cabinet temperature appears on DM.

### Defrost Diagnosis:

*Defrost Initiation:* Has DTh cooled to 8.6°F (-13°C) or lower? Confirm DTh status. See "IV.C. Thermistor Check." If DTh is in proper range, confirm that Comp and ConFM de-energize. If not, check for 115VAC between CM C1 and CM N5. If 115VAC is present and DTh is within proper range, CM is defective and must be replaced.

*Defrost Termination:* Has DTh warmed to 40°F (4.4°C)? If not yet confirmed, confirm DTh status. See "IV.C. Thermistor Check." If DTh is in proper range, has Comp and ConFM energized? If not, check for 115VAC between CM C1 and CM N5. If 115VAC is not present, CM is defective and must be replaced. If 115VAC is present between CM C1 and CM N5 on 2-section refrigerator, check continuity of HPS. If open, allow time for HPS to reset. If HPS does not reset, replace HPS and diagnose reason for HPS activation. See "IV.A.1.7)c) HPS Activation (2-section)." On all models, check for 115VAC at Comp terminals, Comp external overload, start components, and Comp and ConFM motor windings. Check Comp and ConFM motor winding continuity. 2-minute temperature delay timer terminates, temperature display appears on DM.

- 10) **MH and PH Diagnosis:** Check that MH and PH energize. Check for 115VAC at MH and PH. If 115VAC is not present, check power supply and continuity of power switch. If 115VAC is present, check amp draw of MH or PH. If an amp reading is not present, check the continuity of MH or PH.

Legend: **CM**—control module; **Comp**—compressor; **ConFM**—condenser fan motor; **CTh**—cabinet thermistor; **DM**—display module; **DS**—door switch; **DSR**—door switch relay; **DTh**—defrost thermistor; **EvapFM**—evaporator fan motor; **HPS**—high-pressure switch; **MH**—mullion heater; **PH**—perimeter heater

## 2. Freezer

- 7) **Startup/Cool Down**—MH and PH energize. There is a slight delay, then Comp, ConFM, and EvapFM energize and cabinet temperature appears on DM. Once DTh reaches 32°F (0°C), 4-hour Comp cumulative run timer starts.
- a) **Startup Diagnosis:** Check that EvapFM energizes. If not, confirm that the door(s) are closed and DS contacts are closed. Check EvapFM blade for binding. Next, check for 115VAC at DSR (terminals 7 (white (W)) and 8 (light blue (LBU))). If 115VAC is not present, check DS continuity. If 115VAC is present, check DSR coil continuity and contact continuity between terminals 6 (white (W)) and 3 (dark blue (DBU))). If coil or contacts are open, DSR is bad and must be replaced. Next, check for 115VAC between CM F6 and CM N5. If 115VAC is not present, check between CM L3 and CM N5. If 115VAC is present between CM L3 and CM N5 and not between CM F6 and CM N5, CM is defective and must be replaced. If 115VAC is present between CM F6 and CM N5, check EvapFM continuity.

- b) **Cool Down Diagnosis:** Confirm that Comp and ConFM energize and cabinet temperature appears on DM. If not, confirm 115VAC between CM L3 and CM N5. If 115VAC is not present, confirm wiring connections are secure for both the power wire (CM L3) and the neutral wire (CM N5). If 115VAC is present and DM is off, check that the display cable between CM and DM is not disconnected; reconnect if loose. If DM is still off, CM or DM may be bad, so replace both. Next, check that Comp and ConFM are energized. If not, check for 115VAC between CM C1 and CM N5. If 115VAC is present between CM L3 and CM N5 (above) and not between CM C1 and CM N5, check CTh status. See "IV.C.Thermistor Check." If CTh ohm reading is in proper range, CM is bad and must be replaced. If 115VAC is present between CM C1 and CM N5, check for 115VAC on CR coil (terminals 5 and 6). If 115VAC is not present between CR 5 and CR 6, check continuity of HPS. If open, allow time for HPS to reset. If HPS does not reset, replace HPS and diagnose reason for HPS activation. See "IV.A.2.7)c) HPS Activation." If 115VAC is present between CR 5 and CR 6, and Comp and ConFM are not energized, check CR contact continuity. If open, CR is defective and must be replaced. If CR is good and Comp or ConFM are not energized, check for 115VAC at Comp terminals, Comp overload (internal on 1-section), start components, and Comp and ConFM motor winding continuity.

If Comp and ConFM are energized and the cabinet does not cool down, check for a restriction in the refrigeration circuit, correct TXV operation (if applicable), and correct refrigerant charge.

- c) **HPS Activation:** Confirm ConFM is energized and fan blade turns freely. Check that the condenser coil is not clogged or restricted. Check that there are no restrictions in the refrigeration circuit (drier, TXV).

Confirm that the location meets factory requirements:

- This unit is not intended for outdoor use. Normal operating ambient temperature should be within 45°F to 100°F (7°C to 38°C).
  - The unit should not be located next to ovens, grills, or other high heat producing equipment.
  - The unit should not be located in a corrosive environment.
  - The unit should be a minimum of 4" (11 cm) from side walls.
  - A minimum of 10" (25 cm) overhead clearance should be provided for proper ventilation.
- 8) **Cool Down Achieved**—CTh cools to 3°F (1.7°C) below setpoint. EvapFM, MH, and PH continue. Comp and ConFM de-energize. **Diagnosis:** If Comp and ConFM do not de-energize, confirm CTh status. See "IV.C. Thermistor Check." If CTh ohm reading is in proper range and Comp and ConFM do not de-energize, CM is defective and must be replaced.

## 9) Defrost

*Temperature/Time-Initiated Defrost:* Once DTh cools to 32°F (0°C), a 4-hour cumulative Comp run timer starts. Once DTh is at or below 32°F (0°C) and 4-hour cumulative Comp run timer terminates, MH and PH continue, DH energizes, and Comp, ConFM, and EvapFM de-energize. *Defrost Termination:* DTh warms to 59°F (15°C). MH and PH continue. DH de-energizes. 3-minute Comp delay timer starts, 8-minute EvapFM delay timer starts (3-minutes on manually initiated defrost), and 13-minute temperature display delay timer starts.

3-minute Comp delay timer terminates, Comp and ConFM energize. 5 minutes later, 8-minute EvapFM delay timer terminates and EvapFM energizes. 5 minutes after that, 13-minute temperature display delay timer terminates and cabinet temperature appears on DM.

