SECTION 3

ELECTRONIC CONTROL SYSTEM INFORMATION

ELECTRONIC CONTROL TERMINOLOGY & COMPONENT DESCRIPTIONS

All 600-2 Series units utilize an electronic control system. The electronic control system monitors, regulates and controls a variety of functions. The electronic control system also displays temperature readings, ice maker system operation, possible problems with the unit and door ajar alarm status. The table below defines some basic electronic control system terminology and describes some of the electronic control system components. An understanding of the following information is needed in order to comprehend the input operations and functions of the electronic control system.

Term/Component	Definition / Description
Control Board	The printed-circuit board (PC Board) contains the microprocessor, relays and electrical connections which control and monitor all functions and operations of the unit.
Microprocessor	An electrical component on the control board which receives electrical signals from other components, processes that information, then sends an electrical signal to the relays on the board to open or close, and other electronic components in the unit to switch on or off.
Relay	The electrical components on the control board which switch other components in the unit ON and OFF when instructed to do so by the microprocessor.
LCD (Liquid Crystal Display)	That part of the control board seen at the control panel which displays compartment temperatures, service indicator, door ajar alarm bell & ice indicator.
Control Panel Assembly	The information input and read-out area of the electronic control system, located at the top of the upper Compartment.
Membrane Switch	An integral part of the control panel assembly, which consists of the function keys used for all input operations to the electronic control system.
Keys (Function Keys)	The buttons on the Membrane switch used for input operations. (The keys are: UNIT ON/OFF, ALARM ON/OFF, ICE ON/OFF, WARMER, COLDER)
Indicators	The words and numbers that are displayed at the control panel assembly. (Example: Temperature displays, alarm bell indicator, SERVICE indicator, and ICE system indicator)
Error Codes	The code numbers accompanied by the letters "EC" that appear on the LCD during diagnostic mode if the unit experienced specific problems related to electrical signals supplied by electrical components.
Display Units of Measure	Temperatures displayed at the LCD may be in fahrenheit units of measure (°F) or celsius units of measure (°C). A series of key strokes allows the temperature display units of measure to be switched to read as either °F or °C.
Set-Point	The desired compartment temperature, established by pressing the COLDER or WARMER keys.
High Offset (Cut-in)	As the compartment air temperature cycles up and down, the high offset is the maximum compartment temperature that the electronic control system will allow before calling for cooling.
Low Offset (Cut-out)	As the compartment air temperature cycles up and down, the low offset is the minimum compartment air temperature that the electronic control system will allow before interrupting cooling.
Thermistor (Temperature Sensor)	A resistor with which resistance changes as the temperature around it changes. For electronic control system purposes, the microprocessor measures this resistance and displays it as a temperature reading at the LCD.

BASIC 600-2 SERIES ELECTRONIC CONTROL SYSTEM

This page contains a basic illustration of the 600-2 Series electronic control system (See Figure 3-1). Input operations for the electronic control system are performed at the membrane switch (part of the the control panel assembly), with monitoring, regulating and controlling functions taking place at the control board (located directly behind the control panel). Temperatures and possible problems with the unit are displayed at the control panel on the LCD. The entire electronic control system is described in greater detail on the following pages.

NOTE: *The diagram below is not an exact electrical representation of the electronic control system. For more detailed electrical diagrams refer to the wiring diagram and schematic supplied with the unit.*

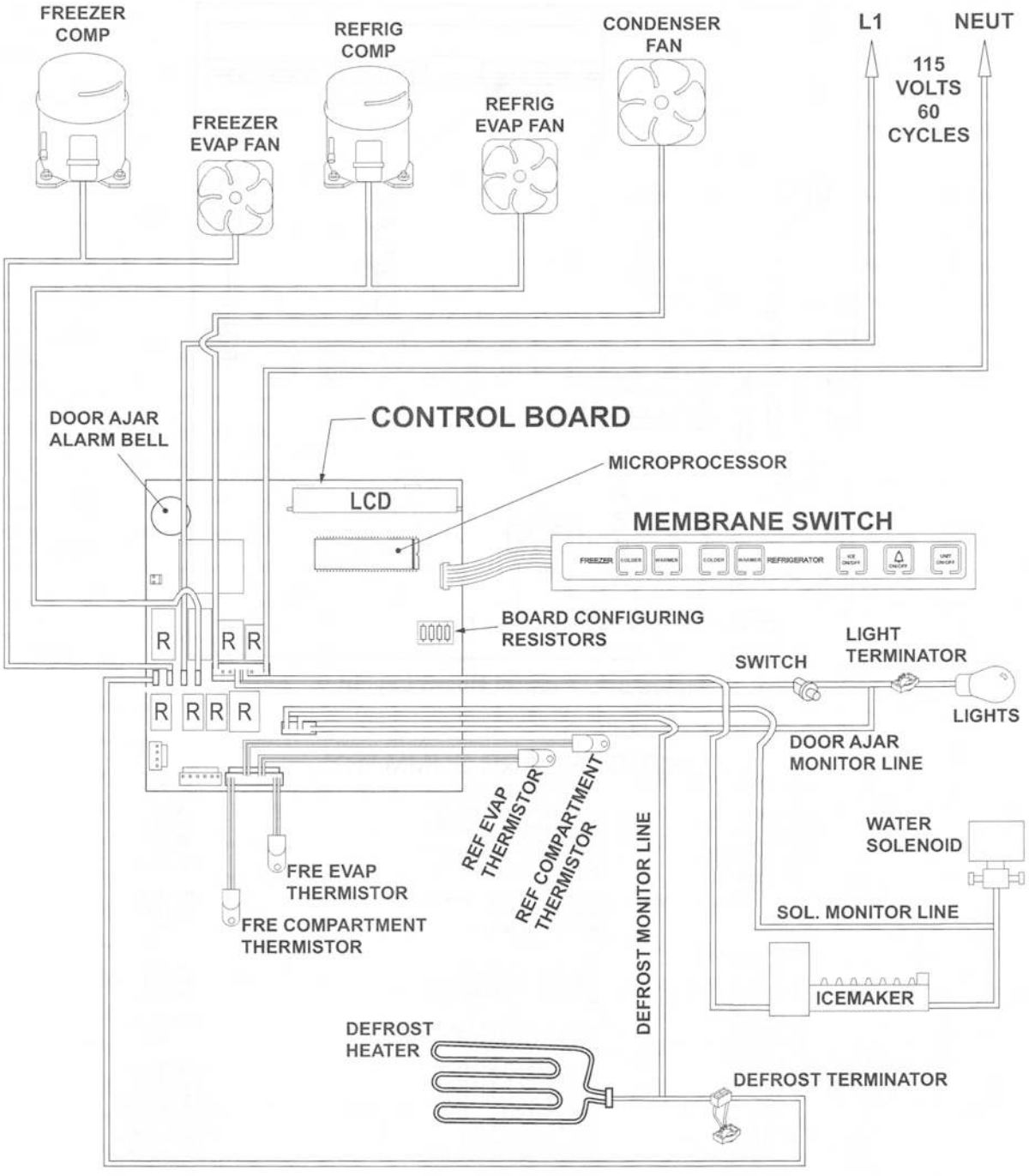

Figure 3-1. Basic 600-2 Series Electronic Control System Diagram

CONTROL BOARD LAYOUT AND SUMMARY TABLE

The electrical connection points on the control board are labeled alphanumerically. These labels correspond with the alphanumeric control board summary table, located on wiring diagrams. By referencing the summary table, it is possible to identify which components are connected at which connection points on the control board. Below is a layout diagram of the control board and a copy of a summary table (See Figures 3-2 & 3-3).

NOTE: *All components on control board are non-replaceable. If problems with control board are identified, the complete control board must be replaced.*

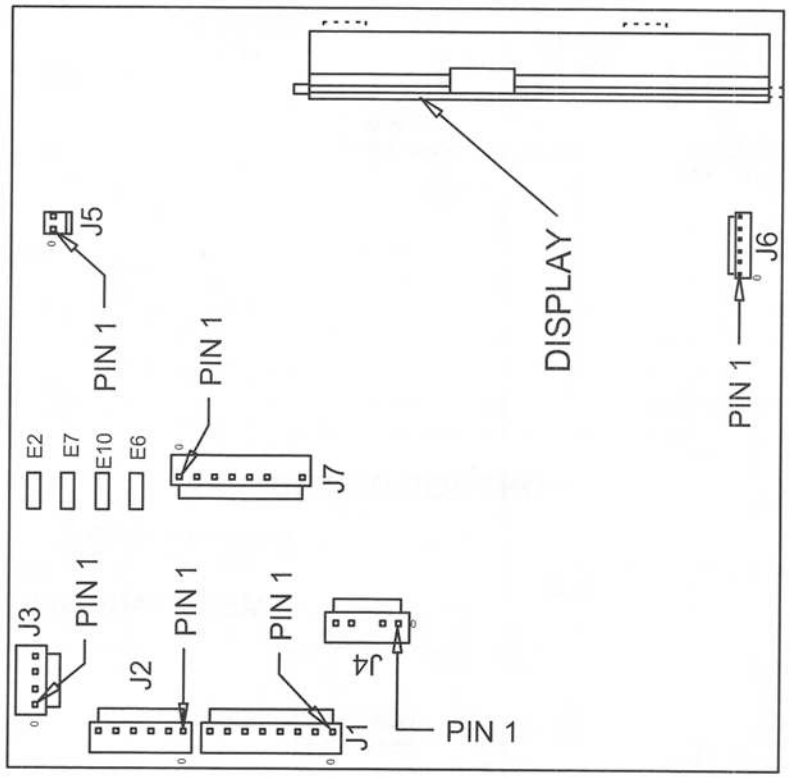

Figure 3-2. Control Board Layout

CONTROL BOARD SUMMARY

	CIRCUIT	DESCRIPTION	FUNCTION	COLOR
120 VOLT CIRCUITS				
E2	DEF HTR	DEFROST HEATER	POWERS DEFROST CIRCUIT	BLUE
E7	FCOMP	FRZ COMPRESSOR	POWERS FRZ COMPRESSOR	PURPLE
E10	L1	POWER IN	POWER INTO BOARD	BLACK
E6	RCOMP	REF COMPRESSOR	POWERS REF COMPRESSOR	GRAY
J7-1	C FAN	CONDENSER FAN	POWERS CONDENSER FAN	WHITE/RED
J7-2	E FAN	NOT USED		
J7-3	I ACC	ICE MAKER ACC (FILL TUBE)	POWERS FILL TUBE HEATER AND ACCESSORIES	WHITE/BLUE
J7-4	LITE	LIGHTS	POWERS LIGHTS	YELLOW
J7-5	ICE	ICE MAKER	POWERS ICE MAKER	PINK
J7-6		NOT USED		
J7-7		NOT USED(NO PIN)		
J7-8	NEU	NEUTRAL	NEUTRAL INTO BOARD	WHITE
J4-1	F DR	FRZ DOOR LIGHT SENSE	SENSES IF FRZ DOOR OPEN	BROWN
J4-2	R DR	REF DOOR LIGHT SENSE	SENSES IF REF DOOR OPEN	ORANGE
J4-3		NOT USED(NO PIN)		
J4-4		DEF SENSOR	SENSES WHEN DEF HEATER SHUTS OFF	GRAY/WHITE
J4-5		ICE MAKER VALVE SENSOR	SENSES WATER VALVE ACTIVATION	TAN
LOW VOLTAGE THERMISTOR CIRCUITS				
J1-1	EVAP FRZ	FRZ EVAP	SENSES FRZ EVAP TEMP	ORANGE/RED
J1-2	EVAP FRZ	FRZ EVAP	SENSES FRZ EVAP TEMP	BLUE/RED
J1-3	EVAP REF	REF EVAP	SENSES REF EVAP TEMP	ORANGE/YELLOW
J1-4	EVAP REF	REF EVAP	SENSES REF EVAP TEMP	BLUE/YELLOW
J1-5	REF	REF COMPARTMENT	SENSES REF CABINET	BLUE/WHITE
J1-6	REF	REF COMPARTMENT	SENSES REF CABINET	BLUE/WHITE
J1-7	FRZ	FRZ COMPARTMENT	SENSES FRZ CABINET TEMP	BLUE/BLACK
J1-8	FRZ	FRZ COMPARTMENT	SENSES FRZ CABINET TEMP	BLUE/BLACK

