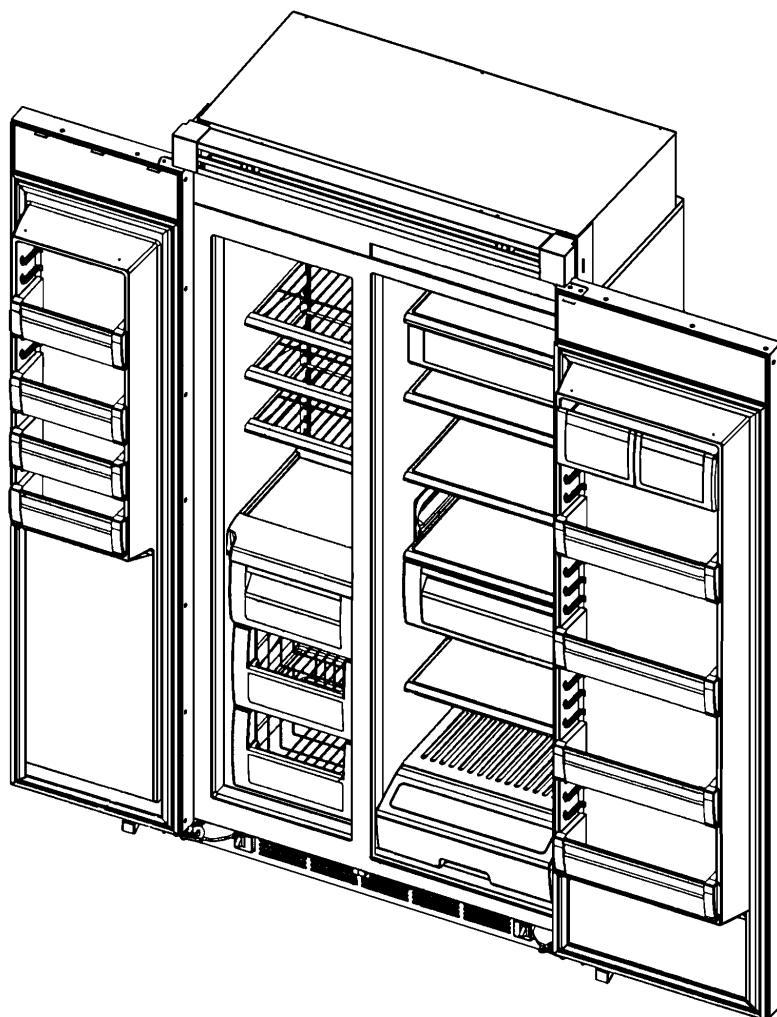




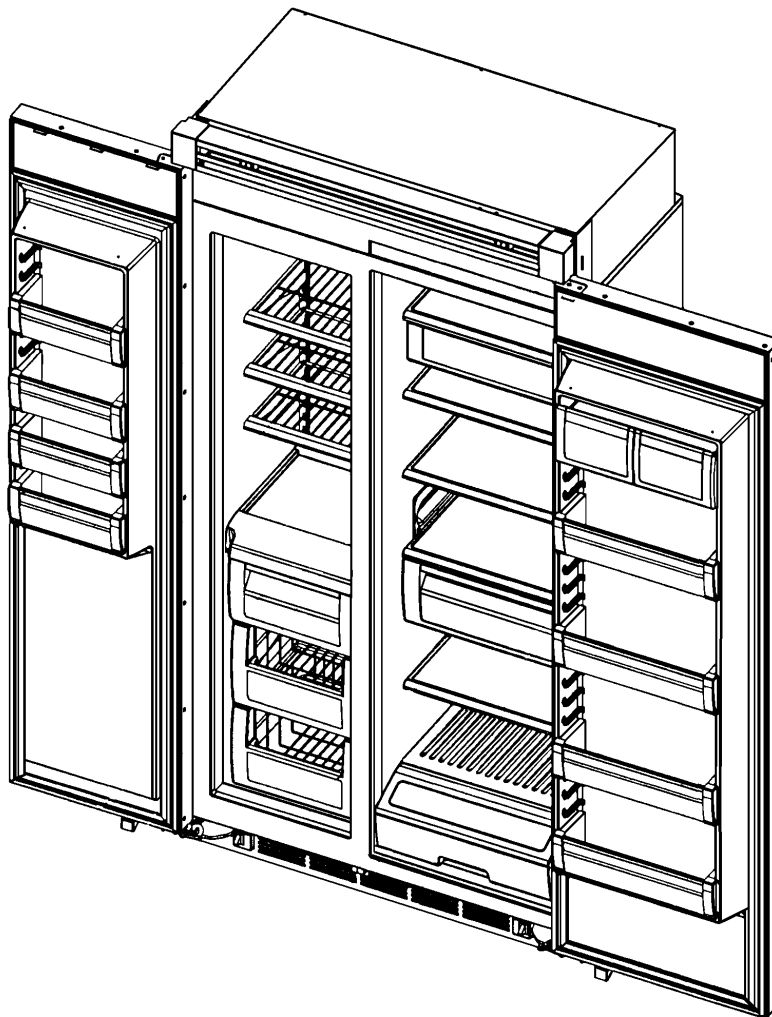
VCSB423G / DDSB423G / DFSB423G  
COVER



**SERVICE NOTE BOOK**  
**BUILT-IN SIDE BY SIDE**  
**REFRIGERATOR/FREEZER**  
VCSB423G / DDSB423G / DFSB423G



VIKING RANGE CORPORATION®



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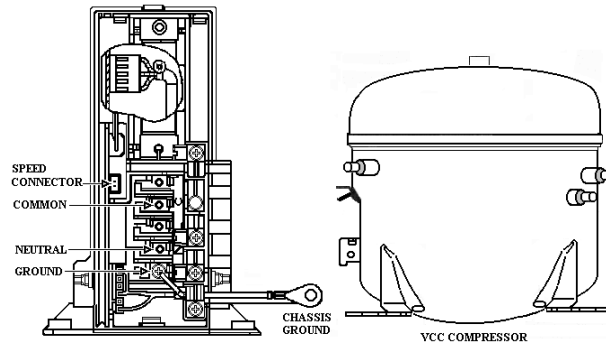
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## TECHNOTES

### WARNINGS

To avoid electrical shock, which can cause severe personal injury or death, disconnect power to refrigerator using power switch before servicing. Wires removed during disassembly must be replaced on proper terminals to insure correct grounding and polarization. After servicing, reconnect power using power switch.

## ALERT



**DC Compressor – DO NOT CONNECT TO 120 VAC**

### Temperature Calibration Offset

Designation	FRZ Offset	FF Offset
423	4	7

Unit Performance Test Chart

	kW/24hr + 0.4	Percent Run Time + 10%	Cycle/24 hr + 25%	Refrigerator Compartment Food Average Temperature + 3°F	Freezer Compartment Food Average Temperature + 3°F	
Ambient *F	65° 90° 110°	65° 90° 110°	65° 90° 110°	65° 90° 110°	65° 90° 10°	
	1.1 1.8 3.5	47 75 88	13 11 6	35 41 43	2 3 5	

Temperature Relationship Test Chart

	T-1 Outlet + 3°F	T-1 Outlet + 3°F	T-3 Suction Line + 7°F	Average Total Wattage + 10%	Suction Pressure + 2 psig	Head Pressure + 2 psig
Ambient *F	65° 110°	65° 110°	65° 110°	65° 110°	65° 110°	65° 110°
	-11 -10	-12 -11	20 90	93 156	5 6	85/120* 160/196*

\* Note: discharge pressures are provided for both energy speed and high speed operation.

**SPECIFICATIONS AND FEATURES**

The VCC receives one of 3 signals from the adaptor board: OFF, E frequency, and H frequency.

**OFF STATE CRITERION**

The VCC control signal is OFF whenever the voltage drive to the compressor relay is off.

**H (HIGH COOLING CAPACITY) STATE CRITERIA**

The VCC control signal goes to the H frequency when any of the following conditions are detected:

- The first compressor cycle after power restoration. The high capacity provides a faster initial pull-down to control temperature.
- The compressor duty cycle exceeds DCHT, 90%. Once triggered, this mode persists until the duty cycle drops below DCHX, 50%. A high external ambient increases the duty cycle.
- Compressor operation for more than 3 hours. The longest normal run time at 90° F is 2 hours. A longer run time implies the user activated the maximum refrigerate or maximum freeze mode or there is an unusual cooling load. The mode persists until the duty cycle drops below DCHX.

**E (EFFICIENT COOLING STATE CRITERION**

The VCC control signal assumes the E state when none of the conditions above for the H state are valid.

Run Time High Trigger (RTHT): 240 minutes
Duty Cycle High Trigger (DCHT): 90%
Duty Cycle Low Trigger (DCLT): 50%
Energy Speed: 75 Hz
Energy Speed: 2250 rpm
High Speed: 3440 rpm
Board Color: Blue

**Note: Compressor Speed = Frequency x Motor Constant**

**VCC (DC) COMPRESSOR SPECIFICATIONS**

Nominal BTU/HR	640 BTU's	Oil	Type	ICI RL 10H
BTU/HR Range	401 - 1086 BTU's		Fl. Oz.	14.54 oz
Nominal Watts	103 Watts	CC	430 cc	Max allowable H2O content in oil is 100 PPM for oil charged compressors. Min allowable oil for pour out is 400cc or 13.5oz Fl. Oz.
Watt Range	75 - 207 Watts	Refrigerant Type	R134a	
Frequency Hz		Inverter Voltage	115V/60Hz	
Energy	75 Hz ± 2.5%	Compressor Voltate	230VDC 3 Phase	
Pull Down	114.67 Hz			
Frequency Range	53 - 150 Hz			
Resistance @77°F				
Run Windings	9.84 Ω ± 2.5% Variance			
Start Windings	9.84 Ω ± 2.5% Variance			
Amps				
Lock Rotor	3.3 amps			
Full load	3.3 amps			

**R134a REFRIGERANT  
SERVICE INFORMATION**

This product uses R134a refrigerant. This refrigerant requires synthetic Ester Oil in the compressor. This cooling system does not tolerate contamination from any of the following:

- Other Refrigerants
- Moisture
- Petroleum-based Lubricants
- Silicone Lubricants
- Cleaning Compounds
- Rust Inhibitors
- Leak Detection Dyes
- Any Other Type of Additive

As a result the following precautions should be observed

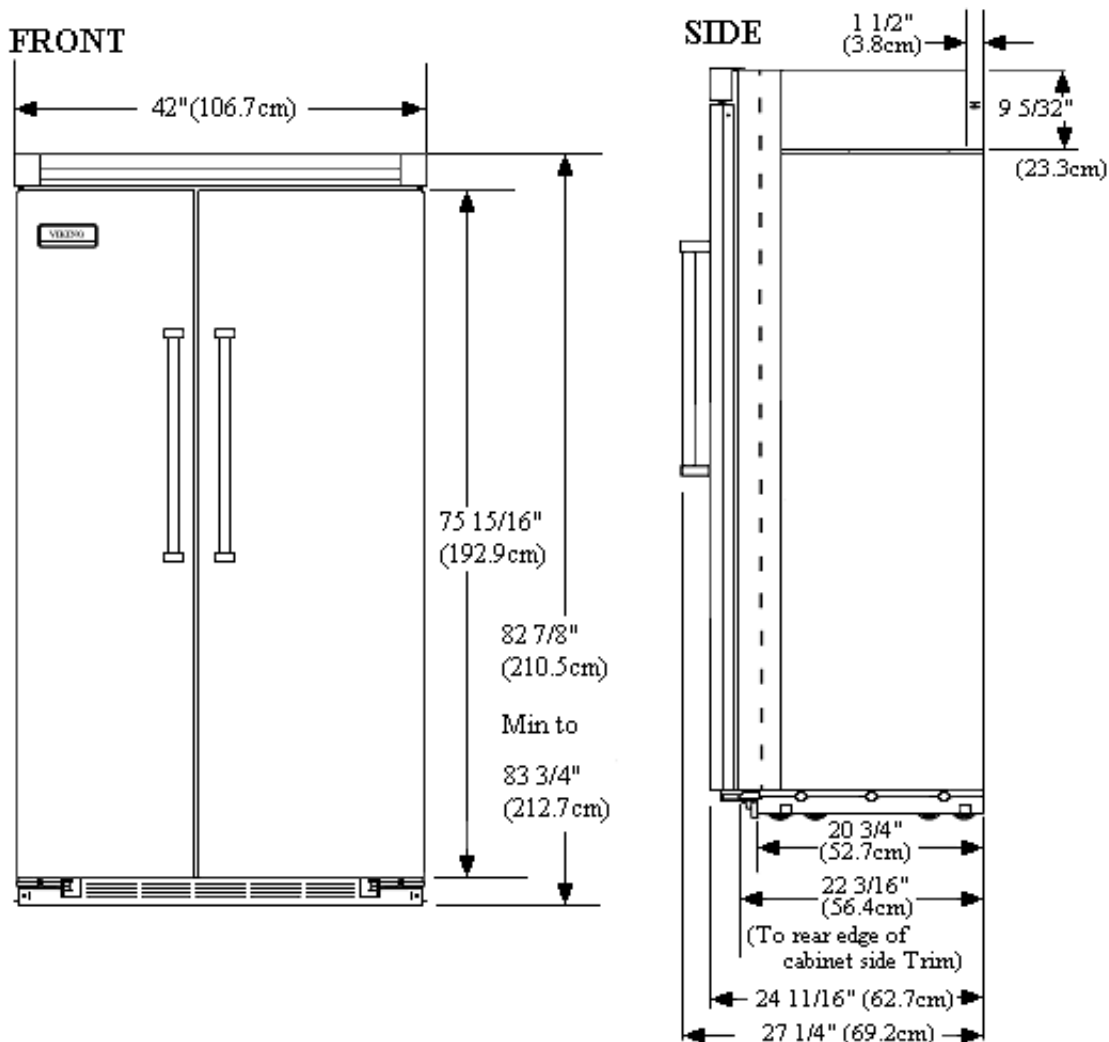
- Use equipment dedicated to R134a sealed system only.
- Do not leave a replacement compressor open to the atmosphere for more than 10 minutes.
- Always replace the filter-drier when performing any repairs on the sealed system.
- If the rubber plugs on the service replacement compressor appear to have been tampered with or removed, **DO NOT USE THE COMPRESSOR**. Get another one.
- The filter-drier **MUST** be cut from the sealed system. Never un-braze the filter-drier from system tubing. Applying heat will drive moisture back into the sealed system.