### **Defrost Diagnosis:**

*Defrost Initiation:* Has DTh cooled to 32°F (0°C) or lower? Confirm DTh status. See "IV.C. Thermistor Check." Has 4-hour Comp cumulative run timer satisfied. Check that Comp, ConFM, and EvapFM de-energize. If not, check for 115VAC between CM C1 and CM N5, then between CM F6 and CM N5. If 115VAC is present, CM is defective and must be replaced. Confirm DH energizes. If not, check for 115VAC between CM H4 and CM N5. If 115VAC is not present and DTh is in proper range, CM is defective and must be replaced. If 115VAC is present, confirm DH amp draw and continuity.

*Defrost Termination:* Has DTh warmed to 59°F (15°C)? If not yet confirmed, confirm DTh status. See "IV.C. Thermistor Check." If DTh is not in proper range, confirm DH amp draw and continuity. If DTh is in proper range, DH de-energizes and 3 delay timers start.

*3-minute Comp delay timer terminates:* Have Comp and ConFM energized after DH is de-energized for 3 minutes? If not, check for 115VAC between CM C1 and CM N5. If 115VAC is not present, CM is defective and must be replaced. If 115VAC is present between CM C1 and CM N5, check for 115VAC on CR coil (terminals 5 and 6). If 115VAC is not present between CR 5 and CR 6, check continuity of HPS. If open, allow time for HPS to reset. If HPS does not reset, replace HPS and diagnose reason for HPS activation. See "IV.A.2.7)c) HPS Activation." If 115VAC is present between CR 5 and CR 6, and Comp and ConFM do not energize, check CR contact continuity. If open, CR is defective and must be replaced. If CR is good and Comp or ConFM do not energize, check for 115VAC at Comp terminals, check Comp overload (internal on 1-section), start components, and Comp and ConFM motor windings. Check Comp and ConFM motor winding continuity.

*8-minute EvapFM delay timer terminates (3-minutes on manually initiated defrost):* Confirm EvapFM energizes 5 minutes after Comp and ConFM energize.

*13-minute temperature display delay timer terminates:* Confirm cabinet temperature appears on DM 5 minutes after EvapFM energizes.

If components fail to start after delay timer terminates, CM is defective and must be replaced.

- 10) **MH and PH Diagnosis:** Check that MH and PH energize. Check for 115VAC at MH and PH. If 115VAC is not present, check power supply and continuity of power switch. If 115VAC is present, check amp draw of MH or PH. If an amp reading is not present, check the continuity of MH or PH.

Legend: **Comp**—compressor; **ConFM**—condenser fan motor; **CM**—control module; **CTh**—cabinet thermistor; **CR**—compressor relay; **DH**—defrost heater; **DM**—display module; **DSR**—door switch relay; **DTh**—defrost thermistor; **EvapFM**—evaporator fan motor; **HPS**—high-pressure switch; **MH**—mullion heater; **PH**—perimeter heater; **TXV**—thermostatic expansion valve

## B. Control Module Check

Before replacing a control module 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. Always choose a white (W) neutral wire to establish a good neutral connection when checking high voltages. Also, confirm that there is a good neutral connection to the control module terminal N5.

Alarm Reset: To silence the alarm, press and release the upper or lower button with power on. For alarm information, see "II.D.2. Alarm Safeties."

### Startup/Cool Down:

- 1) Check all wiring connections. Confirm that the display module cable, cabinet thermistor, and defrost thermistor are properly connected.
- 2) Move the power switch to the "ON" position.
- 3) Check for 115VAC between control module terminals L3 and N5. If 115VAC is not present, check power supply and power switch.
- 4) Check that the display module is on and cabinet temperature is displayed. If not, it is recommended that both the control module and display module be replaced.
- 5) Freezer: Check that the evaporator fan motor is energized. Make sure that the door(s) are closed and the door switch is engaged. Next, check for 115VAC between control module terminals F6 and N5. If 115VAC is not present, control module must be replaced.
- 6) Check that the compressor and condenser fan motor energize. If not, check for 115VAC between control module terminals C1 and N5. If 115VAC is not present, control module must be replaced.

### Defrost:

- 7) Press and hold the lower button until "dEF" appears on the display module.
- 8) Confirm that the compressor, condenser fan motor, and evaporator fan motor (freezer) de-energize. Check for 115VAC between control module terminals C1 and N5 for compressor and condenser fan motor, then between terminals F6 and N5 (freezer) for evaporator fan motor. If "dEF" is displayed and the compressor, condenser fan motor, or evaporator fan motor (freezer) are on, control module must be replaced.
- 9) Freezer: Confirm that the defrost heater energizes. Check for 115VAC between control module terminals H4 and N5. If "dEF" is displayed and 115VAC is not present, control module must be replaced.

10) Check that the components restart after defrost termination.

Refrigerator: Compressor and condenser fan motor energize as soon as the defrost thermistor termination temperature is satisfied. See "*Defrost Termination*" under "IV.A.1.9) Defrost" and "IV.C. Thermistor Check." If components fail to start, control module must be replaced.

Freezer: Compressor and condenser fan motor energize 3-minutes after defrost termination temperature is satisfied. Evaporator fan motor energizes 5-minutes after that (except manual defrost), and the cabinet temperature appears on the display module 5-minutes after the evaporator fan motor energizes. See "*Defrost Termination*" under "IV.A.2.9) Defrost" and "IV.C. Thermistor Check." If components fail to start, control module must be replaced.

### **C. Thermistor Check**

In the event the cabinet thermistor reading is out of range (E1 alarm), the compressor operates on a fixed time basis of 5-minutes on and 5-minutes off.

In the event the refrigerator defrost thermistor reading is out of range (E2 alarm), defrost initiation occurs every 4-hours of cumulative compressor run time and terminates on 20-minute minimum defrost timer.

In the event the freezer defrost thermistor reading is out of range (E2 alarm), defrost initiation occurs every 4-hours of cumulative compressor run time and terminates based on cabinet thermistor temperature.

To check thermistor resistance, follow the steps below.

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the control box cover.
- 3) Disconnect and remove the thermistor in question. See "V.I. Removal and Replacement of Thermistors."
- 4) Immerse the thermistor sensor portion in a glass containing ice and water for 2 to 3 minutes.
- 5) Check the resistance between the wires at the thermistor connector. Normal reading is within 16.0 to 16.7 k $\Omega$ . If outside the normal reading, replace the thermistor.
- 6) Reconnect and replace the thermistor in its correct position. See "V.I. Removal Replacement of Thermistors."
- 7) Plug the unit back in. Move the power switch to the "ON" position.