Figure 3-3. Control Board Summary Table (632-2/642-2 Summary Table Shown)

600-2 SERIES CONTROL PANEL LAYOUT

NOTES:

- *The illustration below is of a 632-2 control panel (See Figure 3-4).*
- *The control panels in models 601R-2, 601RG-2 and 601F-2 lack the obvious keys and indicators illustrated below.*
- *The control panels in models 601RG-2, 611G-2 and 650G-2 include a LIGHTS ON/OFF key that is not shown in the illustration below.*
- *The control panels in models 685-2 and 695-2 are mounted vertically and include a BULK ICE key.*

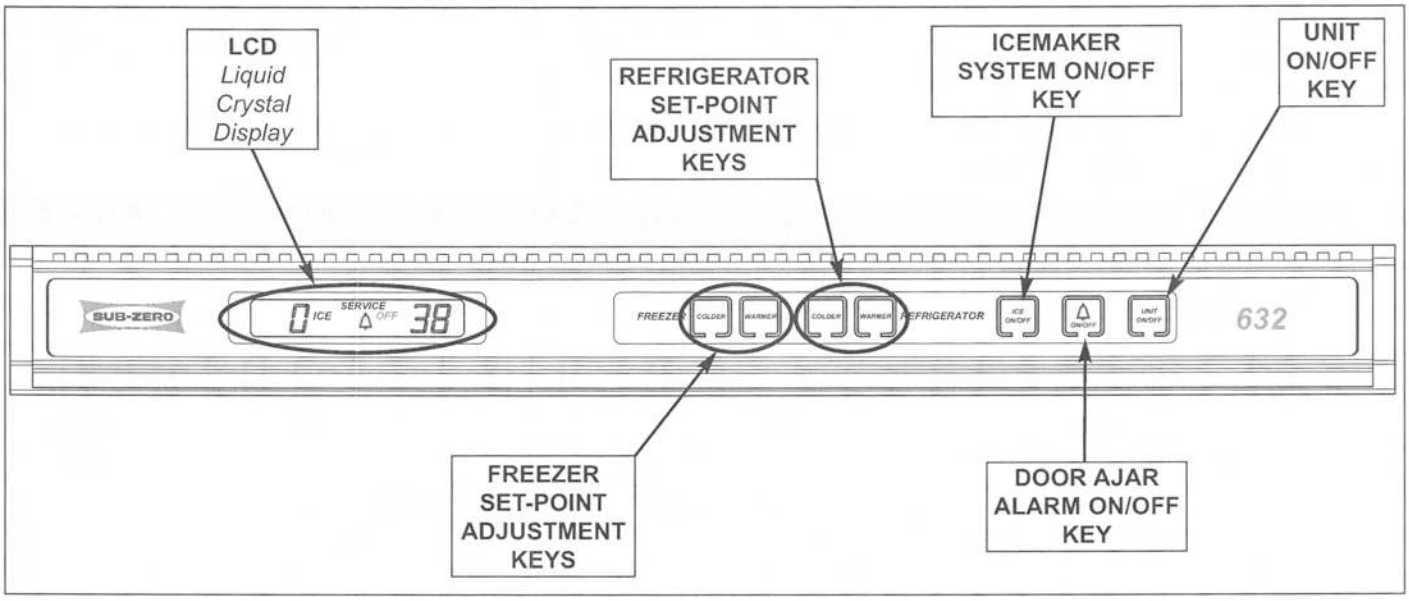

Figure 3-4. 600-2 Series Control Panel Layout *(Model 632-2 Control Panel Shown)*

BASIC ELECTRONIC CONTROL INPUT OPERATIONS

The following pages describe the basic input operations performed at the control panel. The subjects covered are: switching unit ON and OFF; adjusting set-point (temperature adjustment); switching ice maker system ON and OFF; enabling and disabling door ajar alarm feature, and in models 601RG-2, 611G-2 and 650G-2 only, accent lighting system ON and OFF. Please note that though possible to display temperatures in Fahrenheit or Celsius, in most cases Fahrenheit readings are shown.

Unit ON/OFF

All units are shipped in OFF Mode. When power is supplied to the unit, a trace of the word "OFF" is visible on the LCD. By pressing and releasing the UNIT ON/OFF key (See Figure 3-5), power is allowed past the control board to the rest of the unit. This is indicated by the unit's lights energizing and LCD at the control panel illuminating with temperature readings.

NOTE: *Whenever the unit is switched OFF using the UNIT ON/OFF key, a trace of the word "OFF" will be visible on the LCD as long as there is power to the unit.*

⚠ WARNING

WHEN IN "OFF" MODE, 115 VOLTS AC IS STILL PRESENT AT CONTROL BOARD!

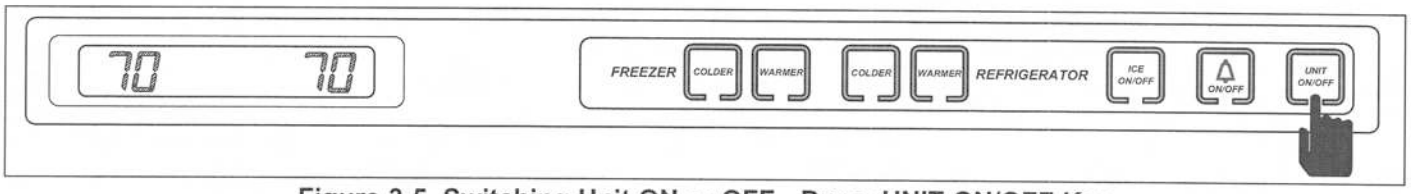

Figure 3-5. Switching Unit ON or OFF - Press UNIT ON/OFF Key

Adjusting Set-Point (Temperature Adjustment)

To adjust set-points, press WARMER or COLDER key on control panel in multiple key strokes until desired set-point is achieved (See Figure 3-6). One key stroke equals one degree change.

NOTE: *The temperature range in a freezer compartment is -5°F (-21°C) to +5°F (-15°C). The temperature range in a refrigerator compartment is +34°F (+1°C) to +45°F (+7°C).*

NOTE: *The initial stroke of the WARMER or COLDER key will change the previous set-point by one degree.*

NOTE: *The set-point will be displayed on the LCD for 10 seconds after the last key stroke. After the 10 second delay, the compartment temperature will be displayed. As the compartment temperature changes, the temperature displayed on the LCD will change by no more than one degree per minute.*

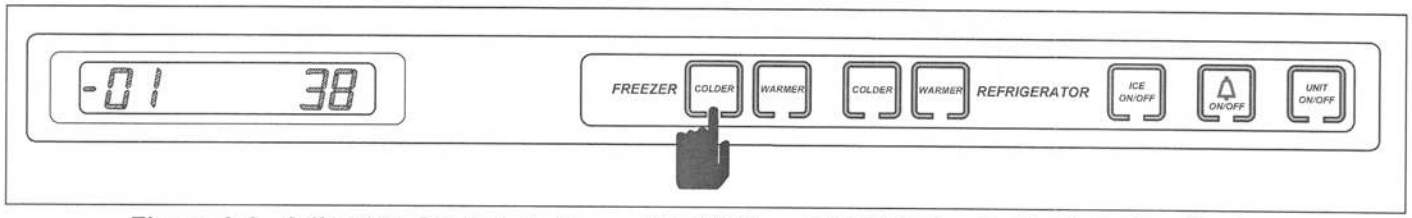

Figure 3-6. Adjusting Set-Point - Press WARMER or COLDER Key In Multiple Key Strokes

Icemaker System ON/OFF

All 600-2 Series units with freezer compartments are equipped with an icemaker. When the unit first arrives in a home, the icemaker system is off. By pressing and releasing the ICE ON/OFF key on the control panel, power is allowed to the icemaker system and "ICE" appears on the LCD (See Figure 3-7). To switch the icemaker system off, press and release the ICE ON/OFF key again and the "ICE" indicator disappears from the LCD, indicating the icemaker system is off.

NOTE: *When in "Sabbath Mode," the icemaker system is deactivated. Sabbath Mode will be explained later.*

NOTE: *To allow ice to freeze fully and reduce effects of low water pressure, power to the icemaker system is interrupted for 45 minutes after each ice harvest. This can be bypassed for service purposes by switching the icemaker system OFF, then back ON with the ICE ON/OFF key.*

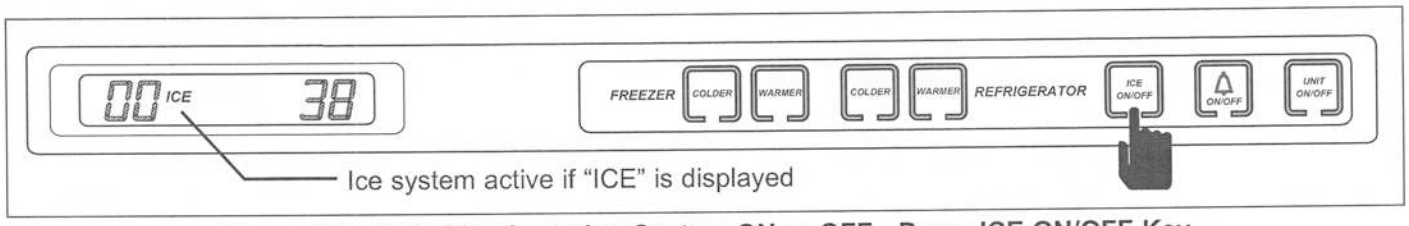

Figure 3-7. Switching Icemaker System ON or OFF - Press ICE ON/OFF Key

Door Ajar Alarm Feature (🔔) ON/OFF

All units are equipped with a door ajar alarm feature. To enable the door ajar alarm, press and release the Alarm Bell ON/OFF key on the control panel (See Figure 3-8). The bell indicator appears on the LCD indicating the alarm feature is active. With the alarm enabled, the bell indicator will flash and an audible alarm will beep whenever the door is left open for more then thirty seconds. To disable the door ajar alarm, press the Alarm Bell ON/OFF key again and the bell indicator disappears from the LCD, indicating the alarm feature is inactive.