<b>HEALTH AND SAFETY HANDLING</b>	<b>134a</b>
Allowable Overall Exposure Limit	1,000 ppm
Vapor Exposure to Skin	No Effect
Liquid Exposure to Skin	Can Cause Frostbite
Vapor Exposure to Eyes	Very Slight Irritation
Liquid Exposure to Eyes	Can Cause Frostbite
Above Minimum Exposure Limit	Can Cause Asphyxiation. Tachycardia and Cardiac arrhythmias.
Safety and Handling	Wear appropriate Skin and Eye protection. Use adequate Ventilation.
Spill Management	Remove or Extinguish Ignition or Combustion Sources. Evacuate or Ventilate Area.
Fire and Explosion Hazards	May Decompose if contact with Flames and Heating elements. Container May Explode IF Heated Due to Pressure Rise. Combustion Products are Toxic.
Storage Conditions	The Procedures/Rules for R12 also Apply to 134a.
Disposal Procedure	Reclaim

## Basic Specifications

Description	VCSB423	DD5B423	DFS8423
Overall Width	42" (106.7 cm)	42" (106.7 cm)	42" (106.7 cm)
Overall Height from bottom*	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)
Overall Depth from rear	To side trim - 22 3/16" (56.4 cm) To front of top grille - 24 11/16" (62.7 cm) To end of handle bracket - 27 1/4" (69.2 cm)	To front edge of side trim - 23 13/16" (60.6 cm) To front of top grill - 24 11/16" (62.7 cm) To end of handle bracket - 27 1/4" (69.2 cm)	To front edge of side trim - 23 13/16" (60.6 cm) To front of top grill - 24 11/16" (62.7 cm) To end of handle bracket - 27 1/4" (69.2 cm)
Cutout Width	41 1/2" - (105.4 cm)	42" (106.7 cm)	42" (106.7 cm)
Cutout Height*	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)	Min. 82 3/4" (210.2 cm) Max 83 3/4" (212.7 cm)
Cutout Depth	Min. 24" (61.0 cm)	Min. 24" (61.0 cm)	Min. 24" (61.0 cm)
Electrical Requirements	115VAC / 60Hz - 6' (162.4 cm) 3-wire cord with grounded 3-prong attached to product.	115VAC / 60Hz - 6' (162.4 cm) 3-wire cord with grounded 3-prong attached to product.	115VAC / 60Hz - 6' (162.4 cm) 3-wire cord with grounded 3-prong attached to product.
Maximum Amp Usage	9.9 Amps	9.9 Amps	9.9 Amps
Inlet Water Requirements	1/4" Copper tubing - Min 20 psi; Max 120 psi	1/4" Copper tubing - Min 20 psi; Max 120 psi	1/4" Copper tubing - Min 20 psi; Max 120 psi
Overall Interior Capacity	Refrigerator - 15.0 cu. ft. Freezer - 9.0 cu. ft. Total capacity - 24.0 cu. ft.	Refrigerator - 15.0 cu. ft. Freezer - 9.0 cu. ft. Total capacity - 24.0 cu. ft.	Refrigerator - 15.0 cu. ft. Freezer - 9.0 cu. ft. Total capacity - 24.0 cu. ft.
Approximate Shipping Weight	525 lbs. (236.2 kg)	525 lbs. (236.2 kg)	525 lbs. (236.2 kg)

## SIDE-BY-SIDE REFRIGERATOR OVERALL DEMINSIONS



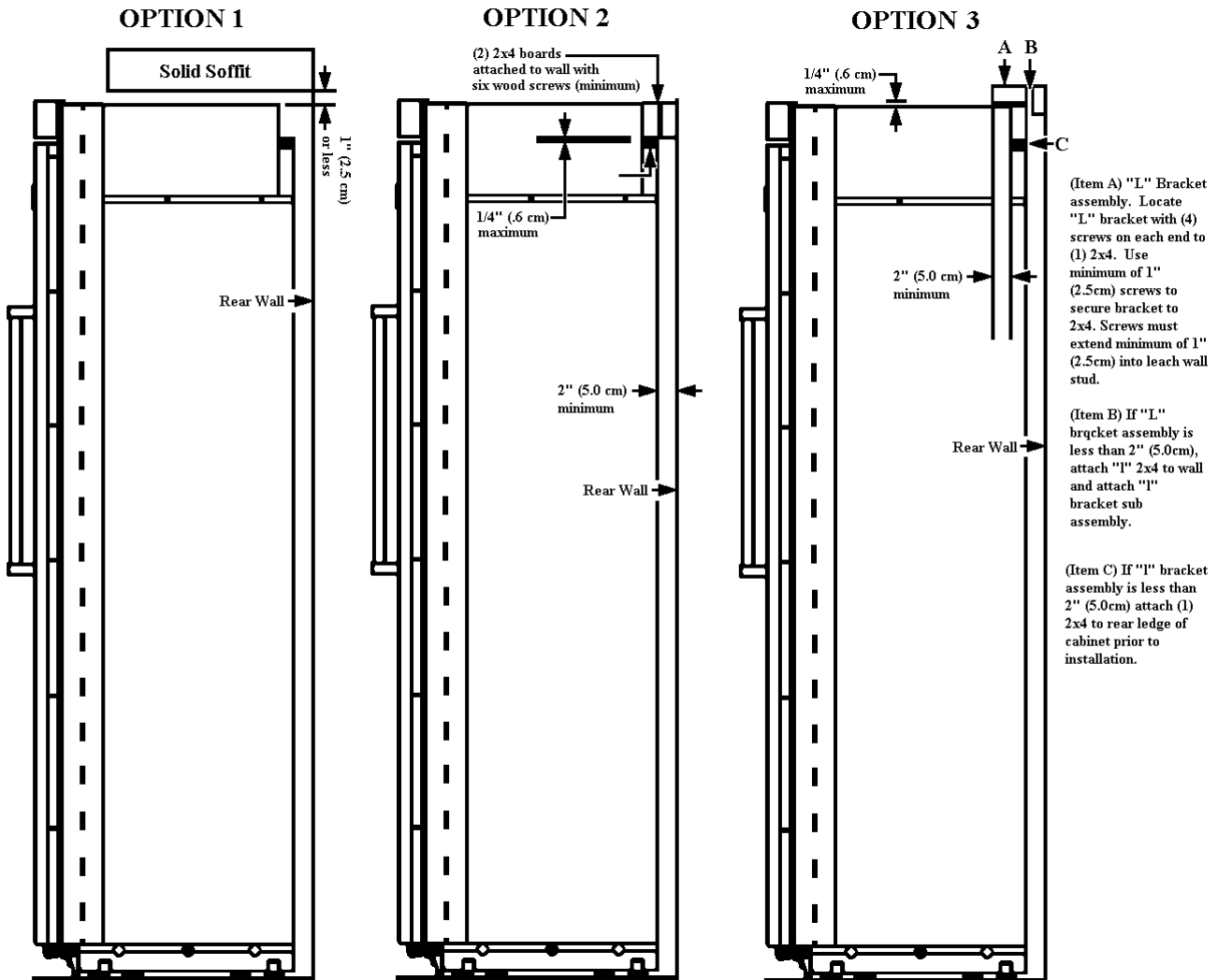


## SECURING THE REFRIGERATOR (3 OPTIONS)

**OPTION 1:** If a solid soffit is 1" (2.5cm) or less above the refrigerator, anti-tip boards are not required.

**OPTION 2:** If a solid soffit is not available or soffit is more than 1" (2.5cm) above refrigerator, center wood boards on rear wall 1/4" (.6cm) maximum above refrigerator. Attach wood boards to wall studs with six of the provided wood screws, making sure that screws are engaged in wall studs 1 1/2" (3.8cm) minimum.

**OPTION 3:** Create "L" bracket assembly by securing "L" brackets to each end of (1) 2x4 with provided screws (Item A). If 2x4 does not extend 2" (5.0cm) beyond rear ledge, attach (1) 2x4 to wall (Item B), attach (1) 2x4 to rear ledge of cabinet (Item C) and attach "L" bracket assembly to 2x4 mounted on wall (Item A).

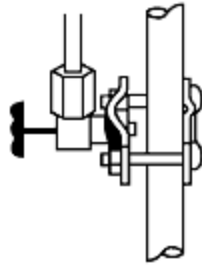


**To rough in water line:**

1. Turn off main water supply. Turn on nearest faucet long enough to clear line of water.
2. **Vertical cold water line:** Use grounded electric drill or hand drill to drill 3/16" (4.5cm) in an easily accessible location in water line.

**Horizontal cold water line:** Use grounded electrical drill or hand drill to drill 3/16" (4.5 cm) hole in the TOP of the water line. This will keep sediment from collecting in valve.

3. Position washer over hole in water line. Turn saddle valve handle clockwise to expose piercing lance a maximum of 3/16" (4.5 cm). Align piercing lance over hole in water line. Place both halves of saddle valve bracket against water line.



Turn saddle valve handle clockwise until piercing lance enters hole in water line and is firmly seated. The saddle valve is now in the closed position. Tighten packing nut. Evenly and firmly tighten bracket screws so washer will make a water-tight connection. **Do not over tighten screws: copper tubing could be crushed**

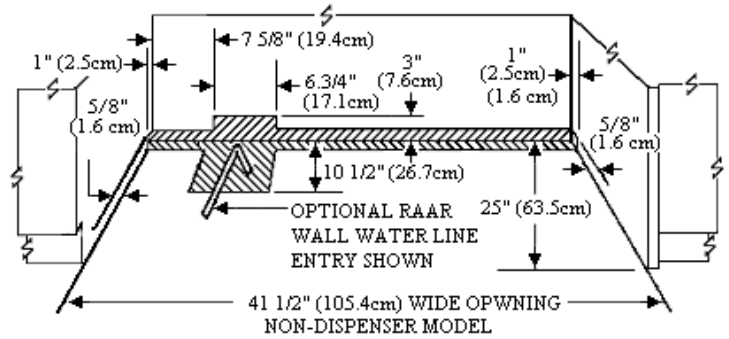
**WATER CONNECTION**

- Do not use plastic water lines between refrigerator and supply. Plastic water lines can fail due to fatigue over time and cause extensive damage to product and the home.
- Use only 1/4" copper tubing for water line.
- Do not connect to reverse osmosis water filtration system.

The 1/4" brass compression union is located in the literature packet.

1. Pull copper supply tubing from plumbing forward from underneath refrigerator (see Figure A).
2. Flush air and impurities from water line by turning on water supply and running two (2) quarts of water into a bucket.
3. Bend the open end of the supply tube to point toward the open end of the Water Valve

**PLUMBING DIMENSIONS**



**NOTE: MUST BE UNDER 1" (2.5 cm) FROM BACK WALL**

Tube (see Figure B). **Note:** The Water Valve Tube is designed to flex or bend as necessary to line up with the supply tube, so union can be connected easily.

4. Remove brass nuts and ferrules from union and slide onto ends of Water Valve Tube (see Figure C).
5. Connect nuts on copper tubing to union (see Figure D). Be sure both nuts are fully seated in union before tightening nuts. Do Not over tighten.
6. Turn on water supply to refrigerator and check for leaks.
7. Turn off water supply to refrigerator and correct any leaks. Repeat this process until no leaks exist.
8. Completely turn on water supply to refrigerator.
9. Verify drain pan is installed and aligned. Drain pan must be pushed past and over initial stopping point.