## D. Diagnostic Chart

### 1. Unit Not Cooling

Problem	Possible Cause	Remedy
[1] Unit does not start.	a) Power Supply	1. Unplugged, off, blown fuse, or tripped or defective circuit breaker.
		2. Loose connection.
		3. Not within specifications.
	b) Cord and Plug	1. Defective.
	c) Power Switch (control box)	1. "OFF" position.
		2. Bad contacts.
	d) Wiring	1. Loose connection or open.
		2. Faulty.
	e) Control Module	1. In alarm or "- - -" displayed.
		2. Defective.
[2] Evaporator fan does not start.	a) Door Switch	1. Defective.
	b) Door Switch Relay	1. Power supply not within specifications.
		2. Bad contacts.
		3. Open coil windings.
	c) Control Module (freezer)	1. Defective.
	d) Evaporator Fan Motor	1. Defective.
[3] Cool down does not start. (compressor)	a) Setpoint	1. Incorrect.
	b) Control Module	1. In alarm or "- - -" displayed.
		2. Defective.
	c) High-Pressure Switch	1. Bad contacts.
		2. Dirty air filter or condenser.
		3. Ambient temperature too warm.
		4. Refrigerant overcharge.
		5. Condenser fan not operating.
		6. Refrigerant lines or components restricted.
	d) Compressor Relay (freezer)	1. Bad contacts.
		2. Open coil windings.



Problem	Possible Cause		Remedy
[3] Cool down does not start. (compressor) (continued)	e) Refrigerators and 2-Section Freezer External Compressor Overload; 1-Section Freezer Internal Compressor Overload	1. Defective.	1. Let compressor cool and allow overload to reset. If overload does not reset: Refrigerator - replace the overload. Freezer - replace the compressor.  Once the overload resets, check compressor amperage and operating voltage.
		2. Open due to clogged filter or condenser coil.	2. Clean filter and condenser coil.
		3. Open due to condenser fan not operating.	3. Replace condenser fan.
	f) Compressor	1. Defective.	1. Replace.
[4] Cool down starts, but temperature does not drop.	a) Location of Unit	1. Air flow to condenser restricted or ambient temperature too high.	1. Increase ventilation or lower ambient temperature.
	b) Cabinet Temperature too High	1. Warm food recently placed in cabinet area.	1. Pre-cool food product or allow time for unit to return to normal setpoint temperature.
		2. Air flow blocked.	2. Remove blockage or redistribute food products.
	c) Setpoint	1. Incorrect.	1. Correct setpoint. See "II.C.2.a) Default Settings."
	d) Door	1. Left open or opened too often.	1. Close. Check for door open at time of warm cabinet temperature.
		2. Not sealing.	2. Check for proper sealing. Replace gasket.
	e) Clogged Filter/Condenser	1. Clogged filter or condenser coil.	1. Clean filter and condenser coil.
	f) Evaporator	1. Clogged or frozen.	1. Clean. Defrost and check defrost cycle.
	g) Evaporator Fan Motor	1. Defective.	1. Replace.
		2. Door switch defective.	2. Check for continuity and replace.
		3. Door switch relay defective.	3. See chart "1.[2]b) Door Switch Relay."
	h) Control Module	1. Defective.	1. See "IV.B. Control Module Check."
	i) Refrigerant/Refrigerant Lines	1. Gas leaks.	1. Check for leaks with a leak detector. Recover refrigerant and repair leaks. Replace drier, evacuate, and recharge. See "V.A. Service for Refrigerant Lines."
		2. Refrigerant lines restricted.	2. Recover, repair, replace drier, evacuate, and recharge. See "V.A. Service for Refrigerant Lines."
	j) Compressor	1. Defective.	1. Replace.
[5] Cool down achieved, compressor continues.	a) Control Module	1. Defective.	1. See "IV.B. Control Module Check."

## 2. Evaporator is Frozen Up

Problem	Possible Cause		Remedy
[1] Evaporator does not defrost completely.	a) Defrost Thermistor	1. Out of position or defective.	1. Reposition or replace. See "IV.C. Thermistor Check."
	b) Control Module	1. Defective.	1. See "IV.B. Control Module Check."
	c) Defrost Heater (freezer)	1. Defective.	1. Replace.
	d) Defrost Thermostat Open (freezer)	1. Defective.	1. Replace.
[2] Compressor on during defrost.	a) Control Module	1. Defective.	1. See "IV.B. Control Module Check."
[3] Evaporator fan on (freezer).	a) Control Module	1. Defective.	1. See "IV.B. Control Module Check."

## 3. Defrost Fails to Terminate

Problem	Possible Cause		Remedy
[1] Defrost cycle too long.	a) Defrost Thermistor	1. Out of position or defective.	1. Reposition or replace. See "IV.C. Thermistor Check."
	b) Control Module	1. Defective.	1. See "IV.B. Control Module Check."

## 4. Other

Problem	Possible Cause		Remedy
[1] Condensate pump not operating.	a) Power Supply	1. Loose wire or connection.	1. Correct or replace loose wire or connection.
	b) Float Switch	1. Sticking.	1. Clean, check continuity. Replace.
	c) Pump Motor	1. Defective.	1. Replace.
	d) Tubing	1. Restricted or defective.	1. Clean or replace.
[2] Abnormal Noise.	a) Fasteners	1. Loose fasteners allow vibration of part.	1. Tighten fasteners.
		1. Problem with mount.	1. Properly mount compressor. Replace any missing grommets.
		2. Floodback to compressor.	2. Check for signs of floodback to compressor. Evacuate and recharge if necessary.
	c) Fan (evaporator or condenser)	3. Defective.	3. Replace.
		1. Fan blade loose.	1. Adjust and tighten.
		2. Defective motor.	2. Replace.
[3] Condensate water overflow.	d) Door Switch Relay	1. Chattering.	1. Replace.
	a) Cabinet Contents	1. Loading of large volumes of warm, moist, uncovered product.	1. Allow product to cool before placing in cabinet. Cover product with plastic wrap.
	b) Location of Unit	1. Unit located near high humidity source such as fryer, steamer, etc.	1. Relocate.
	c) Seals	1. Poor sealing around evaporator, door gaskets.	1. Adjust or replace.
	d) Environment	1. Extreme environment and door-opening conditions.	1. Adjust conditions.
	e) Condensate Pump	1. Not operating.	1. See chart "4.[1] Condensate pump not operating."



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## V. Removal and Replacement of Components

### WARNING

1. This unit should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
2. Move the power switch to the "OFF" position, then unplug the unit from the electrical outlet before servicing.

## A. Service for Refrigerant Lines

### WARNING

1. Repairs requiring the refrigeration circuit to be opened must be performed by properly trained and EPA-certified service personnel.
2. Always recover the refrigerant and store it in an approved container. Do not discharge the refrigerant into the atmosphere.
3. 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-134a or R-404A as a mixture with pressurized air for leak testing.