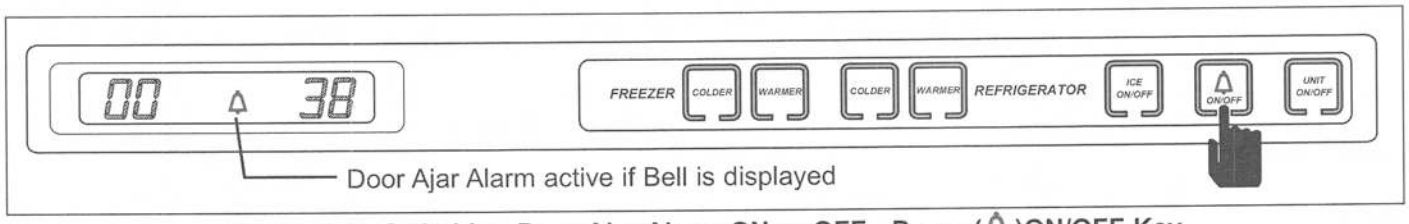

Figure 3-8. Switching Door Ajar Alarm ON or OFF - Press (🔔)ON/OFF Key

Accent Lighting System ON/OFF (Models Produced with Glass Doors Only)

Models produced with glass doors are equipped with an accent lighting system. To energize the accent lighting system, press the LIGHTS ON/OFF key (See Figure 3-9). With the accent lighting system energized, three low intensity light strips (15 Watts each), will stay illuminated when the door is closed. To disable the accent lights, press the LIGHTS ON/OFF key again.

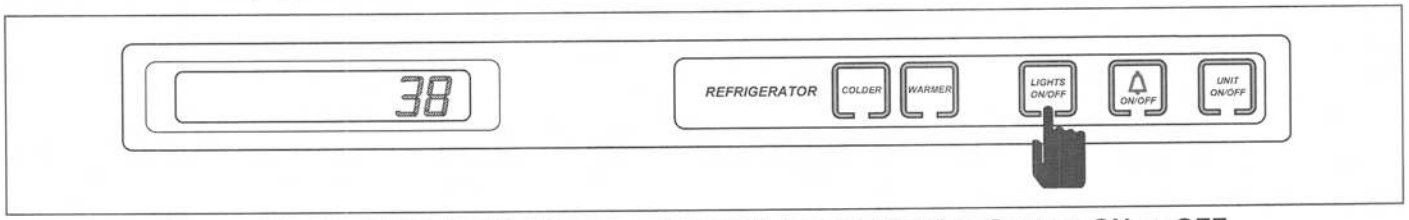

Figure 3-9. Model 601RG-2, 611G-2 and 650G-2 Accent Lighting System ON or OFF - Press LIGHTS ON/OFF Key *(Model 601RG-2 Control Panel Shown)*

FUNCTIONS OF THE ELECTRONIC CONTROL SYSTEM

The following pages explain monitoring, regulating and controlling functions of the electronic control system. In most cases signal traces on a model 632-2 wiring schematic are used to show current flow for functions being explained.

Supply Power to the Lighting System

115 Volts AC are supplied to the lighting system through the control board when the unit is switched ON by pressing the UNIT ON/OFF key. With the doors open, the light switches allows power to the lights (See Figure 3-10).

NOTE: *115 Volt AC signal to the lights is monitored by the microprocessor to control the door ajar alarm feature.*

NOTE: *If in Sabbath Mode, th lighting system is disabled. Sabbath Mode will be covered later.*

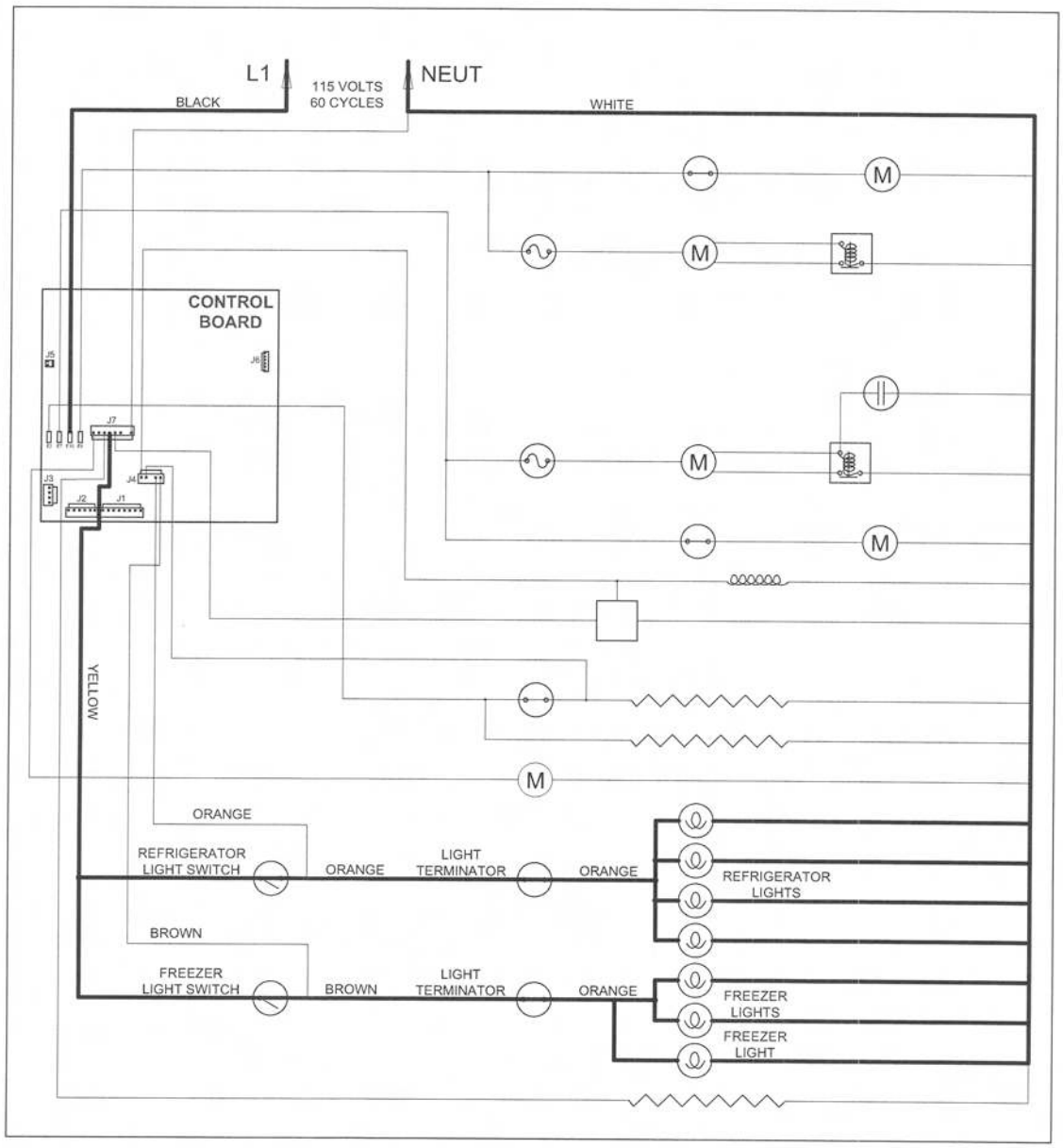

Figure 3-10. Signal Trace Schematic of Lighting System

Monitor, Regulate and Display Compartment Temperatures

Temperature signals from thermistors in refrigerator and freezer compartments are monitored, then displayed on the LCD. When a compartment reaches high offset temperature (calling for cooling), the compressor and evaporator fan are switched on. (See Figure 3-11). When a compartment reaches low offset temperature, the compressor and evaporator fan are switched off. Though compartment air temperature fluctuates from off and on cycles, the "average" temperature is displayed. (See Figure 3-12)

NOTE: *Freezer compartment temperature range is -5°F (-21°C) to +5°F (-15°C). Refrigerator compartment temperature range is +34°F (+1°C) to +45°F (+7°C).*

NOTE: *If average compartment temperature changes, the display will change by one degree per minute.*

NOTE: *A refrigerator compressor will not energize after a refrigerator off-cycle defrost unless the evaporator thermistor detects temperatures 38°F (3°C), or above.*

NOTE: *After a freezer evaporator defrost, the freezer compressor is not energized until after the 5 minute time delay/dwell that follows all freezer defrosts.*

NOTE: *If a refrigerator compartment thermistor is faulty, the refrigerator compressor defaults to 20 minutes on, 40 minutes off cycling, EE appears at right in LCD, SERVICE flashes and Error Code 05 is logged.*

NOTE: *If a refrigerator evaporator thermistor is faulty, the refrigerator compressor will not energize until compartment air temperature exceeds high offset by 5°F (3°C). SERVICE flashes and Error Code 06 is logged.*

NOTE: *If a freezer compartment thermistor is faulty, the freezer compressor defaults to 20 minutes on, 20 minutes off cycling, EE appears at left in LCD, SERVICE flashes and Error Code 07 is logged.*

NOTE: *If in Sabbath Mode, the compartment thermistors still control compressor operation, except that when high offset is reached, there is a random 15 to 25 second delay before compressors are energized.*