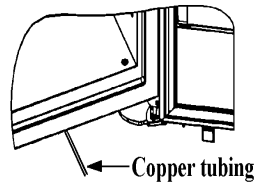


Figure A

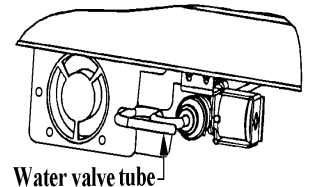


Figure B

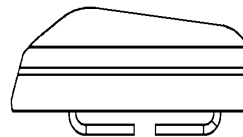


Figure C

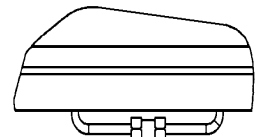
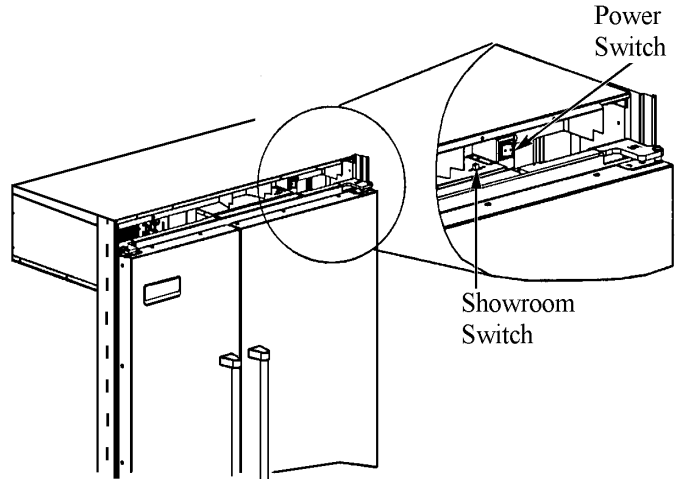


Figure D

## POWER/SHOWROOM SWITCHES

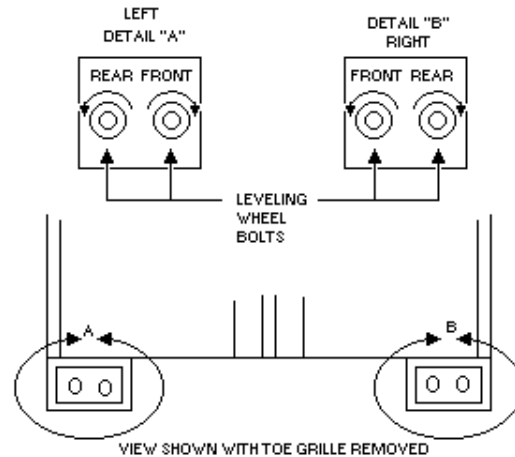
Verify operation by plugging power cord in receptacle. **Power switch will be shipped in the “ON” position and showroom switch will be in the “OFF” position.** (If showroom switch is switched to the “ON” position, showroom mode is engaged and power is shut off to the compressor. This mode is for showroom display only.)



## LEVELING REFRIGERATOR

Lift the refrigerator off the rollers, adjust to desired height and level refrigerator by using a 5/16” hex head wrench (refer to illustration below).

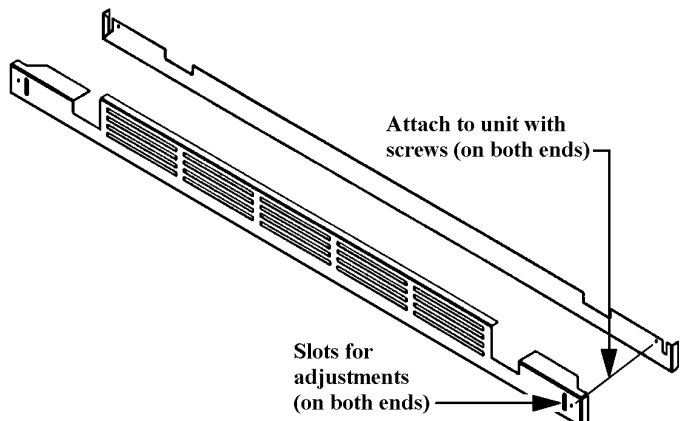
- To raise/lower right side rear, rotate the right side rear hex rod.
- To raise/lower the left side rear, rotate the left side rear hex rod.
- To raise/lower the right side front, rotate the right side front hex rod.
- To raise/lower the left side front, rotate the left side front hex rod.



**NOTE:** DO NOT use an electric driving device. Over-tightening can cause damage.

## KICKPLATE INSTALLATION

Align the holes on both ends of the louvered panel with the holes in the base of the refrigerator. Adjust the kickplate to the desired height and fasten in place by tightening the screws in the slot. Attach the kickplate to the refrigerator on each side with the two black Phillips screws provided.

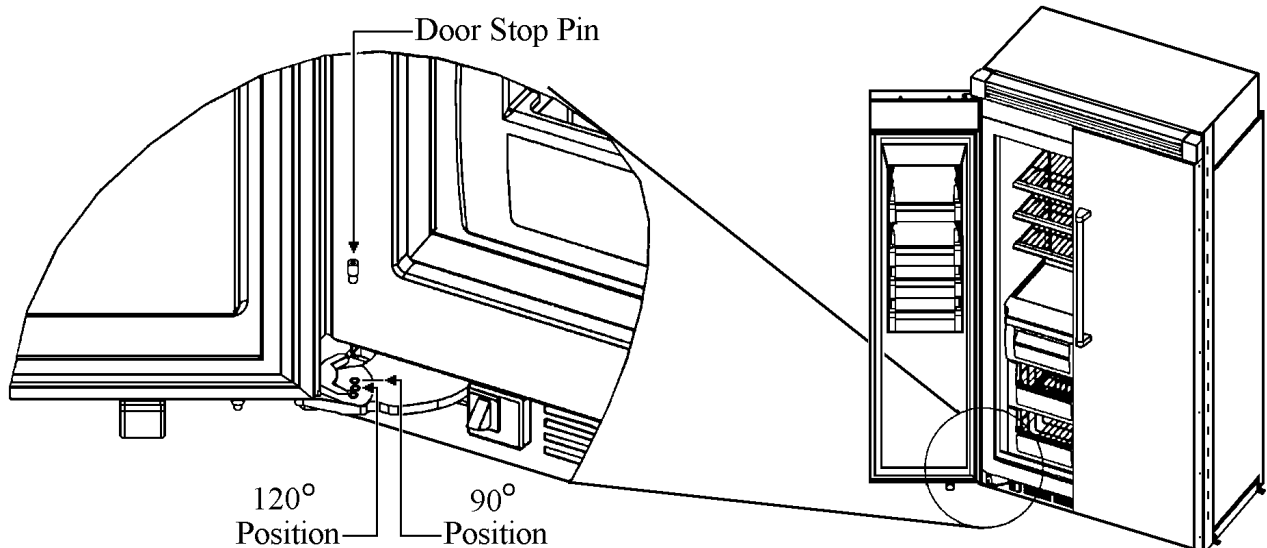


## DOOR STOP ADJUSTMENT

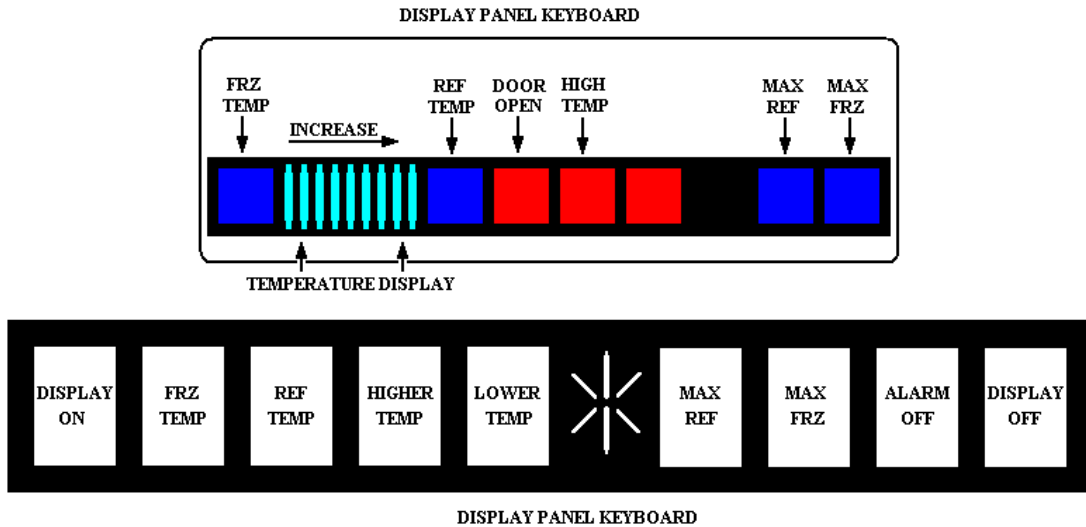
1. Using a 3/16" allen wrench, remove door stop pin located in bottom hinge.
2. The pin is factory set 110°. For 120° swing, move the pin to the utmost forward stop hole. For 90° swing, move the pin to the utmost rear stop hole.

## HINGE ADJUSTMENT

1. Using a 3/16" allen wrench, remove the door stop pin located in bottom hinge.
2. Using the height adjustment shim as a wrenching device, rotate the height adjustment bushing counterclockwise to raise or clockwise to lower the location of the door.
3. When proper adjustment is reached, align shim with door stop pin holes and replace door stop pin. Firmly tighten pin in place.



## DISPLAY PANEL KEYBOARD



### Display Panel Operation

#### Keyboard Pad Functions

##### Entry Tone

Indicates a pad was pressed, command read and accepted. Turn off entry tone by pressing and holding Display On pad for 3 to 5 seconds.

##### Command Accepted Tone

Three short tones indicate command accepted.

##### Display On Pad

1. Activates control panel. Control panel remains active at least 10 minutes.
2. Turns off Power Up Alarm (flashing lights) after power is first plugged in or after power outage.

**Note:** All pads, except Alarm Off, are inactive until Display On is pressed.

##### Freezer Temp Pad

Activates freezer temperature setting mode.

1. Freezer indicator light will glow. Freezer temperature setting will be displayed. Factory setting is 5.
2. Change freezer temperature setting by pressing Higher Temp or Lower Temp Pad.

##### Ref Temp Pad

Activates refrigerator temperature setting mode.

1. Refrigerator indicator light will glow. Refrigerator temperature setting will be displayed. Factory setting is 5.

2. Change refrigerator temperature setting by pressing Higher Temp or Lower Temp Pad.

##### Higher Temp Pad

Raises temperature setting one bar at a time. If entry tone is on. Tone will sound at each bar level until top level is reached.

1. Turn on temperature setting function of control panel by pressing Higher Temp Pad.
2. Press and hold Higher Temp pad to raise temperature setting at a faster rate.

##### High Temperature Alarm

Alarm sounds and indicator light shows if freezer or refrigerator has gone above critical level and remained warm for 2 hours. Alarm tone stops if temperature fails again.

1. Critical temperature for freezer is +15°F; for Refrigerator critical temperature is +60°F.
2. Press Alarm Off pad to turn off alarm.

##### Lower Temp Pad

Lowers temperatures setting one bar at a time. If entry tone is on, tone will sound at each bar level until bottom level is reached.

1. Turn on temperature setting function of control panel by pressing Lower Temp Pad.
2. Press and hold Lower Temp Pad to lower temperature setting at a faster rate.

## Display Panel Operation (con't)

### Max Frz Pad

Activates Maximum freezer mode setting freezer temperature to coldest setting for 24 hours or until Max Frz pad is pressed again.

1. Freezer indicator light will glow.
2. To adjust maximum freezer mode time refer to Program Mode B functions.

### Max Ref Pad

Activates Maximum refrigerator mode setting refrigerator to coldest setting for 24 hours or until Max Ref Pad is pressed again.

1. Refrigerator indicator light will glow.
2. To adjust maximum refrigerator time refer to Mode B functions.

### Alarm Off Pad

Turns off alarm signals. See Alarms section to interpret alarm signals.

1. Press and hold Alarm Off pad for 3 seconds to deactivate Door Open alarm. To reactivate Door Open alarm, press and hold Alarm Off pad for 3 seconds.
2. If Alarm Off pad is pressed and condition causing alarm is not corrected, alarm will reset.

### Hidden Button

Activates Program Mode. See Program Mode section for description of functions available.

1. Open refrigerator door.
2. Press Display On pad.
3. Press hidden button pad.
4. Within 6 seconds press the following pads in this sequence: Max Ref, Max Frz, Max Ref, Max Frz.
5. Tone will sound 3 times and control will be in program mode A.

### Display Off Pad

1. Deactivates control panel.
2. Deactivates temperature indication area of control panel.

## Electronic Functional Description

### Power Disconnect Switch

Use power disconnect switch to disconnect power without unplugging refrigerator. Power disconnect switch is located behind air grille on top right side. Refrigerator is shipped with power disconnect switch in the On position.

### Showroom Switch

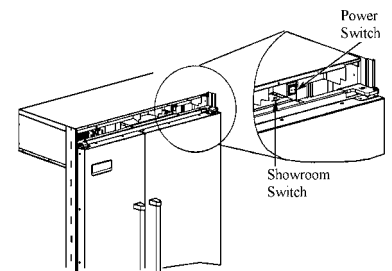
Showroom switch allows electronic controls and interior lights to function independently of refrigeration system. Showroom switch is located behind air grill to right of control panel. Refrigerator is shipped with showroom switch in unit run position.

## Alarms

### Power Up Alarm

After power is initially plugged in, after a power loss, or if power switch is turned off, all temperature indicator lights will flash until Alarm Off or Display On is pressed.

**Note:** All settings return to default factory settings.



### Door Open Alarm

Alarm tone sounds and indicator lights blink if either refrigerator or freezer door is open more than 3 minutes.

1. Turn off Door Open alarm by pressing Alarm Off pad or by closing door.
2. Deactivate door open alarm by pressing Display On pad and then press and hold Alarm Off pad for 3 seconds.
3. Door alarm delay can be adjusted in Program Mode B.

### High Temperature Alarm

Alarm sounds and indicator light shows if freezer or refrigerator temperature has gone above critical level and remained warm for 2 hours. Alarm tone stops if temperature falls again.