### CAUTION

1. Do not leave the system open for longer than 15 minutes when replacing or servicing parts. The Polyol Ester (POE) oils used in R-134a and R-404A units can absorb moisture quickly. Therefore it is important to prevent moisture from entering the system when replacing or servicing parts.
2. Always install a new drier every time the sealed refrigeration system is opened.
3. 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.
4. 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

The unit is provided with refrigerant access valves. Using proper refrigerant practices recover the refrigerant from the access valves and store it in an approved container. Do not discharge the refrigerant into the atmosphere.

## 2. Brazing

### **⚠ WARNING**

1. R-134a and R-404A themselves are not flammable at atmospheric pressure and temperatures up to 176°F (80°C).
2. R-134a and R-404A themselves are not explosive or poisonous. However, when exposed to high temperatures (open flames), R-134a and R-404A can be decomposed to form hydrofluoric acid and carbonyl fluoride both of which are hazardous.
3. Do not use silver alloy or copper alloy containing arsenic.
4. 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 (140PSIG). DO NOT use R-134a or R-404A as a mixture with pressurized air for leak testing.

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

### **CAUTION**

1. Always install a new drier every time the sealed refrigeration system is opened.
2. 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.
3. 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-134a or R-404A as a mixture with pressurized air for leak testing.

## 3. Evacuation and Recharge

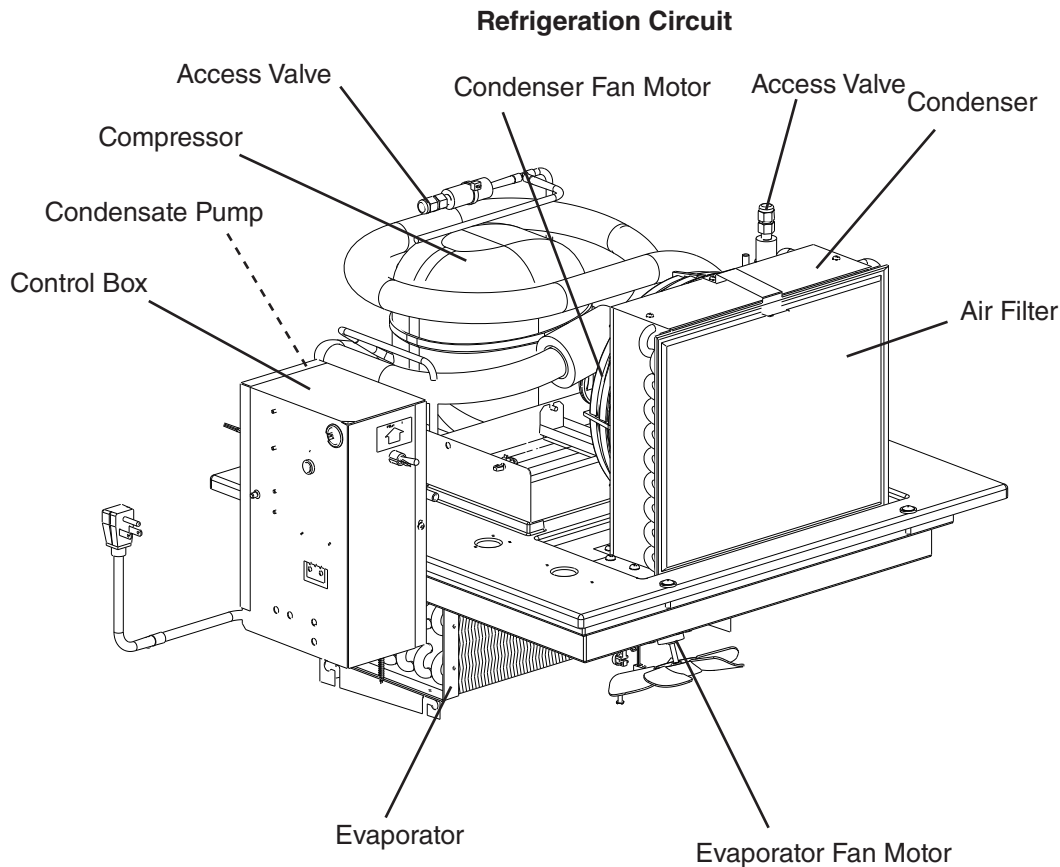
- 1) Attach a vacuum pump to the system. Be sure the charging hoses are connected to both high and low-side access valves.

### **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. 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. See the nameplate for the required refrigerant charge. 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) and optional when charging an R-134a system. 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.  
**CAUTION! To prevent compressor damage, use a throttling valve or liquid dispensing device to add the remaining liquid charge through the low-side access port with the unit running.**
- 9) Close gauge manifold valves and disconnect the hoses.
- 10) Cap the access valves to prevent a possible leak.



**Fig. 3**

## B. Removal and Replacement of Compressor

### CAUTION

1. Always install a new drier every time the sealed refrigeration system is opened.
2. 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.
3. 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).

Note: When replacing a compressor it is recommended to install a new start relay, start capacitor, and external compressor overload (refrigerator). Due to the ability of the POE oil in the compressor to absorb moisture quickly, the compressor must not be opened more than 15 minutes for replacement or service.

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Recover the refrigerant and store it in an approved container. See "V.A. Service for Refrigerant Lines."
- 3) Remove the compressor terminal cover and disconnect the wires from the compressor.
- 4) Remove the discharge, suction, and process pipes.
- 5) Remove the hold-down screws, clips, and rubber grommets.
- 6) Remove the compressor.
- 7) Attach the rubber grommets to the new compressor.
- 8) Place the new compressor in position and secure it using the screws and clips.
- 9) Remove the drier, then place the new drier in position.
- 10) Remove plugs from the suction, discharge, and process pipes.
- 11) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG. See "V.A.2. Brazing."
- 12) 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-134a or R-404A as a mixture with pressurized air for leak testing.
- 13) Evacuate the system, and charge it with the correct refrigerant. See "V.A.3. Evacuation and Recharge." See the nameplate for the required refrigerant and refrigerant charge.
- 14) Install the new start relay, start capacitor, and external compressor overload (refrigerator), then reconnect the compressor wires in their correct positions.  
**WARNING! To reduce the risk of electric shock, be sure to reconnect the compressor ground wire.**
- 15) Plug the unit back in. Move the power switch to the "ON" position.