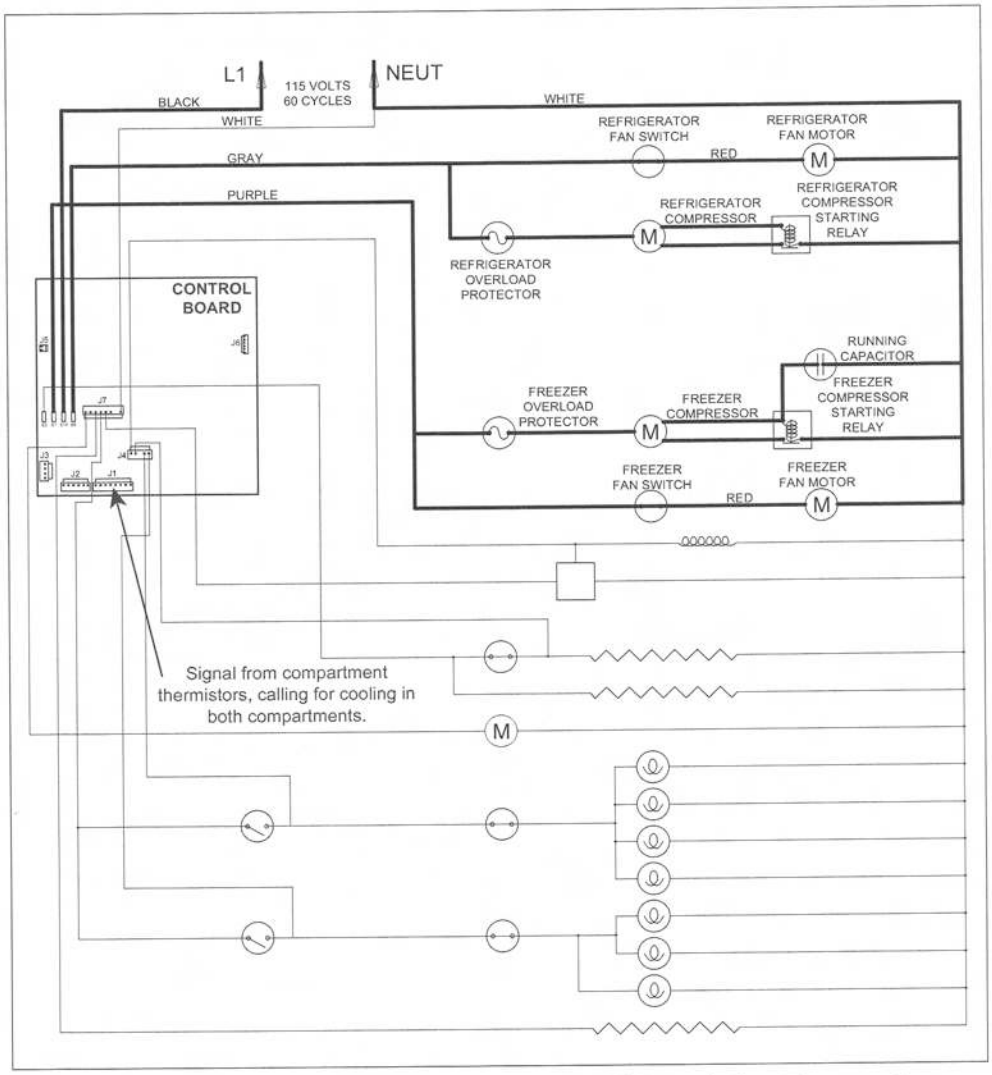

Figure 3-11. Signal Trace (High Voltage Only) Regulating Temperatures

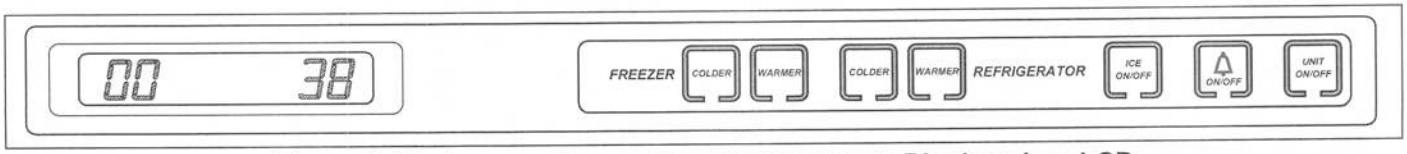

Figure 3-12. Average Compartment Temperature Displayed on LCD

Control Condenser Fan Operation

The microprocessor senses the 115 volt AC output to both compressors. If either compressor is running, a signal is sent to the condenser fan relay on the control board to close, supplying power to the condenser fan (See Figure 3-13). If both compressors are off, the condenser fan will be off.

NOTE: *In single compressor models (601R-2, 601RG-2, 601F-2), power to the condenser fan is supplied by the compressor circuit. The white/red wire from the control board will not be present in those models.*

NOTE: *In models 611G-2 and 650G-2, the condenser fan relay also controls the door heater.*

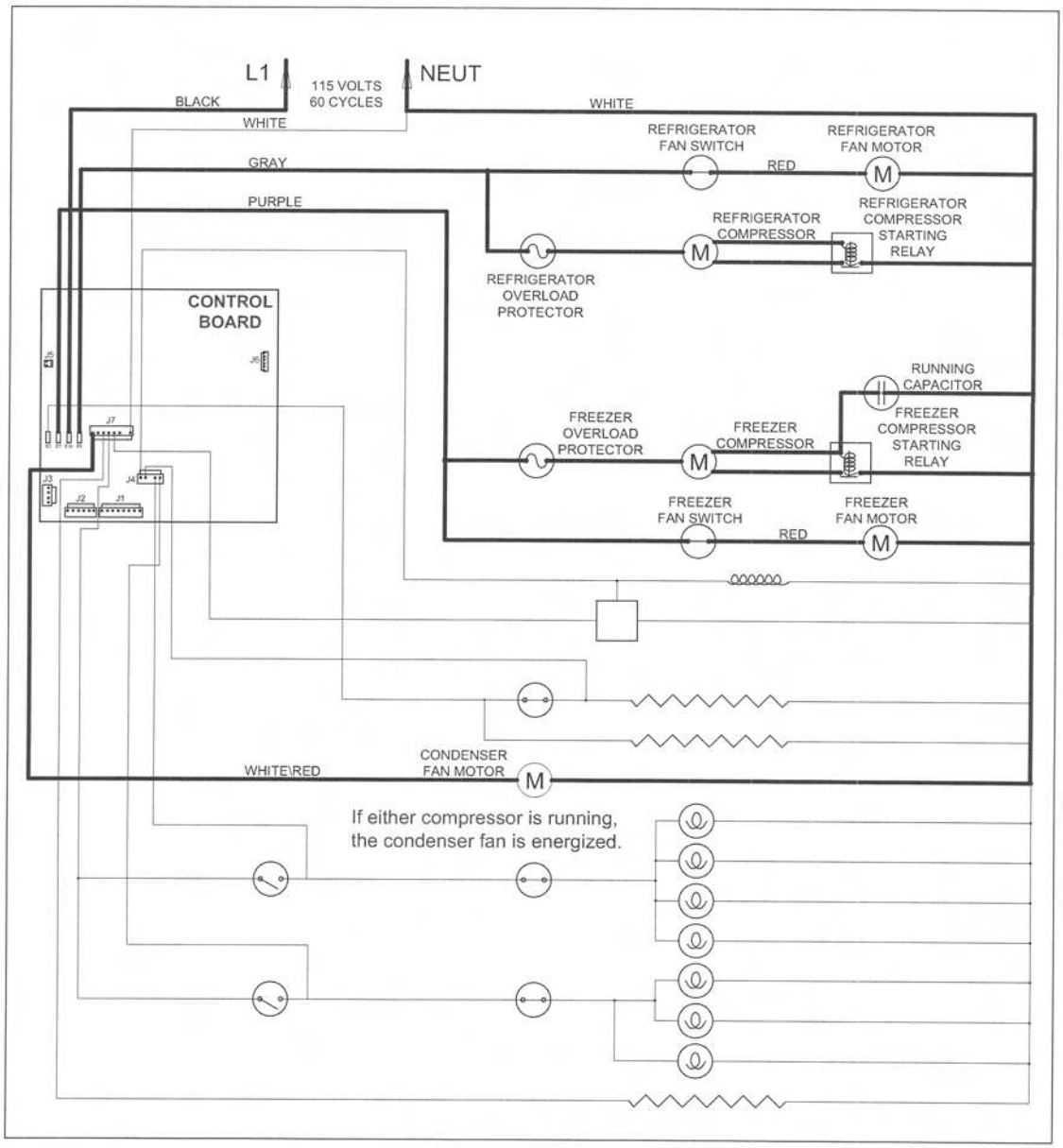

Figure 3-13. Signal Trace Schematic of Condenser Fan Operation

Minimize Condensation on Refrigerator Door Glass (Models Produced with Glass Doors Only)

On models produced with glass doors, the refrigerator door is equipped with a 5 watt braided wire heater around the glass perimeter to help minimize condensation formation on the glass.

- The heater in a 601RG door is on 100%.
- The heater in 611G-2 and 650G-2 doors is tied into the condenser fan circuit (see Control Condenser Fan Operation on preceding page and Figure 3-14 below).

To help minimize condensation on the glass further, the microprocessor detects when the refrigerator door is opened, via the light switch, then when the door closes, the evaporator fan is energized for 5 minutes. This draws any warmer moist air away from the door glass. (See Figure 3-14)

NOTE: *The evaporator fan in these models also cycles with the compressor.*

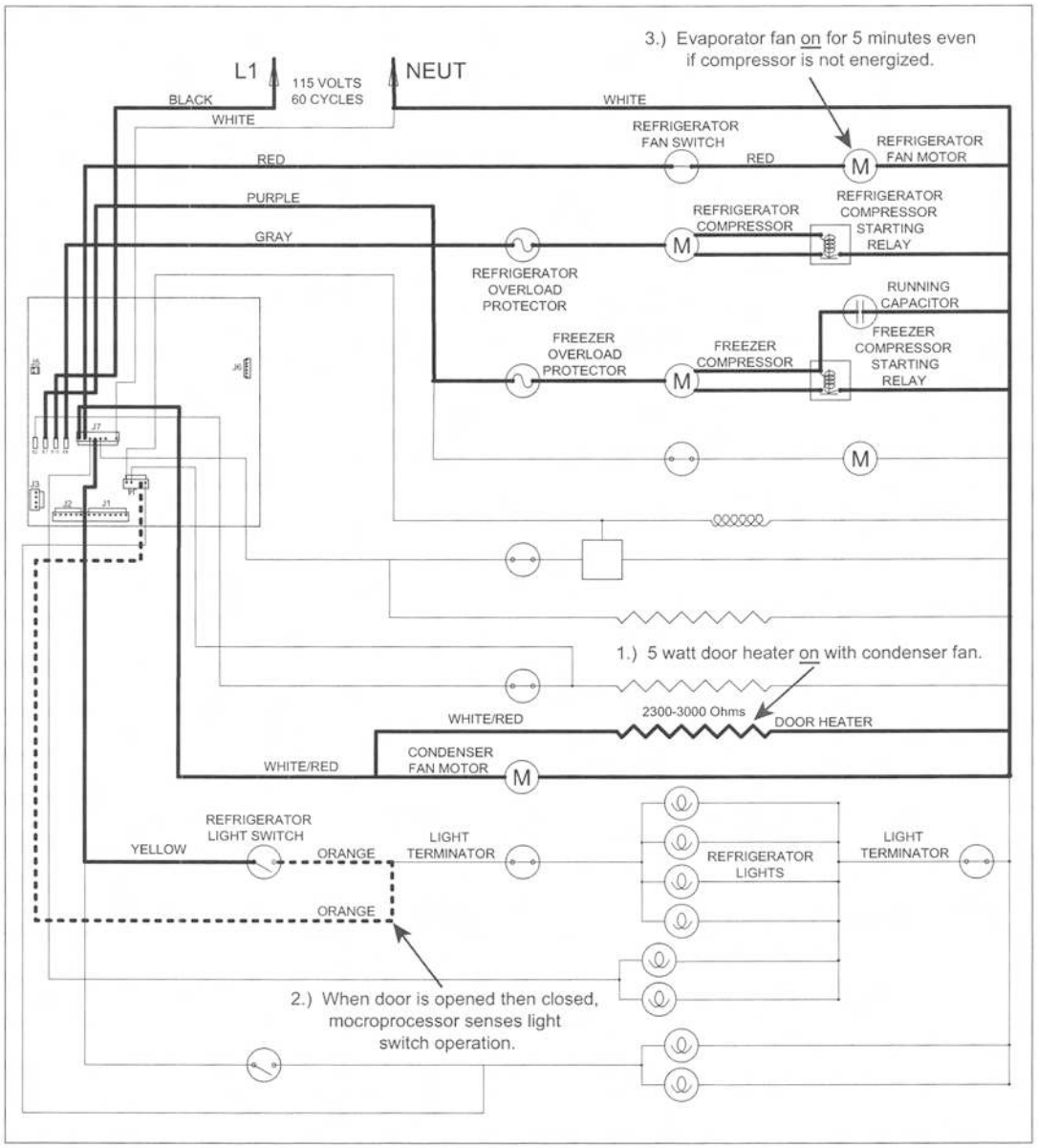

Figure 3-14. Signal Trace Schematic of 611G-2/650G-2 Door Heater & Evaporator Fan Operation

Monitor and Control Refrigerator Off-Cycle Defrost

Temperature signals from the refrigerator compartment evaporator thermistors are monitored by the microprocessor. During off cycle defrost, if the compartment temperature reaches high offset before the evaporator rises to 38°F (3°C), the signal to run the compressor and evaporator fan will wait, allowing the refrigerator evaporator to fully defrost before the compressor is energized (See Figure 3-15).