## Sabbath Mode Feature

**Mode Entry:** To enter Sabbath Mode the user must press and hold DISPLAY ON and then DISPLAY OFF for 3 seconds. The control shall beep 3 times and light the 3 right blue squares to alert the user that Sabbath mode has been entered. When the control enters Sabbath mode it will disable the interior lights, display (excluding the 3 right hand side lit blue squares), and alarm annunciators.

**Power Loss:** If in Sabbath Mode and the control experiences a long Power Loss, it will return to Sabbath Mode when power is regained.

**Exiting Sabbath Mode:** To exit Sabbath Mode the user will again press and hold DISPLAY ON and then DISPLAY OFF for 3 second and 3 beeps shall alert the user the Sabbath Mode has been exited. The control shall return to Normal Mode.

### Automatic Light Shut-off

If the controller senses an open door switch for more than 10 minutes the control will open the light relay removing the Neutral reference from the interior lighting harness. If the control senses a closure after the interior light were disabled it will reset (close the light relay) and the interior lights will be enabled for the next door opening. If the controller does not sense the door switch close, the interior lights will remain off and the customer will need to call technician service. (This feature is disabled in Showroom Mode.)

## Conventional Defrost:

### A. Mode “A” entry

While keyboard is enabled and the refrigerator and / or freezer door open, press the Vacation key once, and within five (5) seconds press Max Refrig, Max Freeze, Max Refrig, and Max Freeze. The controller will be in Mode “A” and an audio confirmation is to sound, three (3) beeps of duration 300ms on and 300ms off.

### B. Adjustable Conventional Defrost – setting time between defrosts

1. **Access:** While in Mode “A”, press and hold Display Off key for 3 seconds. 1 audio confirmation beep will be heard.
2. **Display:** The Conventional Defrost time will be displayed in one of the temperature indicators (one of nine temperature indicators) are to be lit.
3. **Defrost Times:** The indicator light and corresponding Defrost Times is listed below.
4. **Changing Levels:** The defrost times are changed by using the Higher Temp and Lower Temp keys. Pressing the High Temp key once will decrease the defrost time by one level; pressing the Lower Temp key once will increase the defrost time by one level.

Indicator	Defrost Time
1	4 hours
2	5 hours
3	6 hours
4	8 hours
5	12 hours
6	16 hours
7	18 hours
8	20 hours
9	24 hours

5. **Exit Modifying Conventional Defrost – time between defrost:** To exit Adjustable Conventional Defrost, press Display On key. The changed value will be written to the EEPROM and will remain that value until it has been changed again in Mode “A”.
6. **Selecting Conventional Defrost:** Press Display On and make sure you are in Mode “B” (the Clean Condenser Indicator will be off – red square to the far right.) you should see the Vacation Indicator lit – blue square to the far left (group of 3 blue squares). When the Vacation Indicator is lit, you are in Adaptive Defrost, when it is not lit, you are in Conventional Defrost. Toggle from Adaptive to Conventional Defrost by selecting the Vacation Keypad.
7. **Exiting Programming Mode –** Press and hold Display On Key for 3 seconds.

## Mode A Functions (con't)

### Temperature Offset Calibration

Offset amount adjusts temperatures for refrigerator cut-ins and cut-outs by the amount of offset. The chart below shows the indicator and the amount of offset from the factory default setting.

- Setting Refrigerator Temperature Offset  
Press Ref Temp pad. Refrigerator indicator and one indicator will glow. Press Higher Temp pad to move offset to the next warmer setting. Press Lower Temp pad to move offset to the next colder setting. Factory default refrigerator offset is -4.
- Setting Freezer Temperature Offset

Press Freezer Temp pad. Freezer temperature indicator and one indicator will glow. Press Higher Temp pad to move offset to the next warmer setting. Press Lower Temp pad to move offset to the next colder setting. Factory default freezer offset is 0.

### Defrost Mode Selection

Toggle Hidden Button pad to select adaptive or conventional defrost mode. Hidden Button indicator glows when adaptive defrost has been selected. If Hidden Button indicator is off, conventional defrost is selected. Conventional defrost uses 8 hour CRTD value. (**CRTD –Continuous Run Time Defrost.**)

### Forced Defrost Selection

While in Mode “B” toggle Hidden pad to select adaptive or conventional defrost mode. Hidden Button blue square located between high temperature red square and Max Ref blue square indicator glows when adaptive defrost has been selected. If this blue square indicator is off, conventional defrost is selected. Conventional defrost uses the 8 hour CRTD value as the default value when the CRTD is set for house, the defrost will be 4 hrs, 8 hrs, 8 hrs, 8 hrs. (**CRTD – Continuous Run Time Defrost**).

### Forced Defrost

While in Mode “B” defrost can be forced to start, press and hold the Alarm Off pad for 3 seconds. Program changes will be saved permanently in EEPROM and program mode will exit to Run Mode.

### Forced Pull Down

Compressor start can be forced while in Mode “B”, press and holding Max Frz pad for 3 seconds. Program changes will be saved permanently in EEPROM. Compressor, evaporator fan and condenser fan will come on regardless of thermistor input values, compressor dwell / off time and fan delay.

### Exiting Program Mode

Press Display On pad for 3 seconds to exit Program Mode. Tone will sound three times. Changes made in Program Mode will be permanently saved in EEPROM.

**Note:** If no pad is pressed for 10 minutes, Program Mode will be automatically exited. However, no changes will be saved if Program Mode exits automatically.

### Electronic Testing Mode

#### Forced Defrost Start

1. Press Display On pad to activate control panel.
2. Simultaneously press and hold Max Ref and Display Off pads for 3 seconds.

#### Forced Compressor Start

1. Press Display On pad to activate control panel.
2. Simultaneously press and hold Max Frz pad and Display Off pad for 3 seconds.

#### Open Thermistor Detect

Alarm sounds and freezer or refrigerator indicator light shows and temperature indicators 4 through 7 will turn on in sequence if either thermistor circuit opens. Refer to Temperature Control Operation Section and Electronic Testing Section.

1. Press Alarm Off pad to turn off alarm.
2. Alarm will reset for normal operation. If condition has not been corrected, alarm will sound again.



## Electronic Functional Description (con't)

1. Critical temperature for freezer is +15° F; for refrigerator critical temperature is +60° F.
2. Press Alarm Off pad to turn off alarm.

### Thermistor Alarm

Alarm sounds and freezer or refrigerator indicator light shows and temperature indicators 4 through 7 will turn on in sequence if either thermistor circuit opens. Refer to Temperature Control Operation Section and Electronic Testing Section.

1. Press Alarm Off pad to turn off alarm.
2. Alarm will retest for normal operation. If condition has not been corrected, alarm will sound again.

### Temperature Control Operation

For any temperature setting, outputs will be turned off/on based on cut-in/cut-out temperature determined by resistance levels of freezer and refrigerator thermistors.

### Refrigerator and Freezer Thermistor

Temp °F ( C)	Resistance Ohms	Temp °F ( C)	Resistance Ohms
-20 (-29)	495600	36 ( 2)	87510
-15 (-26)	418200	38 ( 3)	82740
-9 (-23)	354000	39 ( 4)	78300
-6 (-21)	300600	43 ( 6)	74100
-4 (-18)	256200	45 ( 7)	70170
5 (-15)	218850	46 ( 8)	66450
10 (-12)	187470	48 ( 9)	62970
16 (-9)	161040	50 (10)	59670
19 (-7)	138690	55 (13)	52290
25 (-4)	119760	61 (16)	45900
30 (-1)	103680	64 (18)	40410
32 ( 0)	97920	70 (21)	36540
34 ( 1)	92550	77 (25)	30000

As temperature decreases, resistance increases.

As temperature increases, resistance decreases.

**Open thermistor or thermistor circuit will result in failure of refrigerator to cool.**

**Shorted thermistor will cause refrigerator to run 100 percent of time except for defrost cycle.**

- Freezer temperature setting and thermistor value will determine if compressor/condenser fan and evaporator fan switches are open or closed. Compressor/condenser fan switch must be open for 6 minutes before switch can close again (compressor dwell time).
- Refrigerator temperature setting and thermistor value will determine if fresh food fan switch is open or closed.
- Cut-out and cut-in temperature values must be reached and maintained for 15 seconds before output state will change (digital delay).
- Refrigerator and freezer control calibration can be adjusted in Program Mode B.

### Factory set freezer and refrigerator settings

Frozen Food		Fresh Food		Level
Cut-Out °F(C) ±1.5	Cut-In °F(C) ±1.5	Cut-Out °F(C) ±1.5	Cut-In °F(C) ±1.5	
-10 (-23)	2 (-17)	29 (-1.7)	34 (1.1)	9
-8 (-22)	4 (-16)	31 (-0.6)	36 (2.2)	8
-6 (-21)	6 (-14)	33 (-0.6)	38 (3.3)	7
-5 (-21)	7 (-14)	34 (1.1)	39 (3.9)	6
-4 (-20)	8 (-13)	35 (1.7)	40 (4.4)	5
-3 (-19)	9 (-13)	36 (2.2)	41 (5.0)	4
-2 (-19)	10 (-12)	37 (2.8)	42 (5.5)	3
0 (-18)	12 (-11)	39 (3.9)	44 (6.6)	2
2 (-17)	14 (-10)	41 (5.0)	46 (7.7)	1
-10 (-23)	2 (-17)	----	----	Max Frz
----	----	29 (-1.7)	34 (1.1)	Max Ref

### Adaptive Defrost Operation

Defrost occurs after predetermined length of compressor run hours. Compressor run time between defrosts changes, or adapts, depending upon recent history of defrost lengths (time it takes for defrost terminator to open after defrost heater has been turned on).

## Electronic Functional Description (con't)

- Defrost terminator opens at 55° F (13° C) and closes at 20° F (-7° C).
- Compressor run time between defrost (CRTD) will be one of 3 values under normal operation: CRTD 1 (8 hours) or CRTD 2 (12 hours) or CRTD 3 (16 hours).

If defrost length is low (DT-LO defined as 21 minutes) indicating small frost load, CRTD for next defrost cycle is advanced to next level.

If defrost length is high (DI-HI defined as 24 minutes) indicating large frost load, CRTD for next defrost cycle is lowered to next level.

If defrost length is between 21 and 24 minutes, CRTD for next defrost cycle remains the same.

Initial value at power up CRTD 0 is 4 hours.

- Hidden Button Mode CRTD equals 96 hours. Hidden Button Mode CRTD is interrupted with door openings. Defrost interval will revert back to interval before Hidden Button Mode. Three things must occur to reach Hidden Button Mode CRTD:
  1. Defrost interval must be CRTD 3 (16 hours).
  2. Both refrigerator and freezer doors must have remained closed since last defrost cycle.
  3. Defrost thermostat must have opened in less than 21 minutes during last defrost cycle.
- Six minutes dwell time occurs after defrost terminator opens before compressor and condenser fan motor will operate. Ten minute dwell time occurs after defrost terminator opens before evaporator fan motor will operate. Dwell time can be bypassed by disconnecting power to the unit for 30 seconds.
- Conventional defrost can be selected in Program Mode B.

## PROGRAM MODE

### Accessing Program Mode

Two programming modes are available. Mode A allows reading refrigerator and freezer thermistor temperatures. Mode B is used for all other programmable functions.

1. Open refrigerator door.
2. Press Display On pad.

3. Press Hidden Button pad.
4. Press the following sequence of pads within 6 seconds; Max Ref, Max Frz, Max Ref, Max frz.\
5. When access is granted, tone will sound three times and control will be in Program Mode A.
6. Toggle to Program Mode B by pressing Display On pad. Red square to the right of High Temp Alarm will disappear when in Mode "B".

### EEPROM Update in Control Memory

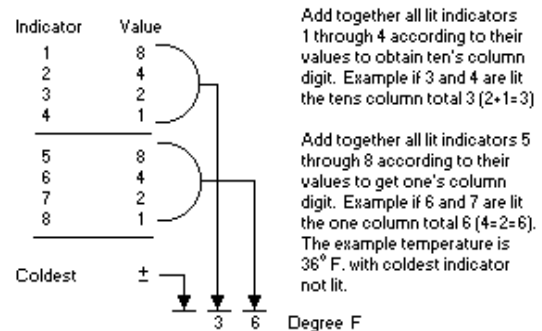
EEPROM is permanent programmable memory of the control panel.

- Entry tone, door open audio alarm and Sabbath Mode State and status are stored in EEPROM after control panel is deactivated.
- Information stored in EEPROM memory is not affected by power loss.

## Mode A Functions

### Reading Temperature Display

Temperature display will show thermistor



temperature in binary coded decimal format (BCD). Indicator lights 1 through 4 represent the tens digit with 1 being the most significant bit. Indicator lights 5 through 8 represent ones digit with 5 being the most significant bit.

### Freezer Thermistor Temperature

1. Choose freezer thermistor temperature display by pressing Freezer Temp pad.
2. Freezer thermistor temperature displays.

### Refrigerator Thermistor Temperature

1. Choose Refrigerator Thermistor temperature display by pressing Ref Temp pad.
2. Refrigerator thermistor temperature displays.

## Mode B Functions

**Warning:** There usually should not be any need to change the offsets. The refrigerator meets energy requirements when shipped from the factory with the factory default.