## C. Removal and Replacement of Evaporator

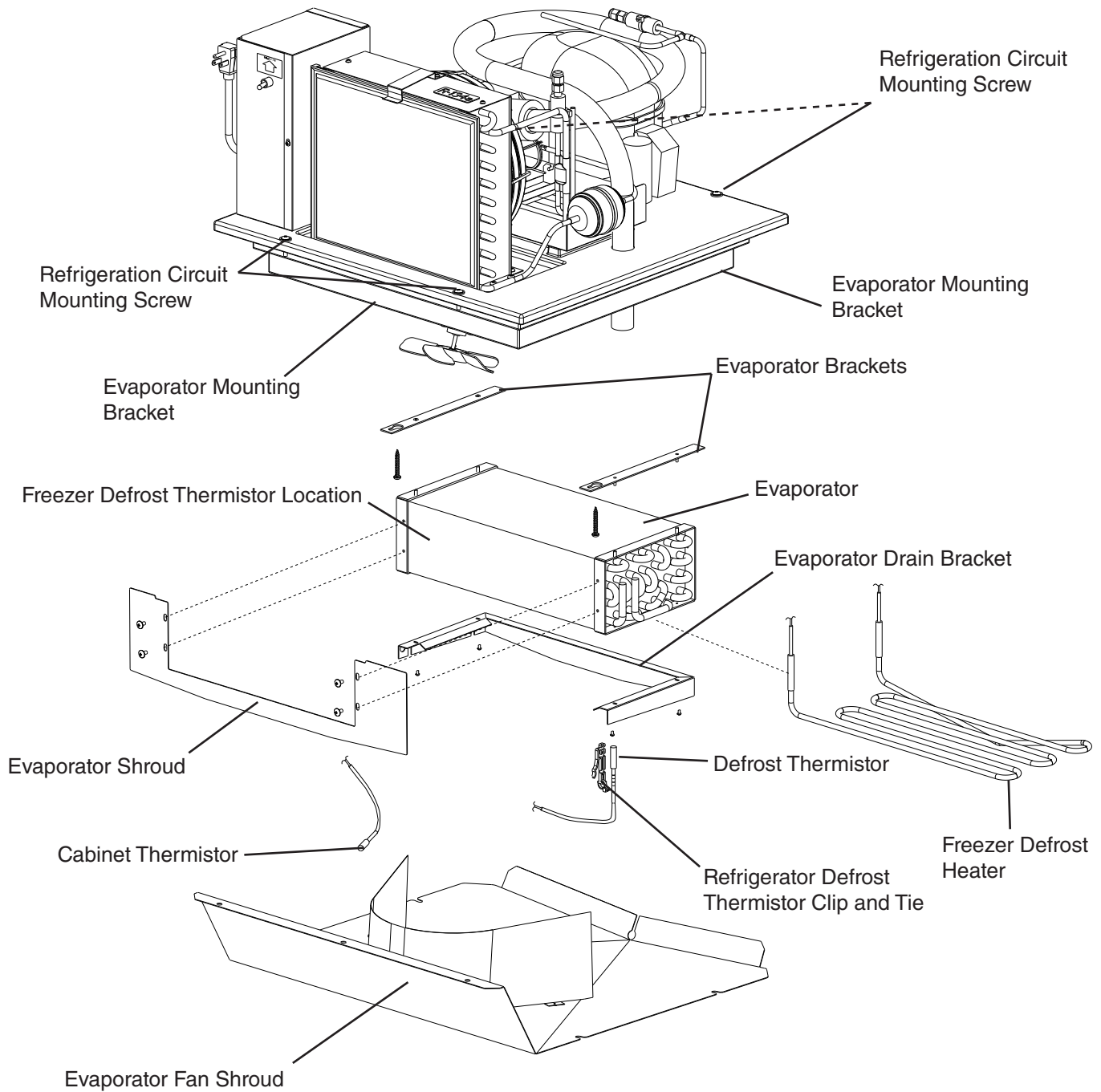
See Fig. 4.

### CAUTION

1. Always install a new drier every time the sealed refrigeration system is opened.
2. 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.
3. 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) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Recover the refrigerant and store it in an approved container. See "V.A. Service for Refrigerant Lines."
- 3) Remove the evaporator fan shroud. Remove the cabinet thermistor from the evaporator fan shroud.
- 4) Note the location of the defrost thermistor, then remove the defrost thermistor.
- 5) Disconnect the evaporator fan motor ground wire, then remove the evaporator shroud and evaporator drain bracket.
- 6) On freezers, remove the defrost heater.
- 7) Remove the 4 refrigeration circuit mounting screws and lift the refrigeration circuit to access the evaporator refrigeration connections.
- 8) Remove the insulation, then disconnect the evaporator tubing.
- 9) Remove the front 2 evaporator mounting screws and slide the evaporator out.
- 10) Remove the evaporator brackets and secure them to the new evaporator.
- 11) Place the new evaporator into the evaporator mounting brackets and secure.
- 12) Remove the drier, then place the new drier in position.
- 13) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG. See "V.A.2. Brazing."
- 14) 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 or R-134a as a mixture with pressurized air for leak testing.
- 15) Lower the refrigeration circuit and secure with the 4 mounting screws.
- 16) Evacuate the system, and charge it with refrigerant. See "V.A.3. Evacuation and Recharge." See the nameplate for the required refrigerant and refrigerant charge.
- 17) Replace the removed parts in the reverse order of which they were removed. Confirm the location of the defrost thermistor. **WARNING! To reduce the risk of electric shock be sure to reconnect the evaporator fan motor ground wire. On freezers, make sure the defrost thermistor wire is not touching the defrost heater.**
- 18) Plug the unit back in. Move the power switch to the "ON" position.

## Evaporator Replacement



**Fig. 4**

## D. Removal and Replacement of Condenser

### CAUTION

1. Always install a new drier every time the sealed refrigeration system is opened.
2. 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.
3. 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) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the condenser shroud.
- 3) Recover the refrigerant and store it in an approved container. See "V.A. Service for Refrigerant Lines."
- 4) Disconnect the condenser tubing, then remove the condenser.
- 5) Place the new condenser in position.
- 6) Remove the drier, then place the new drier in position.
- 7) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG. See "V.A.2. Brazing."
- 8) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). DO NOT use R-404A or R-134a as a mixture with pressurized air for leak testing.
- 9) Evacuate the system, and charge it with refrigerant. See "V.A.3. Evacuation and Recharge." See the nameplate for the required refrigerant and refrigerant charge.
- 10) Replace the condenser shroud in its correct position. **WARNING! To reduce the risk of electric shock, confirm that the condenser fan motor ground wire is properly connected.**
- 11) Plug the unit back in. Move the power switch to the "ON" position.

## E. Removal and Replacement of Expansion Valve (2-Section Freezer)

Moisture in the refrigeration circuit may exceed drier capacity and freeze up at the expansion valve.