NOTE: *If a refrigerator compartment thermistor is faulty, the refrigerator compressor defaults to 20 minutes on, 40 minutes off cycling, EE appears at right in LCD, SERVICE flashes and Error Code 05 is logged.*

NOTE: *If a refrigerator evaporator thermistor is faulty, the refrigerator compressor is not energized until compartment air temperature exceeds high offset by 5°F (3°C). SERVICE flashes and Error Code 06 is logged.*

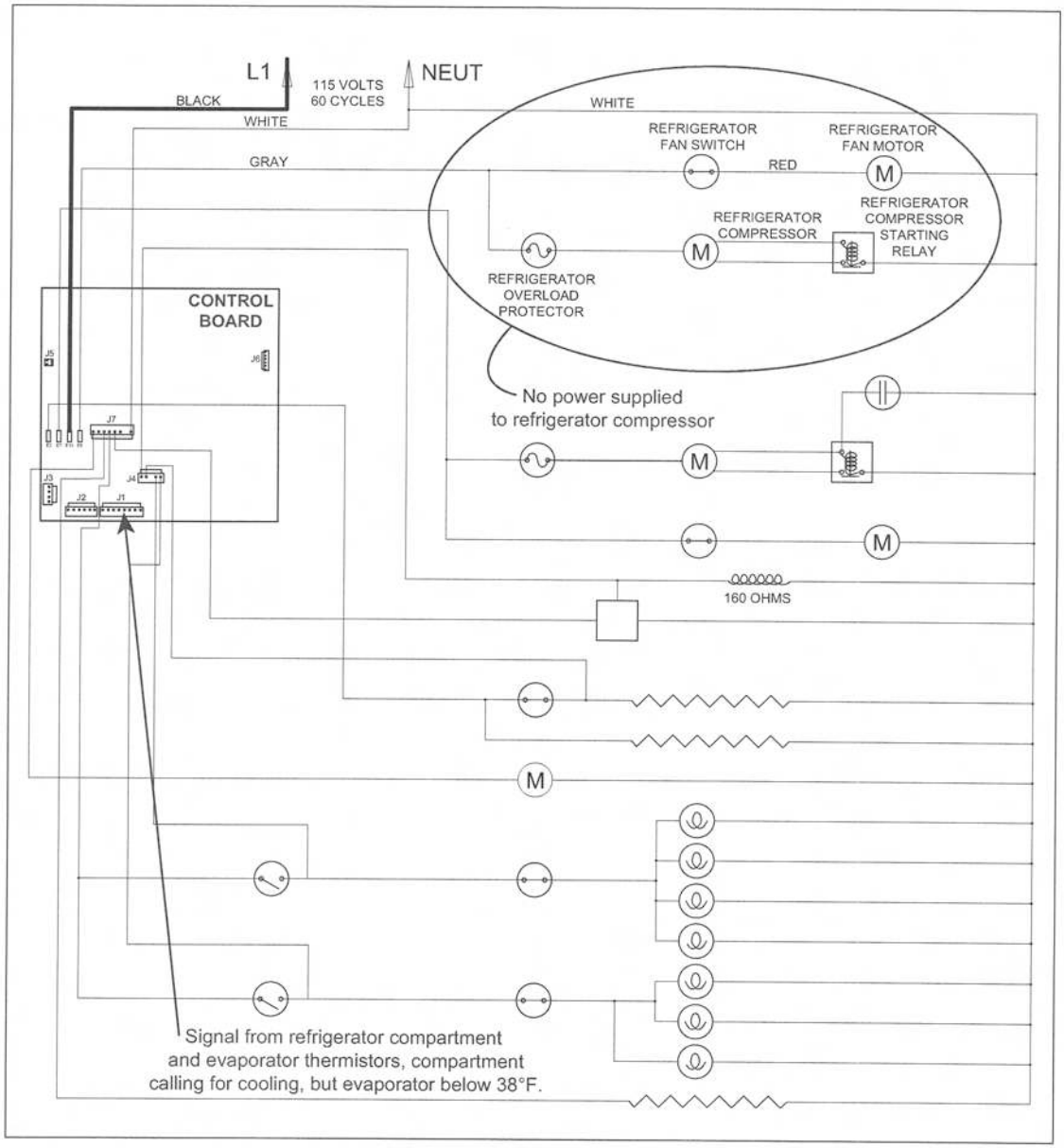

Figure 3-15. Signal Trace Schematic (High Voltage only) of Refrigerator Off-Cycle Defrost

Monitor and Control "Adaptive Defrost" of Freezer Evaporator

Initially, the freezer compressor cycle-runs 12 hours. The control board defrost relay is then closed, supplying power to the defrost, drain tube and fill tube heaters. The compressor, condenser fan and evaporator fan are switched off.

With "Adaptive Defrost", the length of time the defrost heater stays on to open the defrost terminator bimetal (55°F/13°C), is observed by the microprocessor via the grey w/white stripe wire to J4. This length of time is used to calculate the number of hours before the next defrost (defrost interval). If the heater then stays on for a shorter time period, the microprocessor increases the next defrost interval. If the heater then stays on for a longer time period, the microprocessor decreases the next defrost interval. (See Figure 3-16) This is an ongoing process whereby the defrost time and the defrost interval will vary by unit use.

NOTE: *A 5 minute time delay/dwell follows all defrosts, during which the drain tube and fill tube heaters remains energized. At the end of the 5 minute dwell, the compressor, evaporator fan and condenser fan are energized, and the drain tube heater is switched off.*

NOTE: *Minimum defrost interval = 6 hours of compressor run time; Maximum defrost interval = 80 hours of compressor run time; Maximum defrost duration = 20 minutes, plus 5 minute dwell.*

NOTE: *If the defrost sensing line is open, defrost operation defaults to 25 minute defrost time / 6 hour build time, and Error Code 22 is logged. If the evaporator thermistor detects an under-heat or over-heat situation at the same time, Error Codes 20 or 23 is logged, respectively.*

NOTE: *During defrost, the displayed temperature is locked.*

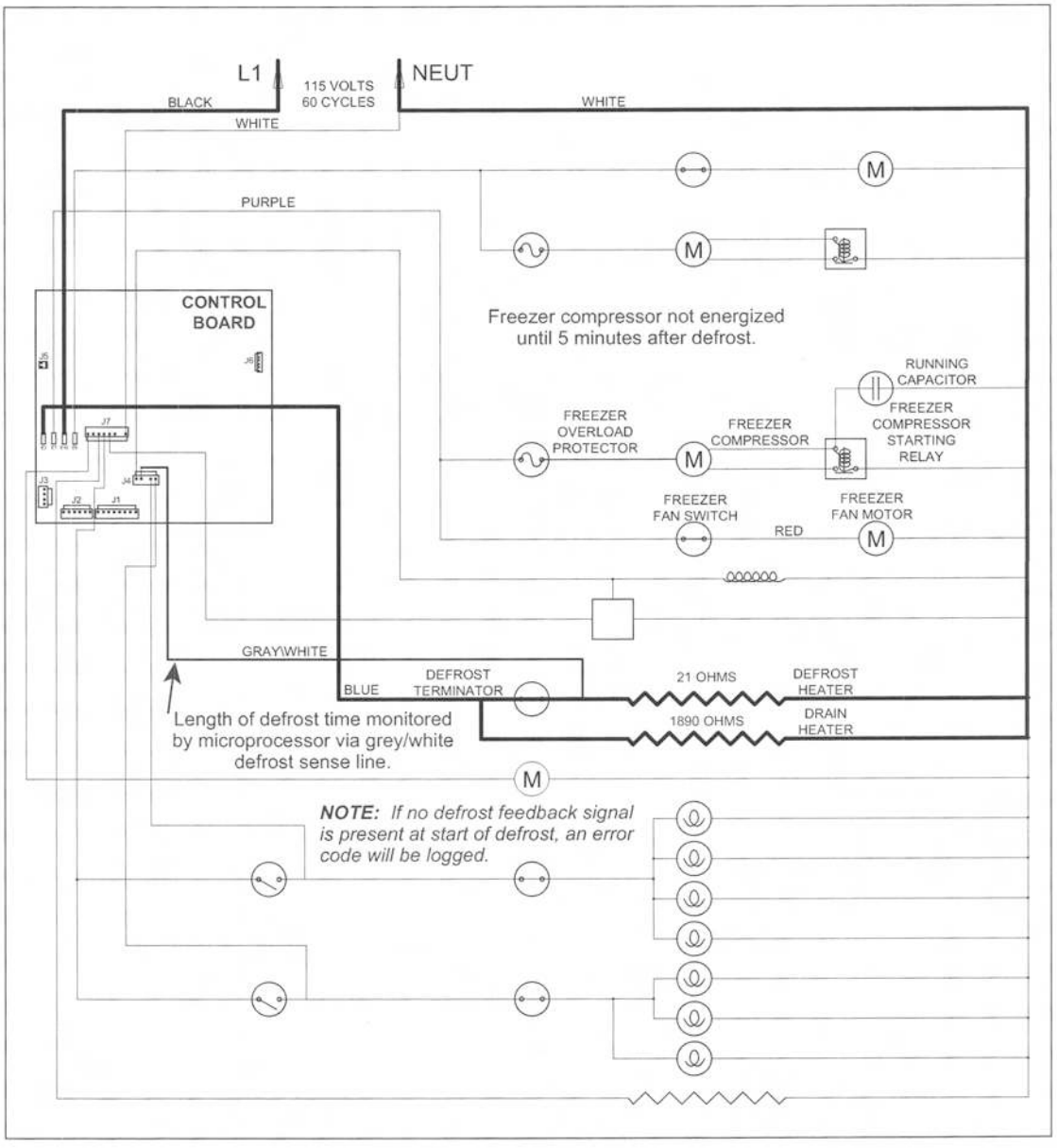

Figure 3-16. Signal Trace Schematic of Freezer Adaptive Defrost

Monitor Compressor Run Duration, Displays If Service is Needed (Starting with Serial #2092137)

The microprocessor observes the changing state of the compressor relays to determine the length of compressor run time (See Figure 3-17). If a compressor runs 100% (Fre = 6 hours / Ref = 4 hours), an error code is logged (EC 40 / EC 50, respectively), and defrost is initiated, but SERVICE will not flash.