### Automatic Keyboard Functions

Activate and deactivate keyboard by toggling Display Off pad. If high temperature indicator glows, keyboard will disable after 10 minutes. If high temperature indicator is off, keyboard is always enabled. **DO NOT LEAVE KEYBOARD IN ENABLED MODE AFTER PROGRAMMING IS COMPLETE**

### Changing Door Alarm Delay

1. While in Mode “B” press Alarm Off pad. Door open indicator will glow. One temperature indicator should glow indicating present delay setting in minutes (indicator 1 means 1 minute, 2 means 2 minutes, etc.) Default delay is 3 minutes.
2. Press Higher Temp pad to decrease delay by 1 minute.
3. Press Lower Temp pad to increase delay by 1 minute.

### Changing Max Ref Run Time Duration

1. Press Max Ref pad. Max Ref light will glow. One temperature indicator should glow indicating present Max Ref run time duration in 2 hour increments (indicator 1 means 6 hours, 2 means 8 hours, etc.) Default delay is 10 hours.
2. Press Higher Temp pad to decrease Max Ref duration by 2 hours.
3. Press Lower Temp pad to increase Max Ref duration by 2 hours.

### Changing Max Frz Run Time Duration

1. Press Max Frz pad. Max Fra light will glow. One temperature indicator should glow indicating present Max Frz run time duration in 4 hours increments (indicator 1 means 8 hours, 2 means 12 hours, etc.) Default delay is 24 hours.
2. Press Higher Temp pad to decrease Max Frz duration by 4 hours.
3. Press Lower Temp pad to increase Max Frz duration by 4 hours.

## Changing Temperature Offset Calibration

Modify the temperature offsets, adjusts the temperatures for the refrigerator and freezer cut-ins and cut-outs by the amount of offset. The chart below shows the indicator and the amount of offset from the factory default setting.

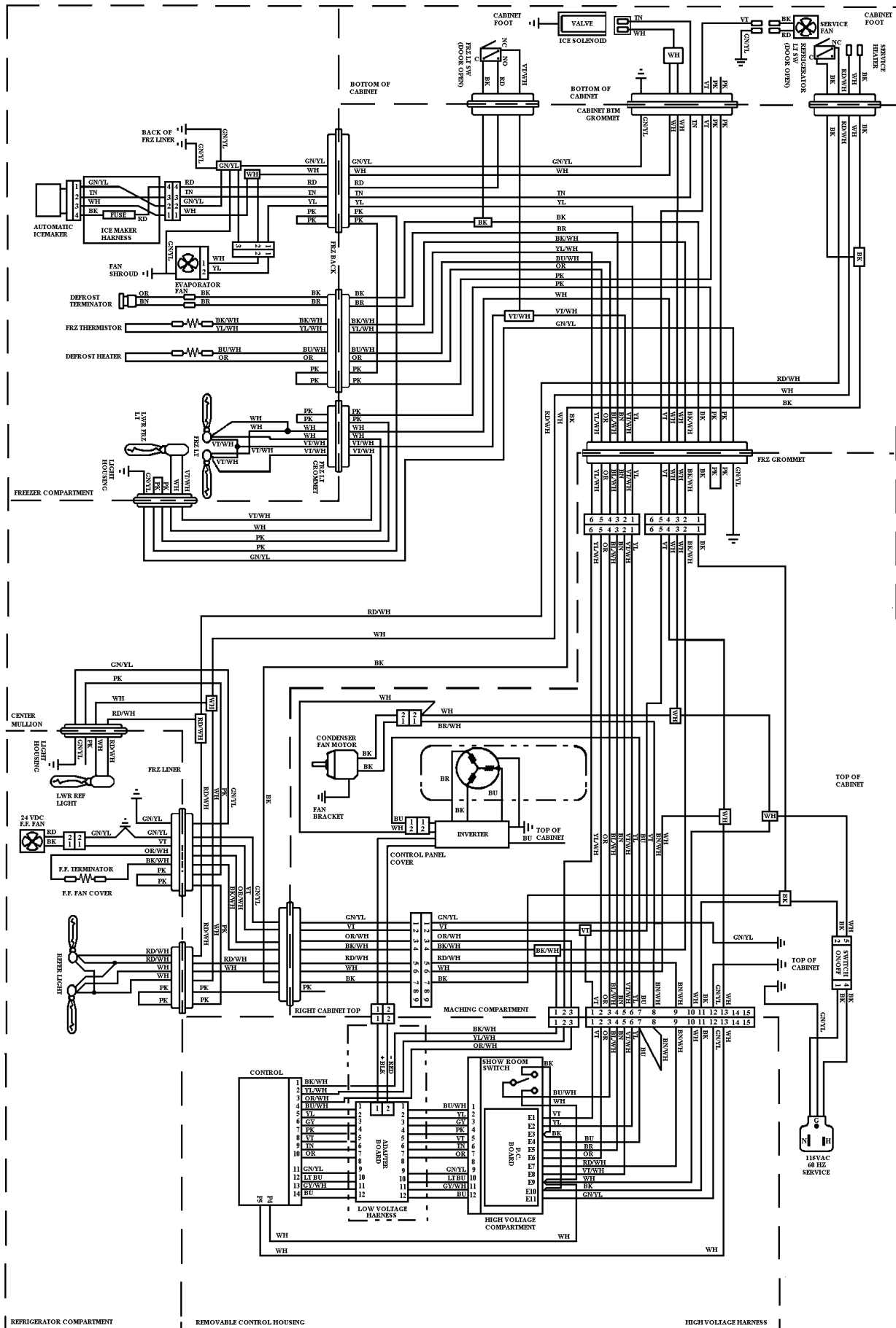
INDICATOR	OFFSET
1	+8
2	+6
3	+4
4	+2
5	0
6	-2
7	-4
8	-6
Coldest	-8

- **Setting Refrigerator Temperature Offset** – While in Mode “B” press Ref Temp pad. Refrigerator indicator and one offset indicator light will glow on the display. Press Higher Temp pad to move offset to the next warmer setting. Press Lower Temp pad to move offset to the next colder setting. Factory default refrigerator offset indicator is 7.
- **Setting Freezer Temperature Offset** While in Mode “B” press Freezer Temp pad. Freezer indicator and one offset indicator will glow. Press Higher Temp pad to move offset to the next warmer setting. Press Lower Temp pad to move offset to the next colder setting. Factory default freezer offset indicator is 4.

### Defrost Mode Selection

While in Mode “B” toggle Hidden Button pad to select adaptive or conventional defrost mode. Hidden Button blue square located between high temperature red square and Max Ref blue square indicator glows when adaptive defrost has been selected. If this blue square indicator is off, conventional defrost is selected. Conventional defrost uses the 8 hour CRTD value as the default value when the CRTD is set for 8 hours, the defrost will be 4 hrs, 8 hrs, 8 hrs, 87 hrs. (**CRTD – Continuous Run Time Defrost.**)

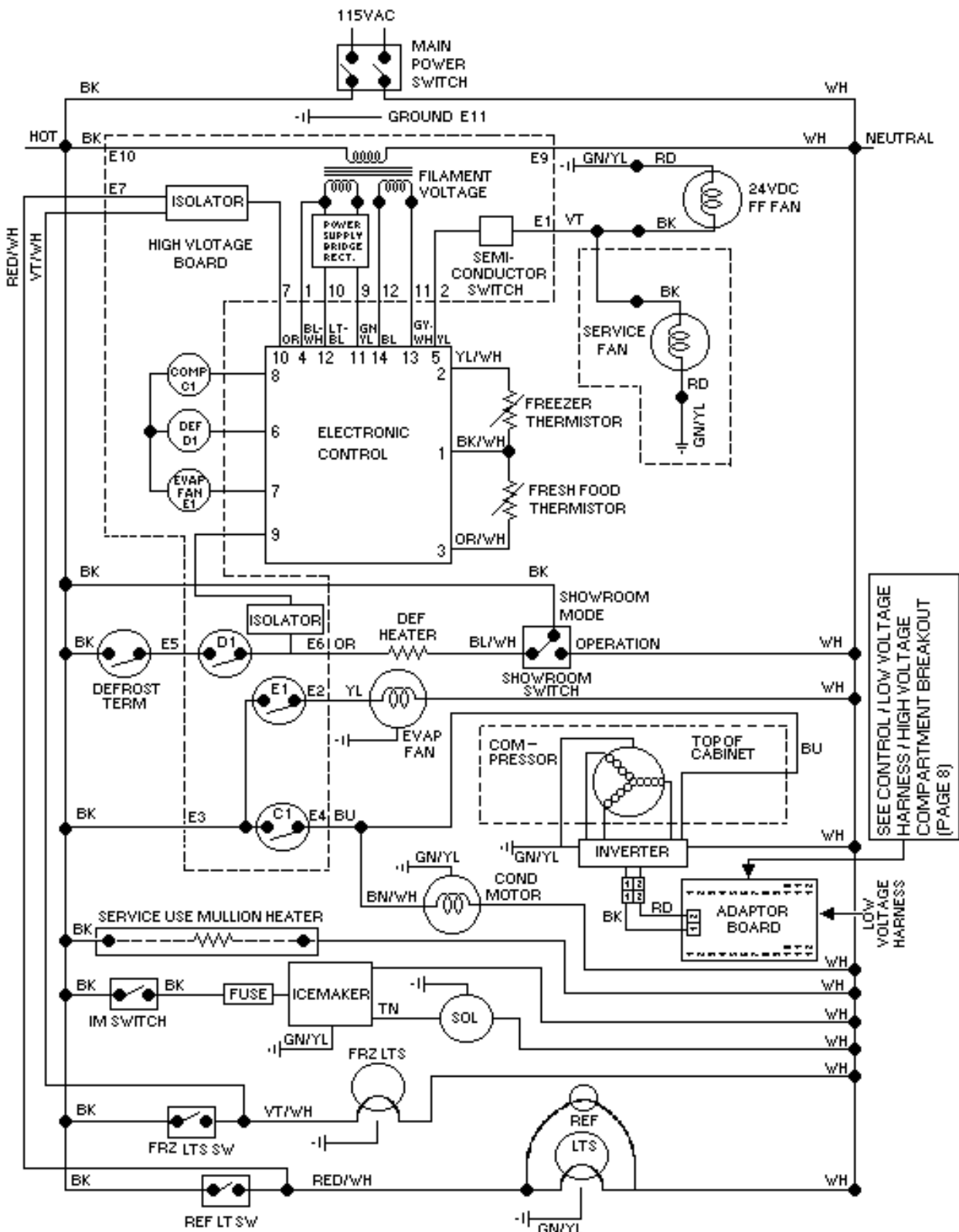
# WIRING DIAGRAM BUILT-IN SIDE-BY-SIDE 42" W. REFRIGERATOR





### WARNING

To avoid electrical shock which can cause severe personal injury or death, disconnect power to refrigerator using power switch before servicing. Wires removed during disassembly must be replaced on proper terminals to insure correct earth ground and polarization. After servicing, reconnect power using power switch.



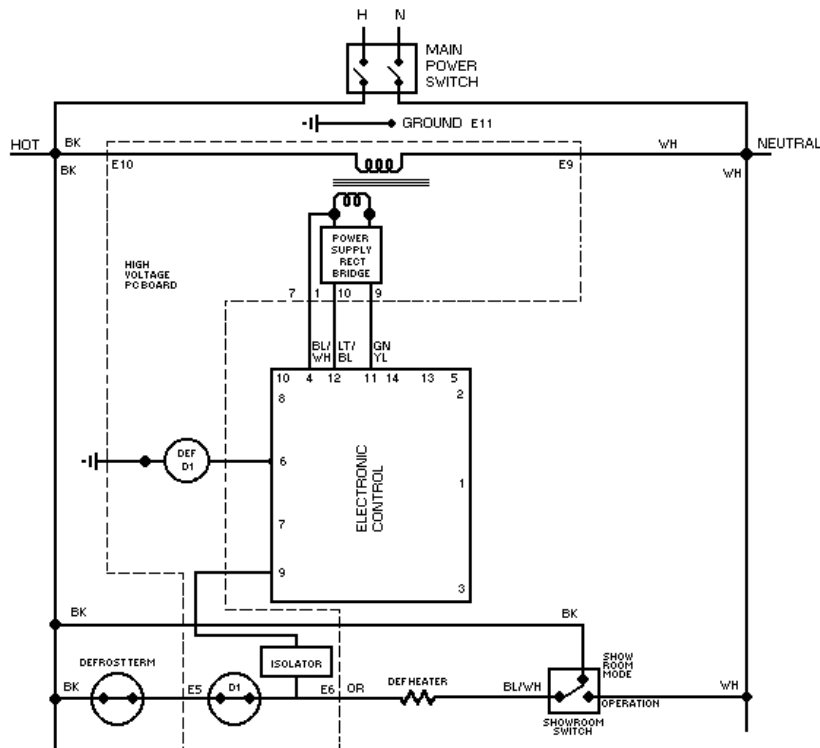
## Adaptive Defrost Theory of Operation



### WARNING

To avoid electrical shock which can cause severe personal injury or death, disconnect power to refrigerator using power switch before servicing. Wires removed during disassembly must be replaced on proper terminals to insure correct earth ground and polarization. After servicing, reconnect power using power switch.

**IMPORTANT:** when the showroom switch is OFF, the isolator sees line voltage which keeps the electronic controller from signaling the evaporator fan motor or compressor relay coils and keeps the fresh food fan off.