### CAUTION

1. Always install a new drier every time the sealed refrigeration system is opened.
2. 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.
3. When brazing, protect the valve body and drier by using wet cloths to prevent the valve body and drier from overheating. Do not allow the valve body or drier to exceed 250°F (121°C).

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Recover the refrigerant and store it in an approved container. See "V.A. Service for Refrigerant Lines."
- 3) Remove the insulation and the expansion valve bulb on the suction line.
- 4) Remove the expansion valve cover and disconnect the expansion valve. Place the new expansion valve in position.
- 5) Remove the drier, then place the new drier in position.
- 6) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG. See "V.A.2. Brazing."
- 7) 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.
- 8) Evacuate the system, and charge it with refrigerant. See "V.A.3. Evacuation and Recharge." See the nameplate for the required refrigerant and refrigerant charge.
- 9) Attach the expansion valve bulb to the suction line in the same location as the previous bulb. The bulb should be between the 10 and 2 o'clock position on the tube. Be sure to secure the bulb with the clamp and holder and to insulate it.
- 10) Place the expansion valve cover in position.
- 11) Plug the unit back in. Move the power switch to the "ON" position.



## F. Removal and Replacement of Evaporator Fan Motor

- 1) Move the power switch to the "OFF" position and unplug the unit.
- 2) Remove the evaporator fan shroud. Remove the cabinet thermistor from the evaporator fan shroud.
- 3) Remove the screws securing the evaporator fan bracket and ground wire, then remove the evaporator fan bracket and evaporator fan motor.
- 4) Remove the evaporator fan motor bracket and fan blade from the evaporator fan motor and secure them to the new evaporator fan motor.
- 5) Install the new evaporator fan motor assembly and reconnect the evaporator fan motor ground wire. **WARNING! To reduce the risk of electric shock, be sure to reconnect the evaporator fan motor ground wire.**
- 6) Route the fan motor wires to the control box. Do not connect wires in the cabinet area. Disconnect the old wires and reconnect the new wires.
- 7) Replace the cabinet thermistor and evaporator fan shroud in their correct positions.
- 8) Plug the unit back in. Move the power switch to the "ON" position.

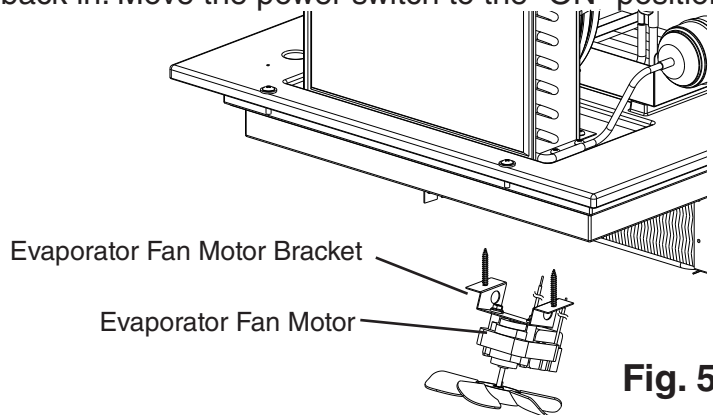


Fig. 5

## G. Removal and Replacement of Condenser Fan Motor

- 1) Move the power switch to the "OFF" position and unplug the unit.
- 2) Disconnect the condenser fan motor ground wire, then remove the condenser fan guard and condenser fan motor.
- 3) Remove the condenser fan blade, then remove the condenser fan guard from the condenser fan motor and secure it and the condenser fan blade to the new condenser fan motor.
- 4) Install the new condenser fan motor assembly.
- 5) Connect the condenser fan motor wires and ground wire. **WARNING! To reduce the risk of electric shock, be sure to reconnect the ground wire.**
- 6) Plug the unit back in. Move the power switch to the "ON" position.

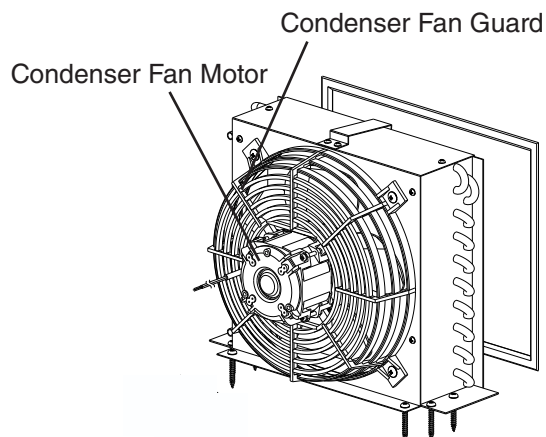
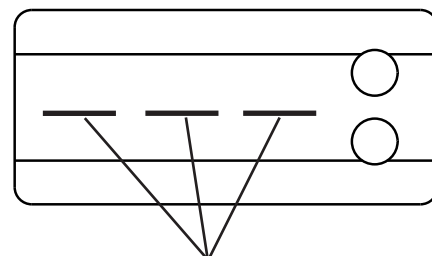
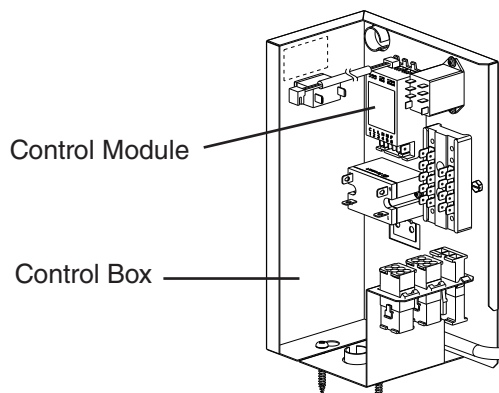


Fig. 6

## H. Removal and Replacement of Control Module

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the control box cover.
- 3) Disconnect the display cable, defrost thermistor, and cabinet thermistor from the control module.
- 4) Remove the nut securing the control module to the control box.
- 5) Note the position of the wires on the control module's lower terminals. Remove the wires from the lower terminals and connect them to the same terminals on the replacement control module.
- 6) Fasten the control module to the control box.
- 7) Connect the display cable, defrost thermistor, and cabinet thermistor to the control module.
- 8) Replace the control box cover in its correct position.
- 9) Plug the unit back in. Move the power switch to the "ON" position.
- 10) The spindle on the control module controls the setpoint until the display module is activated. To activate the display module, press the upper button on the display module to view the current setpoint. Failure to activate the display module may result in unexpected cabinet temperatures.