If several 100% run periods occur, and the compartment temperature does not fall to at least the set point / low offset temperature average (and the door is not opened during the last run period), then SERVICE will flash along with the error code (See Figure 3-18).

NOTE: *To clear a flashing SERVICE and EC, the problem must be corrected, then switch the unit off then back on and/or press the Bell ON/OFF key for 15 seconds. Failure to clear an error code will cause SERVICE to display constant once Diagnostic Mode is initiated.*

NOTE: *If the unit is ever switched OFF then back ON, the compressor will not energize for at least 3 minutes. This 3 minute minimum OFF time is used to protect the compressor and its electricals.*

NOTE: *Prior to serial #2092137, SERVICE will flash if a compressor runs 100%, but no error codes will be logged.*

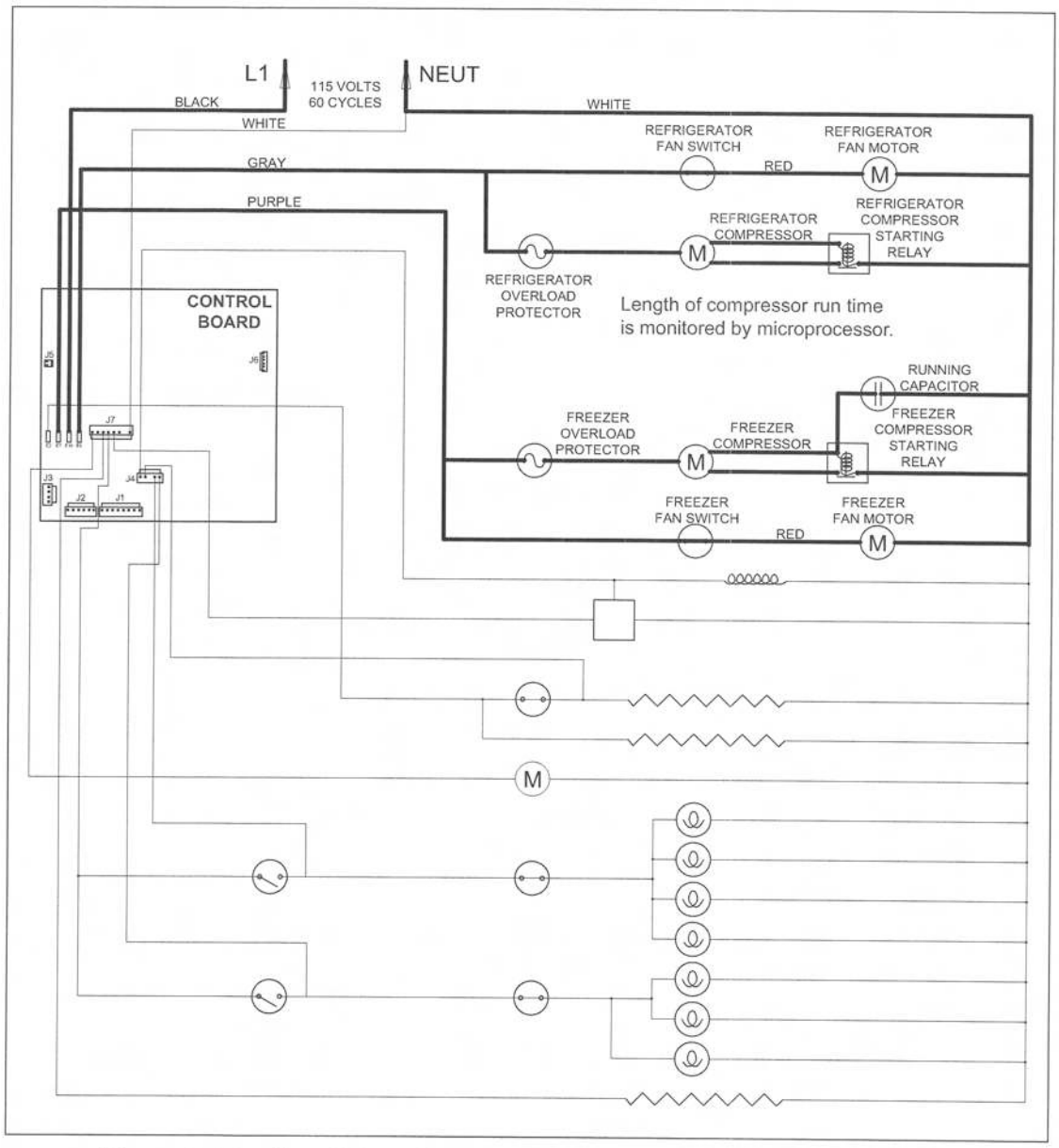

Figure 3-17. Signal Trace Schematic of Compressor Electrical System

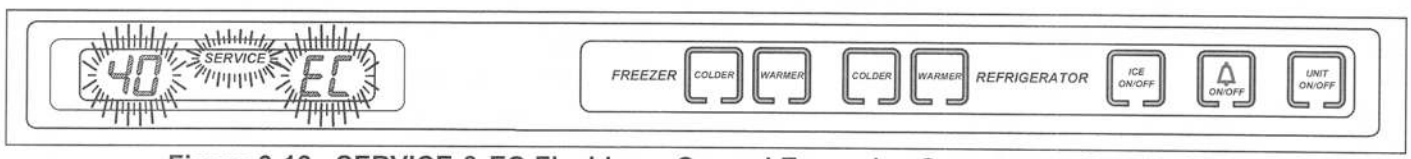

Figure 3-18. SERVICE & EC Flashing = Several Excessive Compressor Run Periods

Monitor Icemaker System and Display If Service is Needed (Starting with Serial #2092137)

The microprocessor observes the 115 Volts AC supplied to the icemaker water valve solenoid. If the solenoid is energized for more than 15 seconds, power to the icemaker system is disabled for 24 hours (See Figure 3-19), and an error code is logged (EC 30). If this happens five consecutive times, ICE and SERVICE on the LCD will flash and the ICE ON/OFF key will be disabled (See Figure 3-20).

NOTE: *To clear the ICE and SERVICE error indicators, and reactivate the ICE ON/OFF key, the problem must be corrected, then the unit must be switched OFF and back ON, and the Alarm key must be pressed for 15 seconds to clear the Error Code.*

NOTE: *To allow ice to freeze fully and reduce effects of low water pressure, power to the icemaker system is interrupted for 45 minutes after each ice harvest. This can be bypassed for service purposes by switching the icemaker system OFF, then back ON using the ICE ON/OFF key.*

NOTE: *When in Sabbath Mode, the icemaker system is disabled. Sabbath Mode will be covered*

NOTE: *Prior to serial #2092137, ICE and SERVICE will flash if* If the solenoid is energized for more than 15 seconds, but the ice making system will not *shut down for 24 hours.*

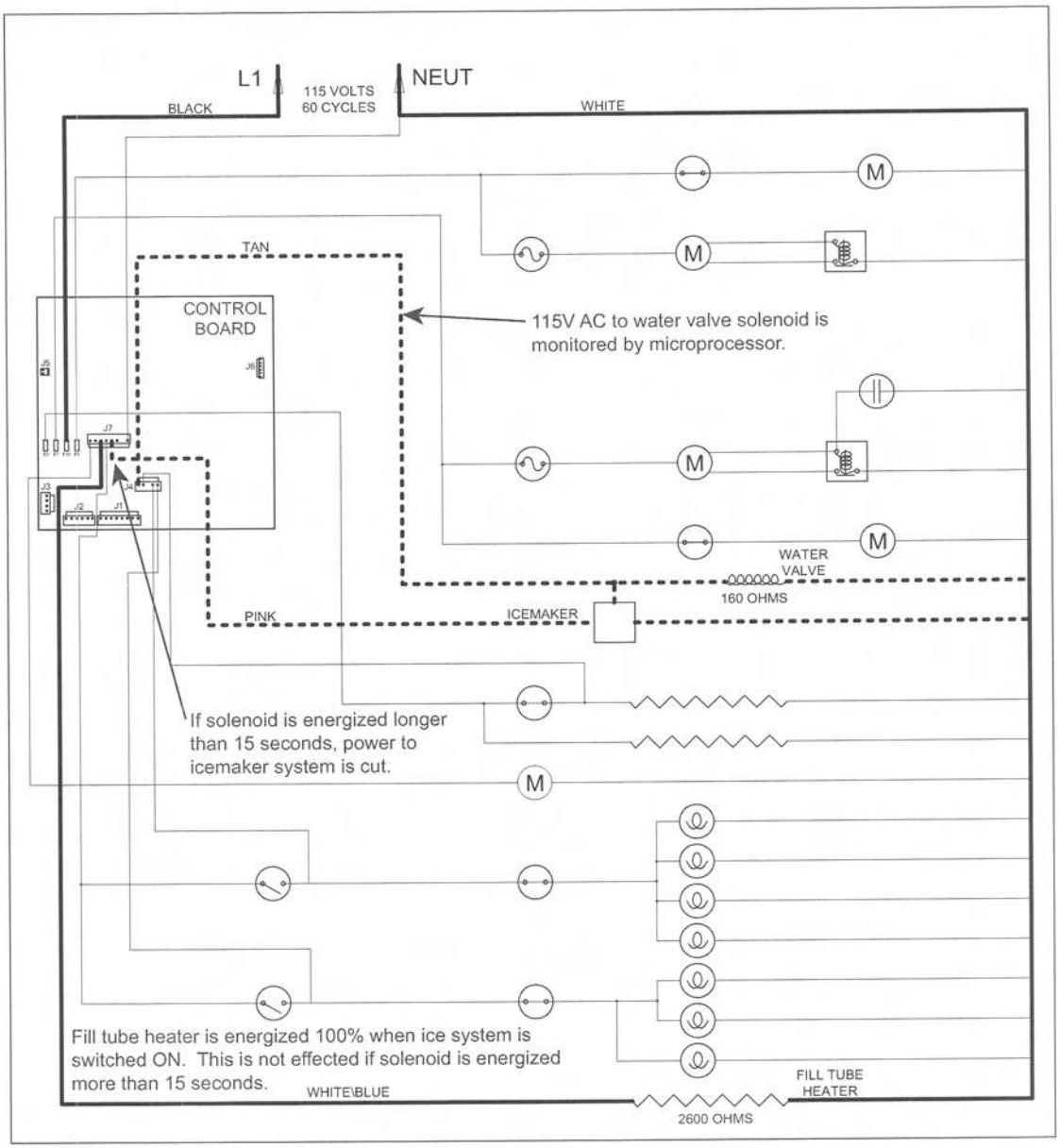

Figure 3-19. Signal Trace Schematic of Icemaker Electrical System

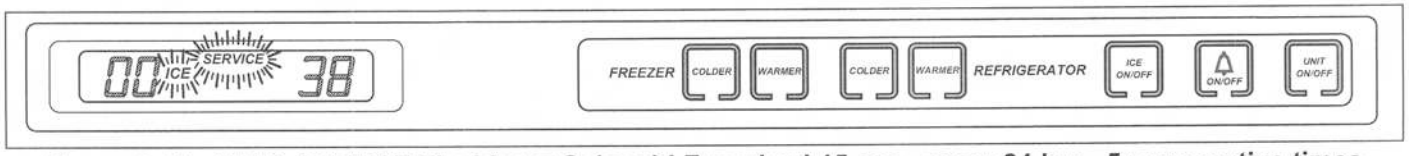

Figure 3-20. ICE & SERVICE Flashing = Solenoid Energized 15 sec., every 24 hrs., 5 consecutive times

UNIQUE ELECTRONIC CONTROL INPUT OPERATIONS

The following pages illustrate unique input operations performed at the control panel that you would not expect a customer to perform every day. The input operations described are: Temperature Unit Selection Mode, Sabbath Mode, Showroom Mode, Manual Compartment Disable Mode and Manual Freezer Evaporator Defrost.