After designated compressor run time, refrigeration cycle is interrupted and electronic control sends a low voltage signal to defrost relay coil (def D1).

Powering the relay coil closes contact (D1) completing high voltage circuit to defrost heater through closed defrost terminator (closes at 15°F).

Isolator, which is part of high voltage PC board, recognizes presence of line voltage to defrost heater and sends low voltage signal to electronic control.

Electronic control keeps count of number of minutes defrost terminator remains closed (opens at 48°F).

Length of time defrost terminator is closed determines if the next defrost cycle advances by 4 hours of compressor run, stays at the same interval, or delays by 4 hours of compressor run.

If defrost terminator does not open before 29 minutes, defrost cycle is automatically terminated by electronic control and refrigeration cycles will resume after 6 minutes dwell-time.

## TERMINAL BOARD

The electrical diagram in figure 1 represents the most typical connections with the use of a terminal board.

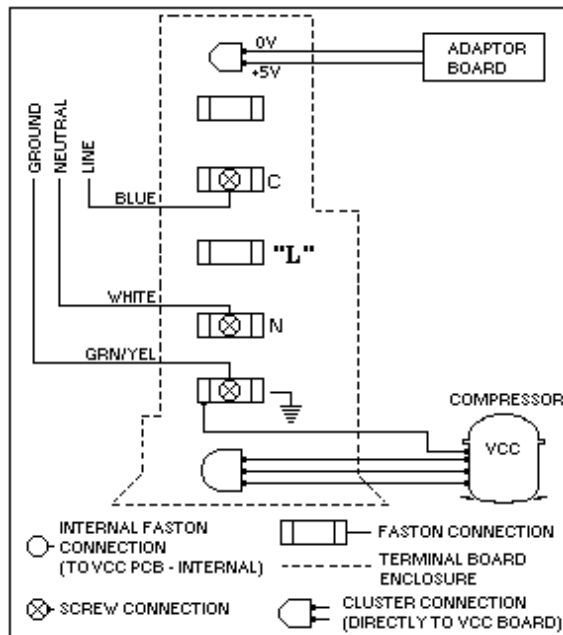


FIG. 1

## STARTING PROCEDURES

Once all due electrical connections are made and the compressor is properly assembled to the refrigeration system, the compressor will start if AC voltage is supplied to the inverter. The following steps take part during the start procedure:

- After the connection to the supply AC line (or switch on of thermostat) the inverter will spend 6 seconds of waiting time for the first try. The inverter will also stand by for 6 seconds after each failed attempt (if any).
- After the 6 seconds delay, the inverter will position the rotor.
- Immediately after positioning the rotor, the compressor will start and accelerate to the pre-selected speed entering the normal operation mode.

- In the occurrence of a failed start, a limit of 12 consecutive tries will be made until the inverter will assume a waiting condition depending on the software version installed (this situation may be encountered if there is no equalized pressure between suction and discharge sides in the refrigerating system). The inverter will also assume a waiting condition if hardware defects are detected before the first try.
- If power is switched off during the starting procedure, the inverter will self reset when the power is recovered.
- A "watch dog" routine running at all times will reset the inverter in case strong line or control signal disturbance occurs.

## NORMAL OPERATION MODE

After a normal starting, the compressor will run under the desired speed dictated by the speed control signal input.

During this phase, the compressor speed will be monitored for each shaft turn and compared with the speed control signal information. If the compression load is too high for the selected speed, the compressor motor will be adjusted to work under a lower speed until the compressor is able to maintain a constant speed. If the load is too high so the compressor cannot be maintained at the lowest possible speed, then the compressor will be stopped.

At all times, a "watch dog" routine will reset the inverter in case it stops working properly. If power is switched off during the operation, the inverter will self reset when the power is recovered and begin a new starting procedure.

## INVERTER SHUTDOWN

The compressor may only be switched off by cutting its power supply or by entering the due speed control input.

If the compressor is made to stop due to power supply switch off, then the inverter will self reset when the power is recovered and begin a new starting procedure.

If the inverter remains connected to AC line while the compressor is stopped, a stand by power consumption will be present in order to maintain the inverter in operation.

## PROTECTIONS

The VCC compressor is electronically protected meaning that this function is performed by the inverter circuit during its operation. The compressor itself is not equipped with internal or external conventional overload protector (bimetallic). The following are the main built in protections and performed by the inverter.

- a) **LOW OR NO VOLTAGE** – If the AC (supply) voltage drops below 85 VAC (as a general rule) the inverter will be automatically reset.
- b) **“WATCH DOG”** – A “watch dog” routine running at all times will reset the inverter in case strong line or control signal disturbance occur. The “watch dog” function provides a hardware monitor over the software to avoid losing the program. All the signals that the microprocessor is receiving are monitored.
- c) **LOCKED ROTOR** – In case the rotor is locked during the starting trial, the current output to the compressor is interrupted. In the occurrence of a failed start, a limit of 12 consecutive tries will be made until the inverter will assume a waiting condition depending on the software version installed (this situation may be encountered if there is no equalized pressure between suction

and discharge sides in the refrigerating system.

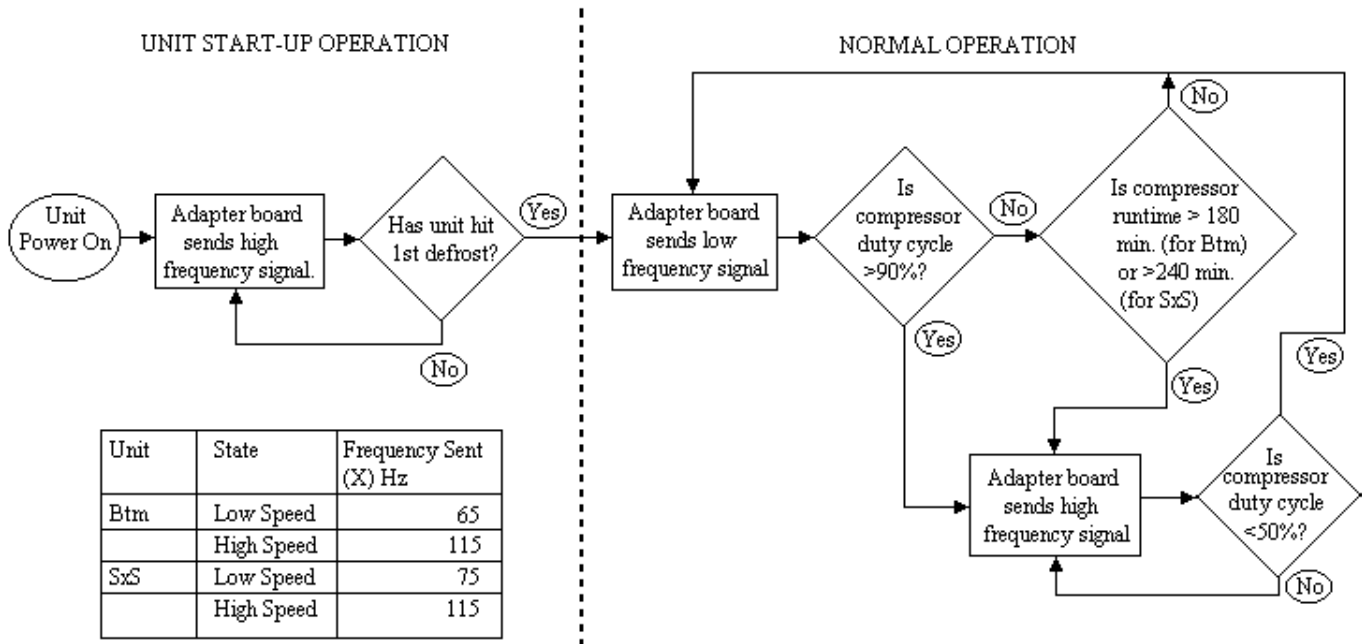
- d) **HARDWARE CHECK** –During the starting procedure and before applying current to the compressor motor, all power switches are checked for short circuit. If a malfunction is detected, the inverter will enter the waiting time mode.
- e) **OVERCURRENT PROTECTION** – The inverter hardware is able to detect and react when the current overcomes a predefined limit of 3.3amps. In case the input current limit is reached, the motor current will be kept at this value.
- f) **OVERLOAD PROTECTION** – If the load on the shaft of the compressor is increased for a given speed input, the current will be increased until its limit (3.3 A max) is reached. If the current is already at 3.3 Amps then the speed will be decreased until constant speed is achieved keeping the balance with the shaft load. If the load continues to increase the compressor will reduce its speed until the lowest speed limit. If the load is further increased then a stall condition is reached.  
  
In case the overload is kept for a long time, the power stage of the inverter may increase in temperature. This overheating is then sensed by a temperature sensor installed on the power switches heat sink that shuts down the inverter when over the limit of 90° C.
- g) **SPEED PROTECTION** – Two operating limits are defined for the compressor operation: Min speed 1600 rpm (53 Hz) and Max speed of 4500 rpm (150 Hz).
  - a. **Minimum speed:** if the speed signal requires operation under the speed limit than the compressor will stop.



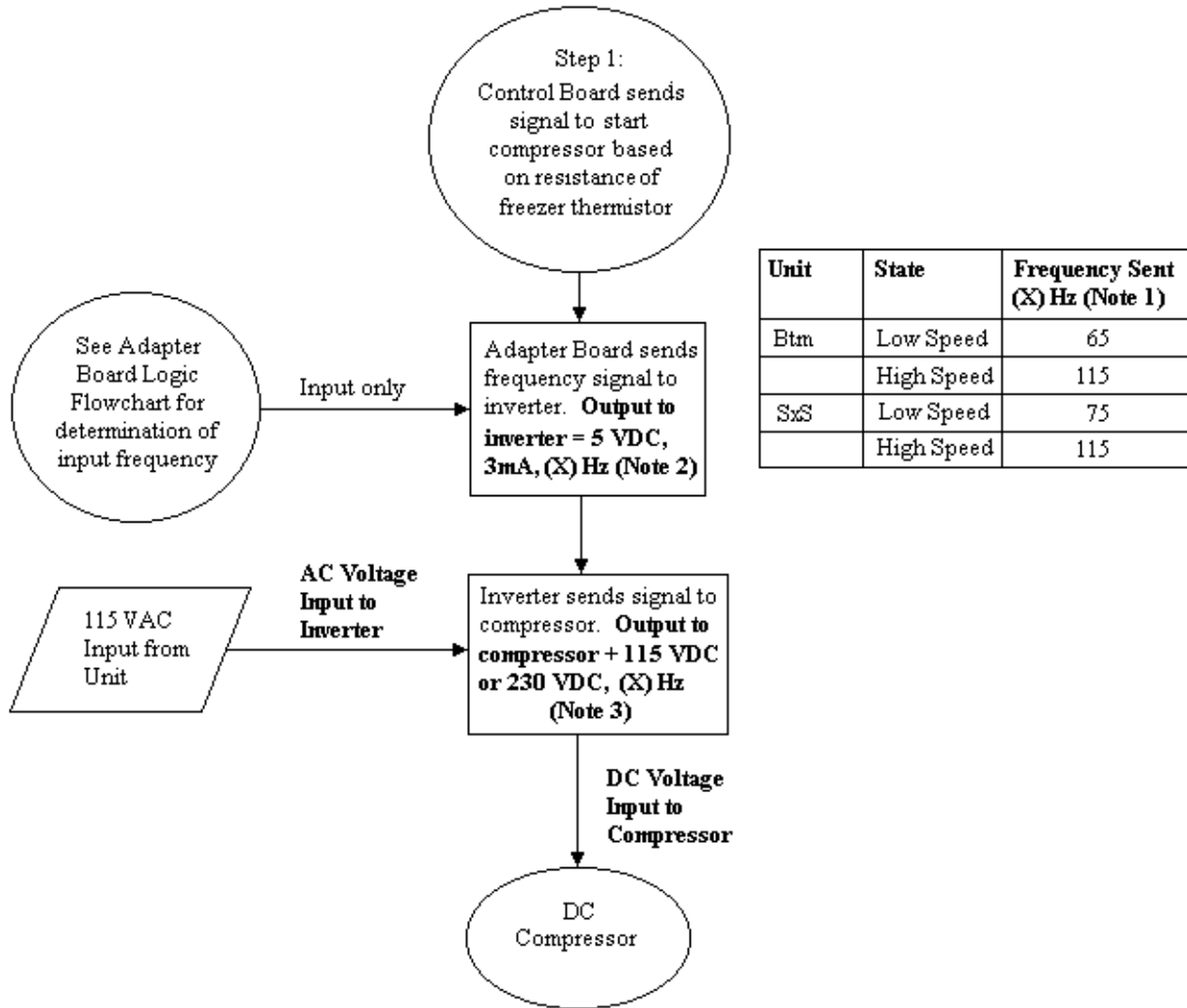
- b) Maximum speed: if the speed signal requires operation above the speed limit than the compressor will be kept running at the maximum speed.
- h) SHORT CIRCUIT PROTECTON – In case short circuits, a current detection circuit will open the power

switches (cutting the current) and avoiding further damage to power devices or compressor winding.  
 In case of a major failure in the hardware (short circuit of two or more power switches, a fuse will brake the current supplied to the inverter).