Note: If three dashes ( - - - ) appear on the display module when energized, the compressor and display module are off. To turn the compressor and display module on, press and hold the upper and lower buttons until the temperature appears on the display. **CAUTION! The three dashes must be cleared, otherwise the compressor will not run and product will be lost.**



**Fig. 7**

**CAUTION! The three dashes must be cleared, otherwise the compressor will not run and product will be lost.**

To turn the compressor and display module on, press and hold the upper and lower buttons until the temperature appears on the display.

## I. Removal and Replacement of Thermistors

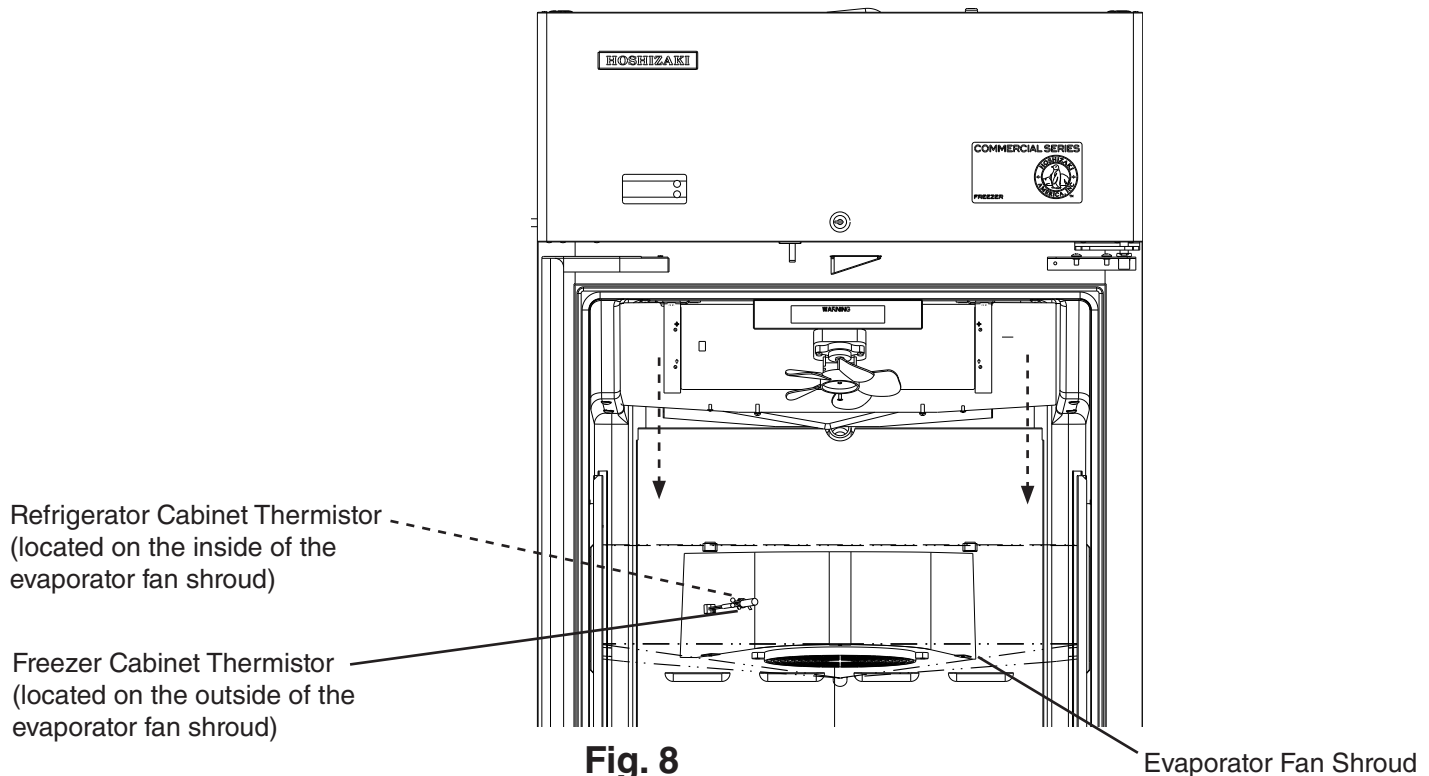
This section covers removal and replacement of the cabinet and defrost thermistors. For a thermistor check procedure, see "IV.C. Thermistor Check."