Temperature Units Selection Mode *(Selecting Degrees Fahrenheit or Degrees Celsius Display)*

The electronic control is initially set to display temperature in Fahrenheit (°F) units of measure. Units of measure can be converted from °F to °C (Celsius), and/or back again. This operation is called Temperature Units Selection.

NOTE: *Temperature Units Selection must be performed within the first minute after switching the unit ON.*

To convert temperature units of measure from Fahrenheit (°F) to Celsius (°C) readings, press and hold the door ajar alarm bell ON/OFF key and the UNIT ON/OFF key simultaneously for 5 seconds, then release the keys (See Figure 3-21). " °C " will appear on the LCD indicating that temperatures will now be displayed in Celsius units of measure. To convert back to Fahrenheit units of measure, repeat the steps above (See Figure 3-22).

NOTE: *Temperature Units Selection Mode will end 10 seconds after the last key stroke.*

NOTE: *Do <u>not</u> press and hold the UNIT ON/OFF key first, that will simply switch the unit OFF.*

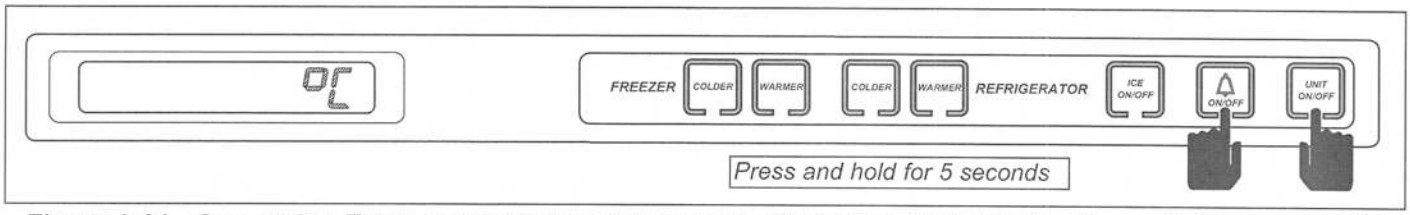

Figure 3-21. Converting Temperature Units of Measure to °C *(within first minute after switching unit ON)* - Press and Hold Bell ON/OFF Key and UNIT ON/OFF Key for 5 Seconds

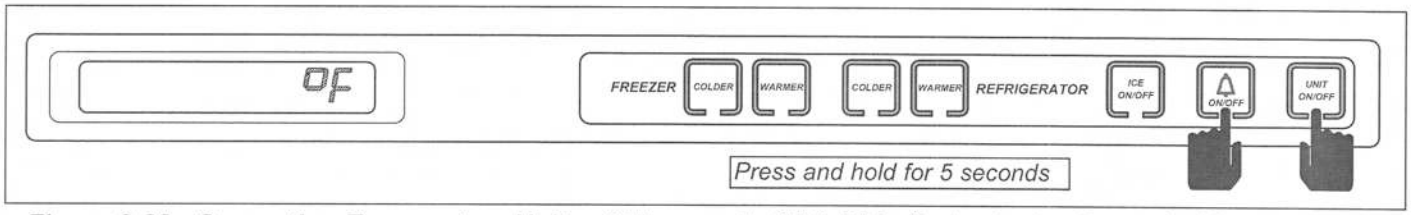

Figure 3-22. Converting Temperature Units of Measure to °F *(within first minute after switching unit ON)* - Press and Hold Bell ON/OFF Key and UNIT ON/OFF Key for 5 Seconds

Sabbath Mode

Sabbath Mode was incorporated into the electronic control system for the observance of certain religious days. Initiating Sabbath Mode disables the LCD, lighting system, ice making system and door ajar alarm feature.

To initiate Sabbath Mode, the unit must first be switched OFF using the UNIT ON/OFF key (See Figure 3-23), then press and hold the UNIT ON/OFF key until the LCD and lights switch OFF, approximately 10 seconds (See Figure 3-24). To return to normal operation, press and release the UNIT ON/OFF key.

NOTE: *During Sabbath Mode, the LCD is disabled and set-points cannot be changed.*

NOTE: *During Sabbath Mode, the compartment thermistors still control compressor operation, except that when high offset is reached, there is a random 15 to 25 second delay before compressors are energized.*

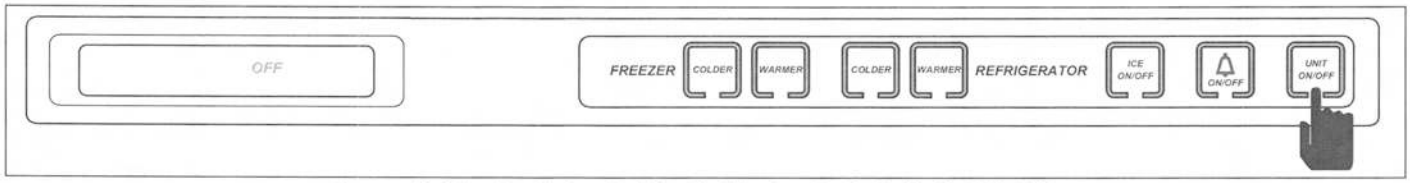

Figure 3-23. To Enter Sabbath Mode, Switch Unit OFF First

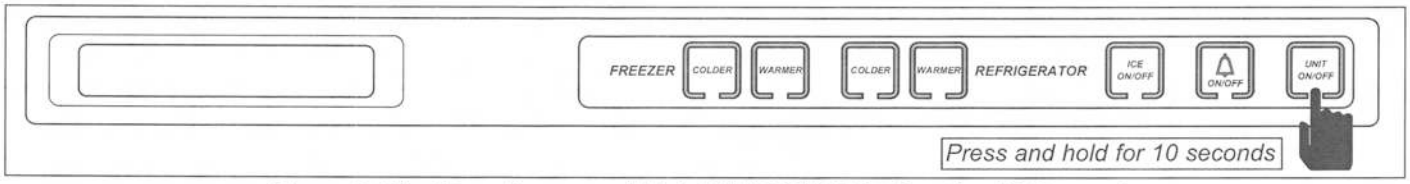

Figure 3-24. Then Press and Hold UNIT ON/OFF Key for 10 Seconds

Showroom Mode

Showroom Mode was incorporated into the electronic control system so that units could be displayed in a showroom setting. When in Showroom Mode, all cooling functions are disabled, but the lighting system remains active.

To initiate Showroom Mode, the unit must first be switched OFF using the UNIT ON/OFF key (See Figure 3-25), then press and hold either pair of WARMER and COLDER keys, then the UNIT ON/OFF key, then release all three keys (See Figure 3-26). To return the unit to normal operation, repeat the steps above.

NOTE: *Always check set-points after returning unit to normal operation.*

NOTE: *It is possible to determine if a unit is in Showroom Mode by initiating Diagnostic Mode. If "Sr" is observed in the left temperature display area during Diagnostic Mode, the unit is in Showroom mode. Initiating Diagnostic Mode is covered later in this section.*

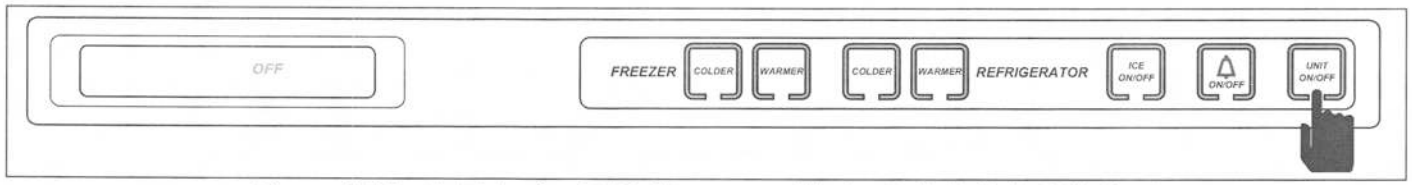

Figure 3-25. To Enter (or Exit) Showroom Mode, Switch Unit OFF First

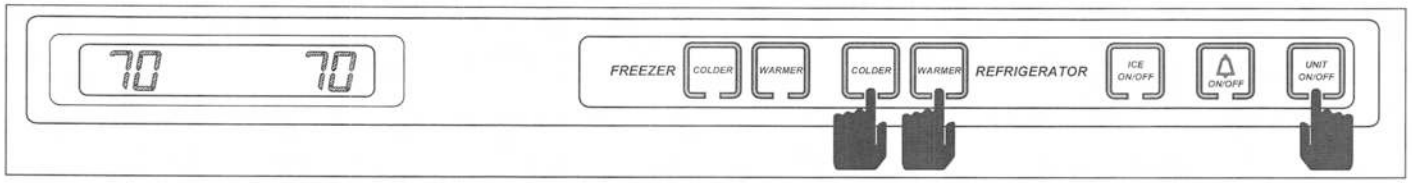

Figure 3-26. Then Press and Hold WARMER and COLDER Keys, Then the UNIT ON/OFF Key

Manual Compartment Disable Mode (Starting with Serial #2092137)

Manual Compartment Disable Mode allows a customer or Service Technician to switch one compartment off for interior cleaning, defrosting, or diagnostic purposes, while allowing the other compartment to continue cooling.

To initiate Manual Compartment Disable Mode, the unit must first be switched OFF using the UNIT ON/OFF key (See Figure 3-27), then press and hold the WARMER key for the compartment being disabled, then the UNIT ON/OFF key, then release both keys (See Figure 3-28). The LCD will display "- -" (double dashes) in place of temperature readings for the compartment chosen, indicating all cooling functions for that compartment are disabled. To return the unit to normal operation, repeat the steps above, or press UNIT ON/OFF key.