### ADAPTER BOARD LOGIC FLOWCHART



## CONTROL BOARD OPERATION

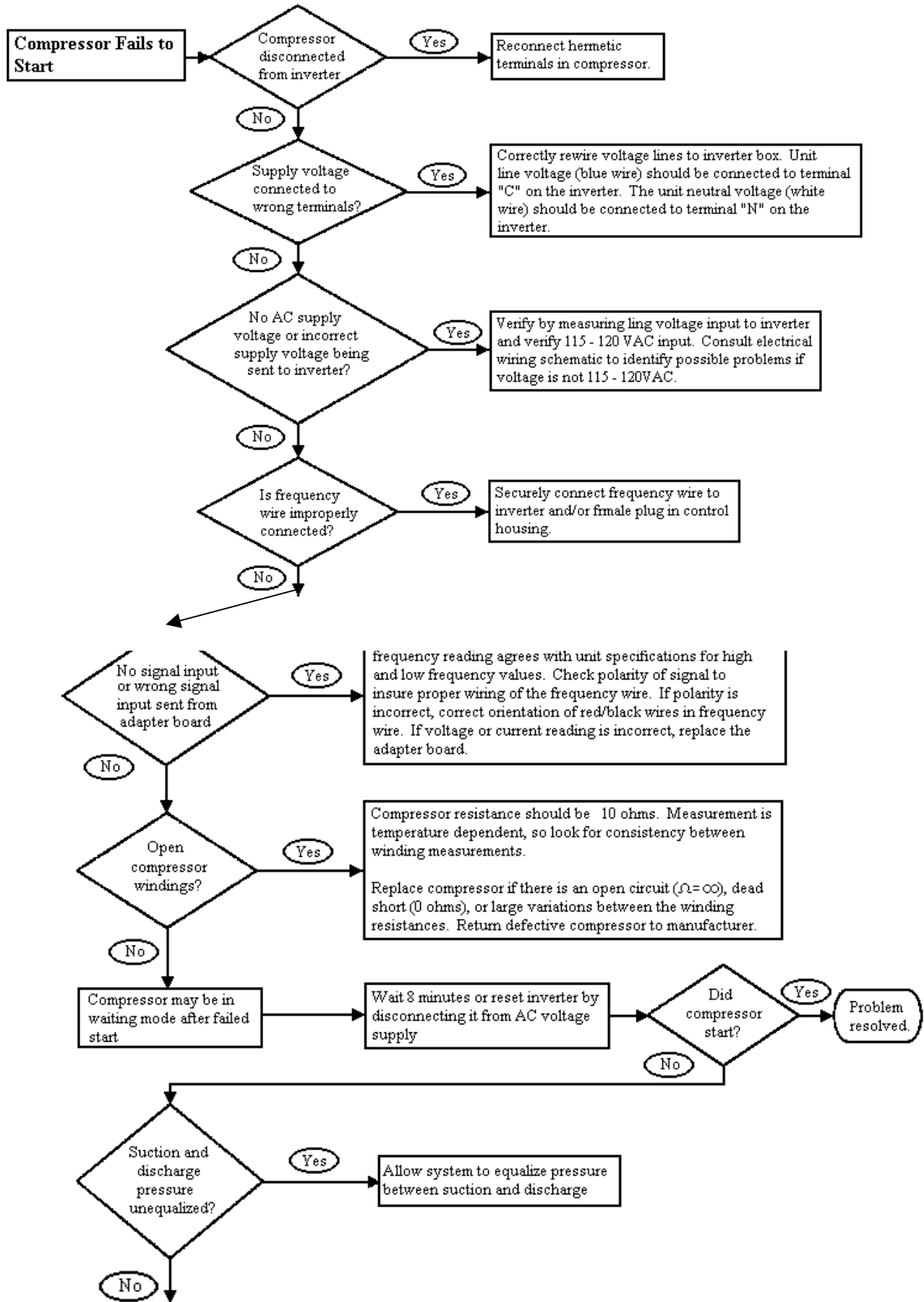


Note 1: Compressor speed (rpm) = (X) Hz \*30

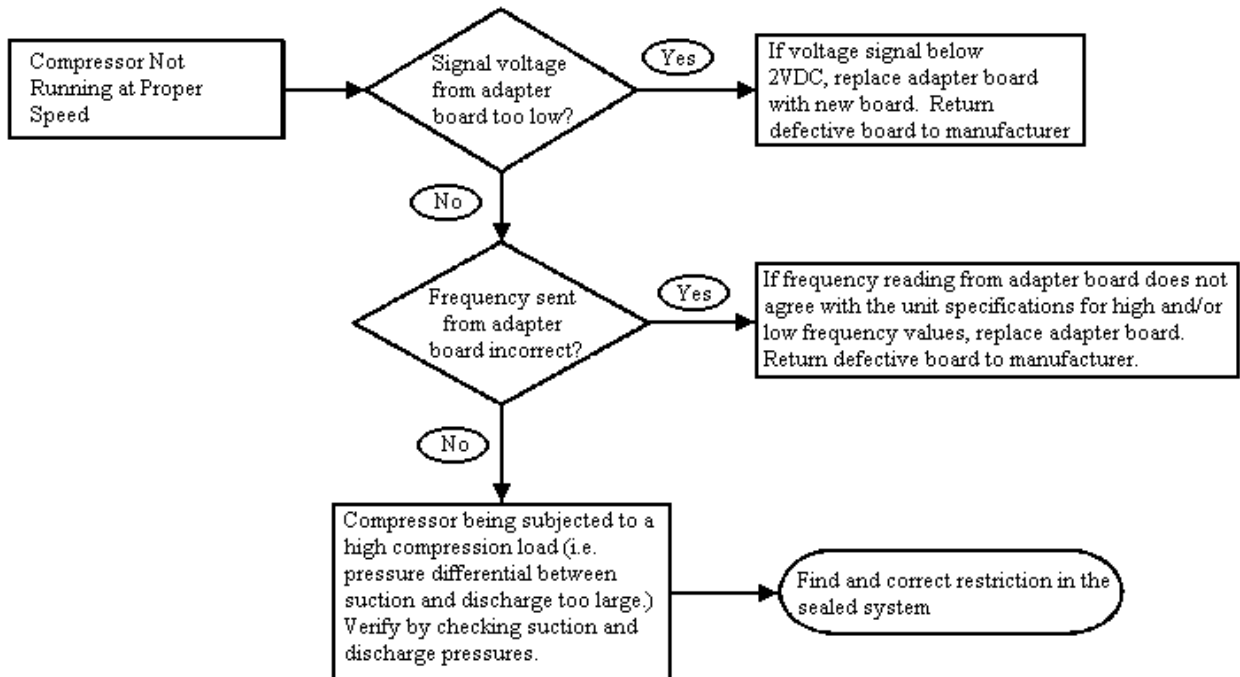
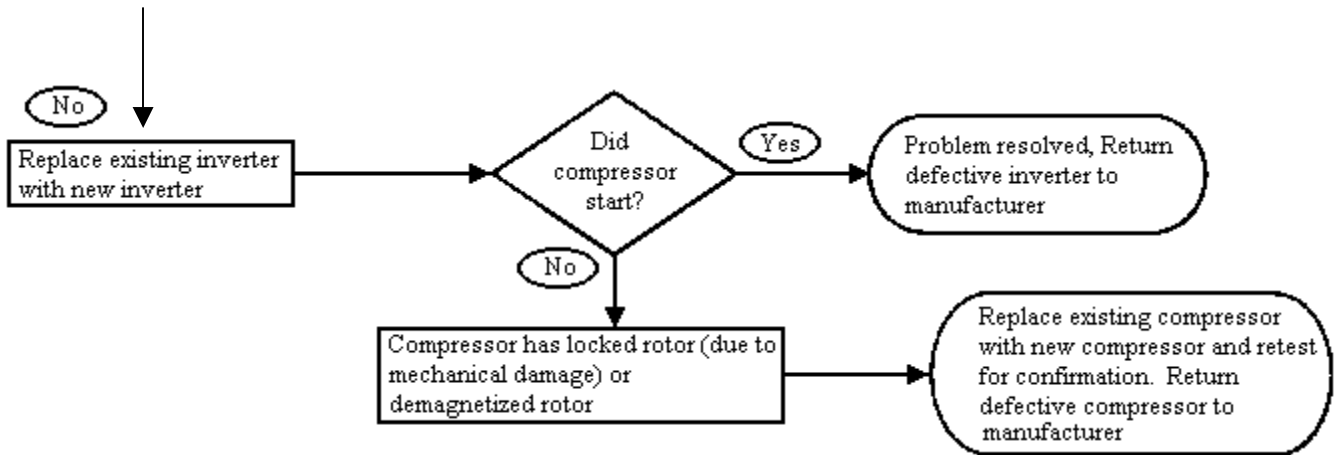
Note 2: The 5 VDC signal from the adapter board to the inverter is the driving potential for the frequency signal. It is not the voltage being sent to the compressor. The speed in which the compressor runs is dependent upon the frequency that is sent from the adapter board.

Note 3: Embraco inverter uses a voltage doubler during speeds >2250 rpm to increase the efficiency at high speeds. If the voltage doubler is off, the inverter sends 115 VDC to the compressor. If the voltage doubler is on, the inverter sends 230 VDC to the compressor.

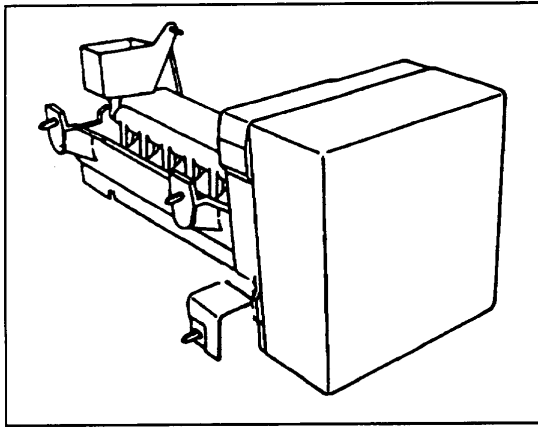
## TROUBLESHOOTING



## TROUBLESHOOTING (con't)



## ICE MAKER



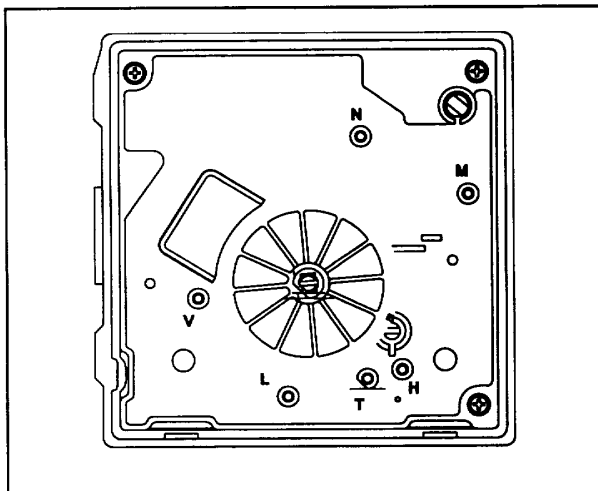
### Operation

Thermostat closes when temperature reaches  $17^{\circ} \pm 3^{\circ}\text{F}$  ( $-8.3^{\circ} \pm 1.5^{\circ}\text{C}$ ). Current flows through thermostat to motor. See “Ice Maker Wiring Diagram”. Motor is linked with drive gear. From module, there are copper contacts that ride on copper strips on backside of drive gear. As the drive gear rotates, contacts will make or break a circuit (tract) to the copper strips to operate ice maker.

All components can be tested without removing ice maker or moving refrigerator away from installation. Remove cover.

Test points are identified on module:

- N = Neutral side of line
- M = Motor connection
- H = Heater connection
- T = Thermostat connection
- L = L1 side of line
- V = Water valve connection



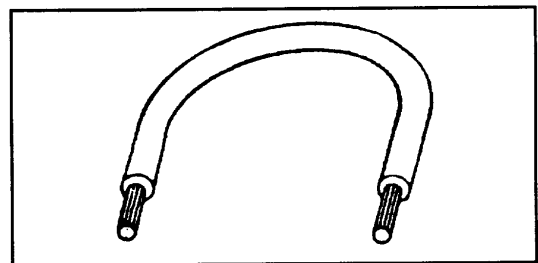
### Specifications

- Mold heater: 185 watts, 264 ohms
- Thermostat: Close  $17 \pm 3^{\circ}\text{F}$  ( $-8 \pm 1^{\circ}\text{C}$ )  
(Bimetal) Opens  $32 \pm 3^{\circ}\text{F}$  ( $0 \pm 1^{\circ}\text{C}$ )
- Water fill: 140 cc, 7.5 sec.
- Motor cycle Stamped in circuit.  
Plug in connectors  
One revolution of blades takes  
3 minutes plug stall time on ice  
(eject and water fill)

### Testing Procedures

Verify ice maker has power, shut off arm is down, and freezer is cold enough to close bimetal thermostat.

- Test point L and N will verify 120 volts to ice maker module.
  - Test point T and H will verify bimetal thermostat is open or closed.
  - Verify test probes go into test points  $\frac{1}{2}$  inch (1.25 cm).
1. Short T and H with a shunt (insulated 14 gauge wire with ends stripped back  $\frac{5}{8}$  inch (1.6 cm) to run motor. If motor runs. Replace bimetal thermostat. If motor does not run, replace module.



2. Leave jumper in for half of revolution. Touch heater mold. If heater mold feels warm, heater is working properly
3. Remove jumper. Water valve will be energized in last half of revolution if mold heater has not failed.