### CAUTION

1. The thermistors are fragile; handle very carefully.
2. Do not shorten or cut the thermistor leads.

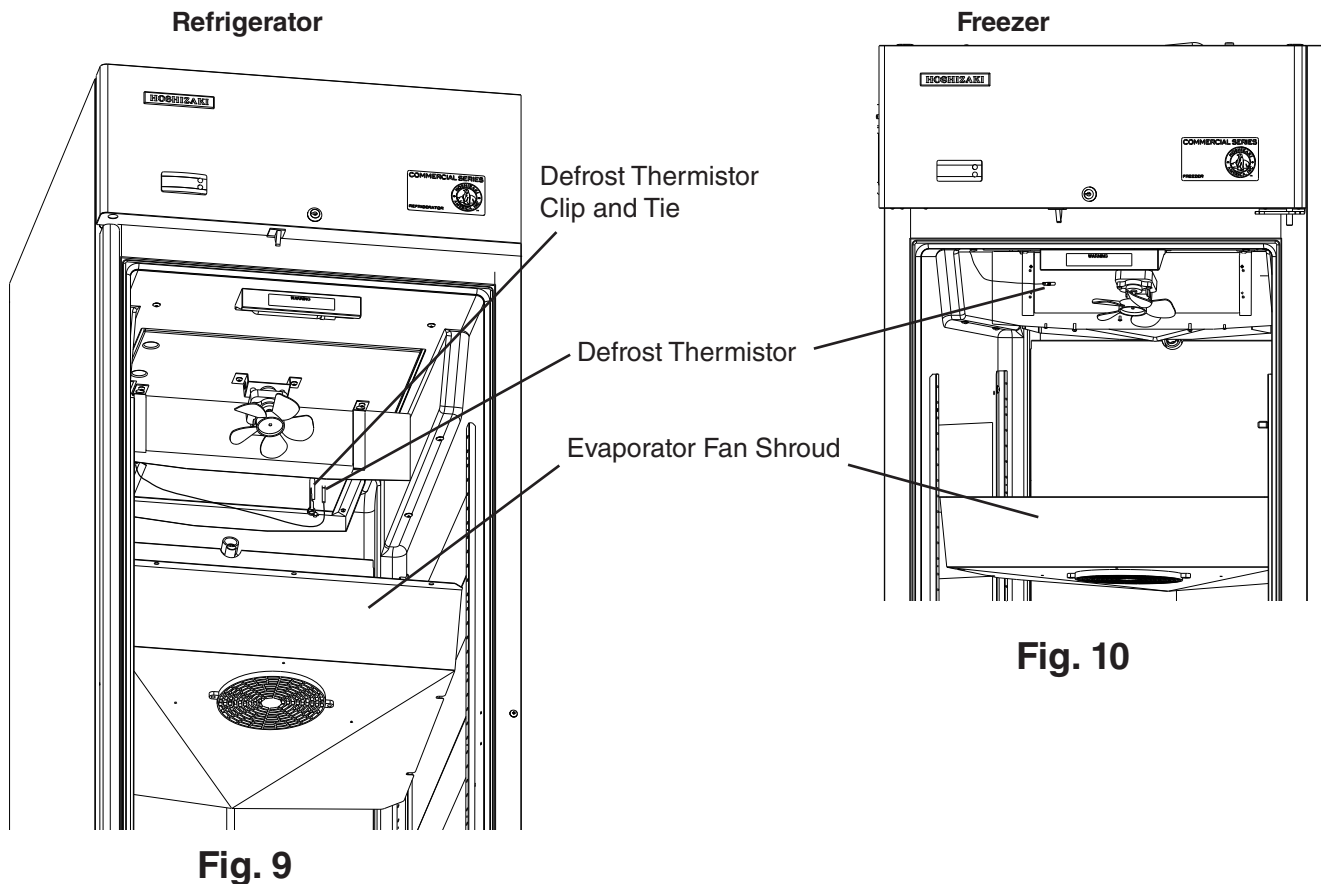
#### 1. Cabinet Thermistor

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the evaporator fan shroud. Remove the cabinet thermistor from the evaporator fan shroud.
- 3) Remove the control box cover.
- 4) Disconnect the cabinet thermistor from the control module, then remove the cabinet thermistor.
- 5) Route the new cabinet thermistor from the control box to the evaporator fan shroud.
- 6) Secure the cabinet thermistor to the evaporator fan shroud.
- 7) Replace the evaporator fan shroud in its correct position.
- 8) Connect the cabinet thermistor to the control module, then replace the control box cover in its correct position.
- 9) Plug the unit back in. Move the power switch to the "ON" position.



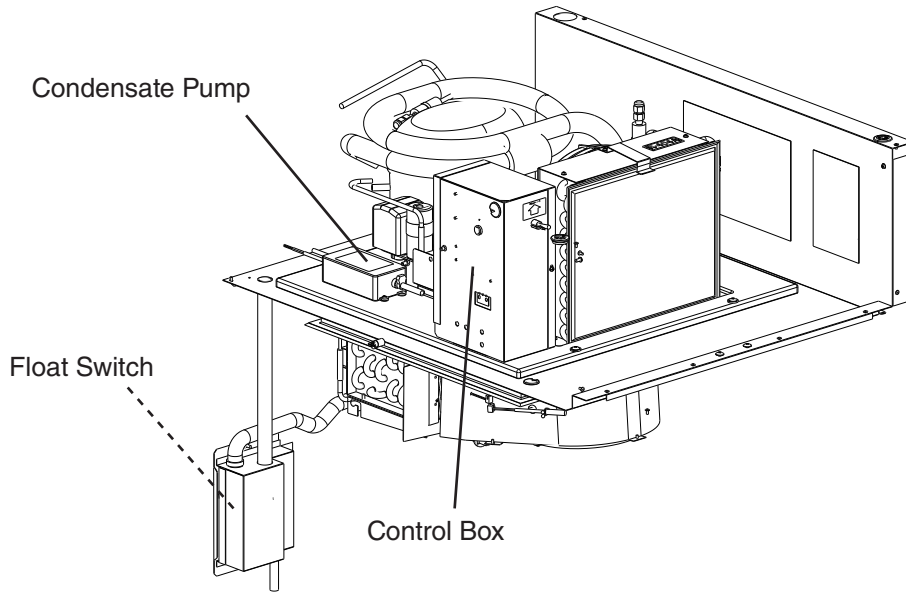
## 2. Defrost Thermistor

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the evaporator fan shroud. Remove the cabinet thermistor from the evaporator fan shroud.
- 3) Note the location of the defrost thermistor, then remove the defrost thermistor.
- 4) Remove the control box cover.
- 5) Disconnect the defrost thermistor from the control module, then remove the defrost thermistor.
- 6) Route the new defrost thermistor from the control box to the evaporator. Insert the defrost thermistor in its correct position. If replacing on a refrigerator, secure the defrost thermistor wire with a tie to the clip. **WARNING! On freezers, be sure the thermistor wire is not touching the defrost heater.**
- 7) Secure the cabinet thermistor to the evaporator fan shroud. Replace the evaporator fan shroud in its correct position.
- 8) Connect the defrost thermistor to the control module, then replace the control box cover in its correct position.
- 9) Plug the unit back in. Move the power switch to the "ON" position.



## J. Removal and Replacement of Condensate Pump

- 1) Move the power switch to the "OFF" position, then unplug the unit.
- 2) Remove the control box cover, then disconnect the condensate pump wires.
- 3) Remove the condensate pump.
- 4) Place the new condensate pump in position and connect the wires.
- 5) Route the condensate pump tubing.
- 6) Plug the unit back in. Move the power switch to the "ON" position.



**Fig. 11**

## K. Removal and Replacement of Door Gasket

Remove old gasket by pulling it directly out of the vinyl gasket retainer. Thoroughly clean the gasket area with mild soap and water prior to installing the new gasket. The new gasket should be installed by assembling it at the corners first, then working toward the center at the top, bottom, and sides. The arrow-shaped portion of the gasket should be firmly seated in the retainer groove for proper assembly. This can be checked by lifting the edge of the gasket and observing the engagement.

### CAUTION

In order to get a proper gasket fit, it is important not to stretch gasket material during assembly.

## L. Door Re-Hinging

The doors are reversible. See the table below. Instructions for re-hinging are included in the kits.

Convert	Door Type	Kit Number
Right to Left	Full	HS-4016
Left to Right	Full	HS-4017
Right to Left	Half	HS-4018
Left to Right	Half	HS-4019

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## VI. Cleaning Instructions

### 1. Stainless Steel Exterior

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

### 2. Interior

Spills should be wiped up promptly to avoid unpleasant odors. The cabinet interior should be cleaned periodically with a mild soap or detergent.

### 3. Door Gaskets

Door gaskets should be cleaned regularly with mild soap and water to remove dirt and grease.

### 4. Air Filter

Check the filter at least once a month. If it is dirty, use warm water and a neutral cleaner to wash the filter.

### 5. Condenser

Check the condenser once a year and use a brush or vacuum cleaner to clean the unit as required.