**Caution**  
To avoid ice maker damage do not short any contacts together other than those specified.

## Ice Maker

Module Ohmmeter Check No power to Ice Maker and Ejector Blades in End of Cycle Position			
Test Points	Component	Module Position	Ohms
L-H	Mold & Heater	Attached to Support	264
L-M	Motor	Separated form Heater	16,100

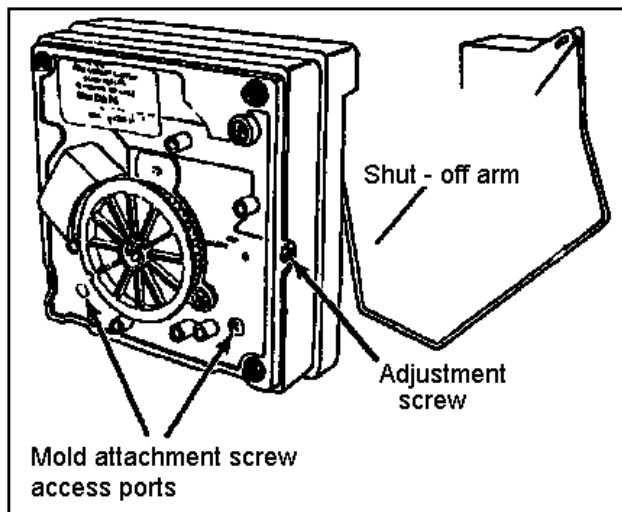
Module Voltage Checks with Meter or Test Light Power to Ice Maker			
Test Points	Component	Line Voltage	0 Volts
L-N	Module	Power On	Power Off
T-H	Bimetal	Open	Closed
L-H	Heater	On	Off
L-M	Motor	On	Off
N-V	Water Valve	On	Off

## DISASSEMBLY PROCEDURES

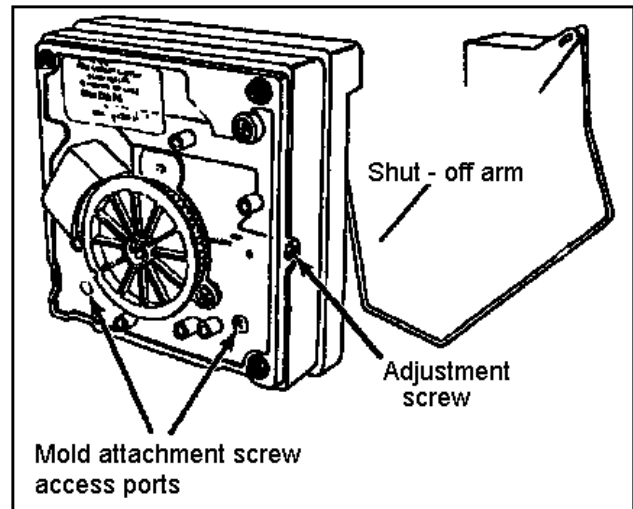
### Cover

1. Pull water adjustment knob forward.
2. Snap off cover.

**WARNING: To avoid electrical shock which can cause severe personal injury or death, disconnect power to refrigerator using power switch before servicing. Wires removed during disassembly must be replaced on proper terminals to insure correct earthing and polarization. After servicing, reconnect power using power switch.**



## Module, Motor, and Support Assembly

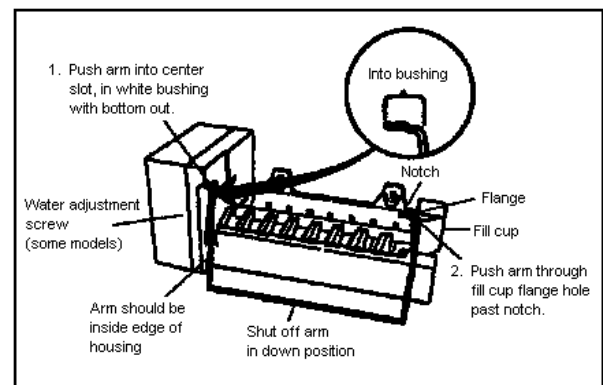


1. Loosen both screws in module access ports.
2. Disconnect shut-off arm.
3. Pull mold from support assembly.

Remove module only by removing 3 screws and pulling module out of housing.

### Shut-Off Arm

1. Pull shut-off arm out from white bushing.
2. Replace by pushing completely in.
3. Follow steps below.



### Module and Heater Assembly

1. Remove module and support assembly.
2. Install module and support assembly on replacement mold and heater assembly.

### Fill Cup

1. Remove module and support assembly.
2. Remove ejector blades and shut-off arm.
3. Pull fill cup from mold.

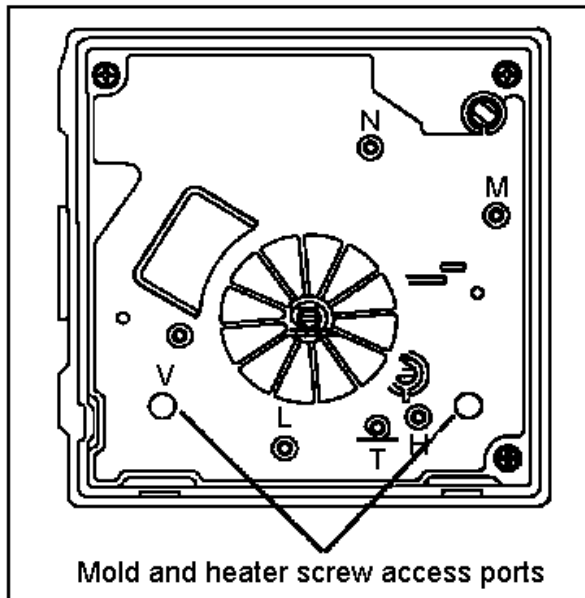
## Ice Maker

### Ejector Blades or Stripper

1. Remove module and support assembly.
2. Install ejector blades, realigning "D" coupling with module cam.

### Accessing Control Box

1. Remove motor and contact assembly from control box by removing 3 screws.
2. Remove shut-off arm.
3. Pull free.

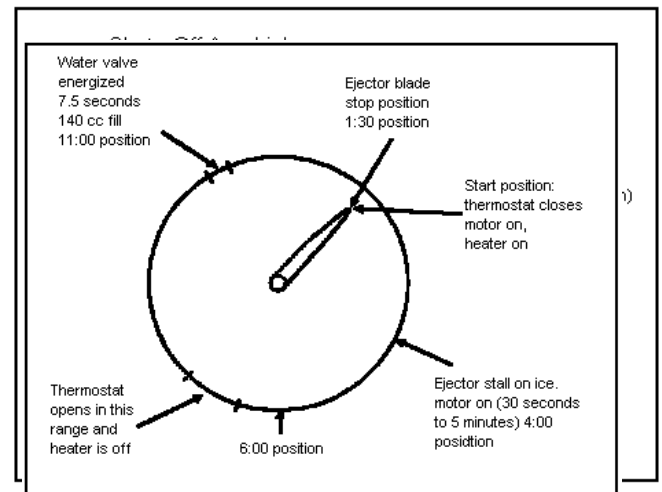


**CAUTION** To avoid main assembly damage do not rotate blades or drive gear

Switches will jam if turned counterclockwise and gears will be destroyed if turned clockwise. Advance ice maker into cycle by using a jumper to bridge H to R. Ice maker will not run if motor is defective. Shut-off arm must be in on position.

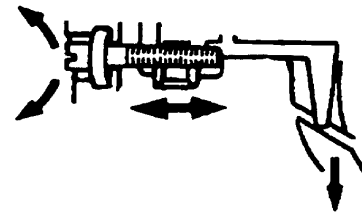
There are several slotted shafts on motor assembly board. Do not insert screwdriver and attempt to turn shafts. Slots permit assembly only.

There are non-repairable and non-replaceable components in module. When diagnosing or repairing ice maker, do not remove module unless replacing module.



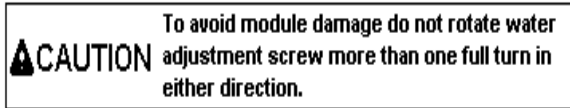
### Water Fill Valve

Turning water level adjustment screw will move contact in relationship with contact ring segment. This causes contact to vary time water valve is energized. Contact ring is tapered at end of fill time.

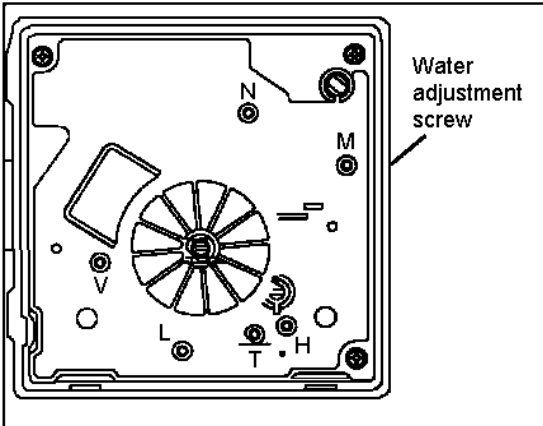


- Turning screw clockwise decreases fill time.
- Turning screw counterclockwise increases fill time.
- ½ turn equals 20 cc or 1.2 seconds.
- Full turn equals 40 cc or 2.4 seconds.

## Ice Maker



If water valve adjustment screw fall out, put screw in hole and align as shown below.



When small hole is centered in large hole, water fill adjustment is 7.5 seconds (normal fill time).

### Water Problems

Poor water quality can cause ice maker to fail or produce unacceptable cubes. Mineral content or sand can restrict screen in water fill valve or particle of sand can keep valve from seating properly.

If water valve does not close, the following could occur

- no ice production
- small or hollow ice cubes
- flooding of ice container

Install water filter to eliminate bad taste, odor, and visible contaminates.

Mineral contact can cause lime build up in mold, Wicking of water over mold and poor cube release can occur. Silicone is applied at upper edges around fill cup and stripper.

### Temperature Problems

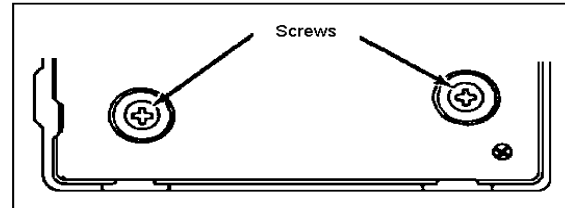
Freezer temperatures above normal  $0^{\circ} \pm 2^{\circ} \text{ F}$  ( $-18^{\circ} \pm 1^{\circ} \text{ C}$ ) will slow down ice production. Increase ice production by setting freezer to colder setting. Thermostat cycling temperature (1 revolution ice maker) is  $17^{\circ} \pm 3^{\circ} \text{ F}$  ( $-8^{\circ} \pm 1^{\circ} \text{ C}$ ). Ice will freeze when these temperatures

are achieved. Cycling time will be slower if freezer temperature is not cold enough to achieve mode temperatures easily.

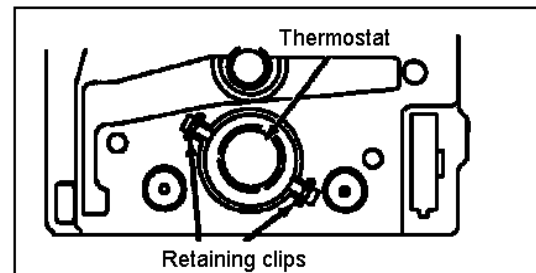
Thermostat, mold heater, and wiring harness are replaceable. Any other failure, including motor, requires replacement of module assembly. Replacement mold assembly comes with new mold heater installed.

### Thermostat

1. Remove control box from mold by removing screws.



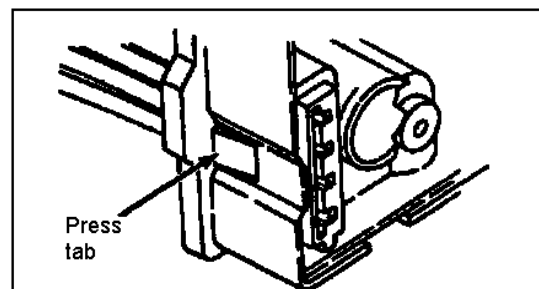
2. Pull front of black housing free of mold. Thermostat is on mold side.



3. Grasp 1 thermostat clip and pull out.
4. Press in new thermostat. Verify pins are properly indexed. Electrical assembly does not need to be removed. If replacing module, transfer clips to new mold support. Use new thermal bonding material.

### Wiring Harness

Remove wiring harness by pressing retaining tab and pulling forward.





## Ice Maker

### **⚠ CAUTION**

**To avoid property damage, test for water leaks after repair or replacement of water valve. Do not overtighten connection to household water supply.**

## Water Valve

Water valve has 1 solenoid. Valve has 80 mesh screen water strainer. When solenoid is energized, the amount of water entering ice maker mold is directly proportional to length of time water valve switch is held closed by timing cam. Inside valve is a flow washer which acts as a water pressure regulator. Proper ice maker fill is 140cc  $\pm$  10cc at 7.5 seconds of water fill at an inlet pressure ranging from 20 to 120 PSI (1.4 to 8.2 bar).

## Wire Harness

A non-resettable thermal fuse micro device 170° F (78°C) is spliced into black wire of ice maker wiring harness. Excessive heat can cause no ice production. Replacing wiring harness will only temporarily solve problem. Replace ice maker thermostats.