NOTE: *Always check set-points after returning unit to normal operation.*

NOTE: *Prior to serial #2092137, it is necessary to repeat the steps above in order to return the unit to normal operation.*

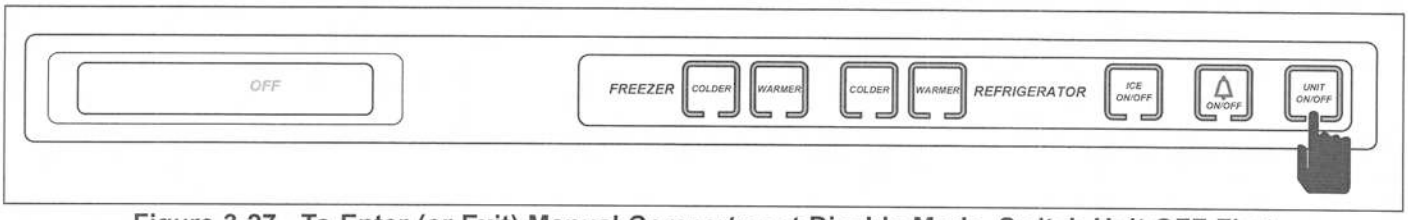

Figure 3-27. To Enter (or Exit) Manual Compartment Disable Mode, Switch Unit OFF First

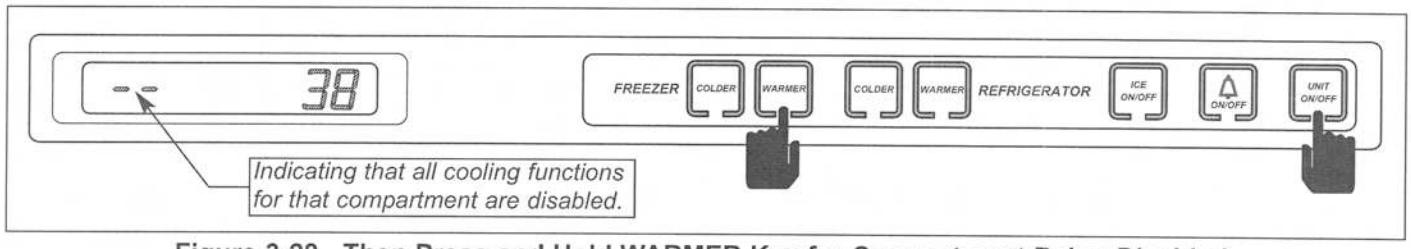

Figure 3-28. Then Press and Hold WARMER Key for Compartment Being Disabled, Then the UNIT ON/OFF Key.

Manual Freezer Evaporator Defrost

Manual Freezer Evaporator Defrost was incorporated into the electronic control to assist in servicing and diagnostics.

To initiate manual freezer evaporator defrost, press and hold the ICE ON/OFF key for 5 seconds, then release the key. (See Figure 3-29).

NOTE: *Manual Freezer Evaporator Defrost will not operate if unit is in Sabbath Mode.*

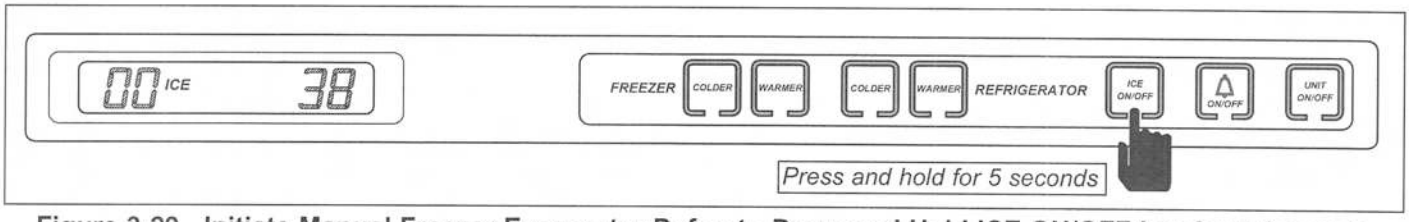

Figure 3-29. Initiate Manual Freezer Evaporator Defrost - Press and Hold ICE ON/OFF key for 5 Seconds

POSSIBLE ERROR INDICATORS

These pages contain diagrams illustrating what a customer may see on the LCD if there is a problem with the unit.

NOTE: *To clear indicators and error codes, problem must be corrected then press Bell ON/OFF key for 15 seconds.*

NOTE: *For thermistor errors described below, thermistor can be tested by submersing it in a glass of ice water for 2 to 5 minutes, then check for 30,000 to 33,000 ohms.*

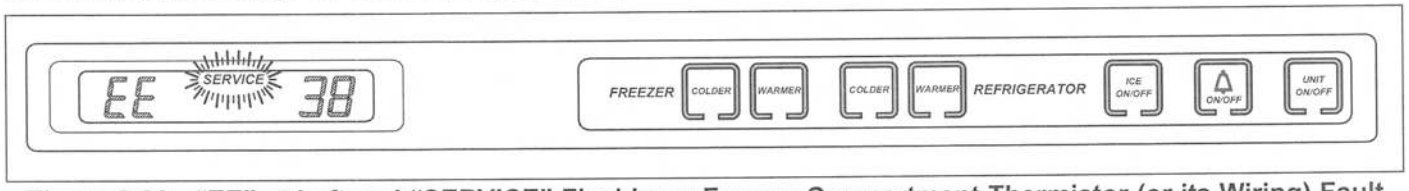

Figure 3-30. "EE" at Left and "SERVICE" Flashing = Freezer Compartment Thermistor (or its Wiring) Fault

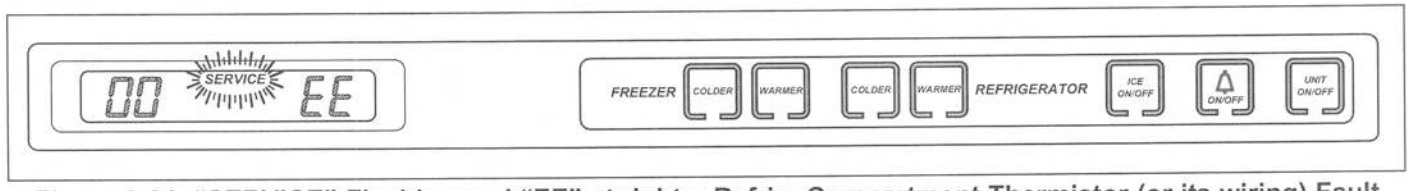

Figure 3-31. "SERVICE" Flashing and "EE" at right = Refrig. Compartment Thermistor (or its wiring) Fault

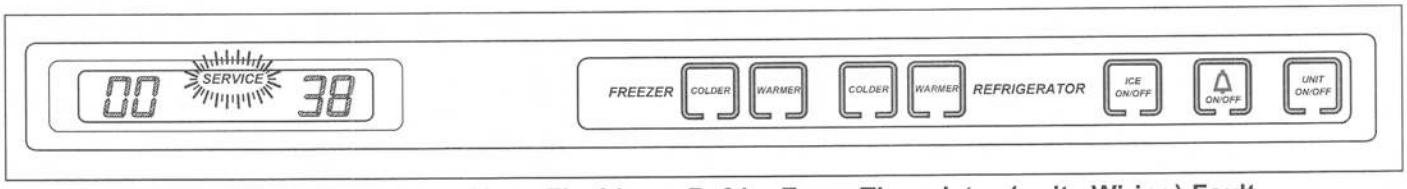

Figure 3-32. "SERVICE" Alone Flashing = Refrig. Evap. Thermistor (or its Wiring) Fault

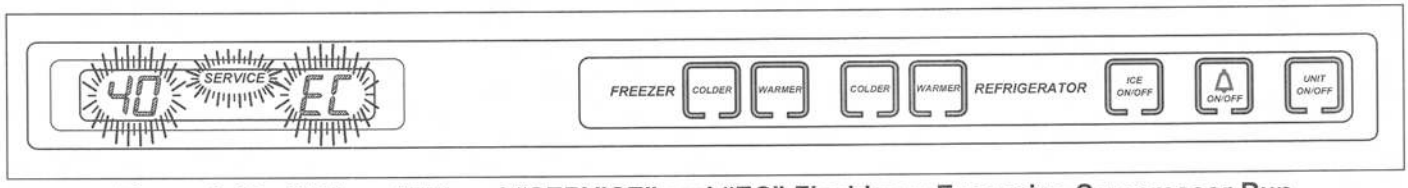

Figure 3-33. "40", or "50" and "SERVICE" and "EC" Flashing = Excessive Compressor Run

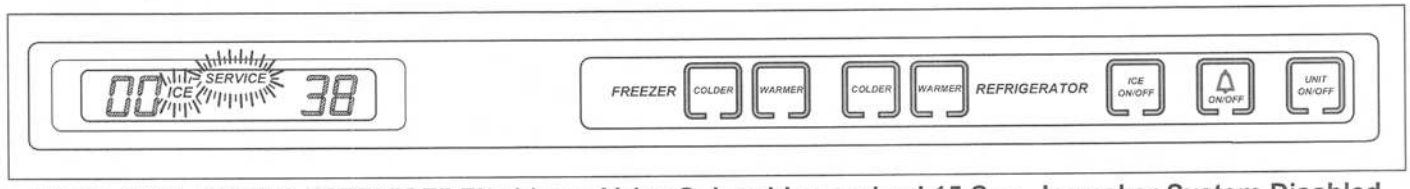

Figure 3-34. "ICE" & "SERVICE" Flashing = Valve Solenoid energized 15 Sec., Icemaker System Disabled

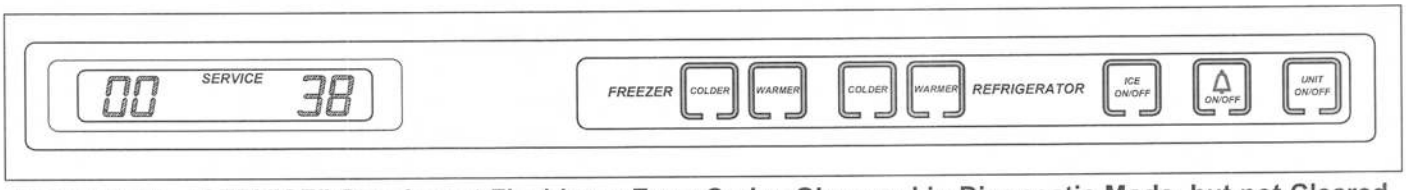

Figure 3-35. "SERVICE" Steady, not Flashing = Error Codes Observed in Diagnostic Mode, but not Cleared

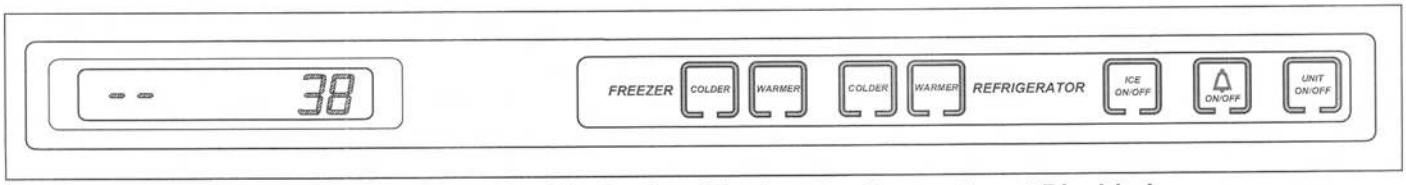

Figure 3-36. " - - " Double Dashes Displayed = Compartment Disabled

TROUBLESHOOTING INPUT OPERATIONS

The following few pages explain troubleshooting input operations performed at the control panel. The input operations described are Diagnostic Mode, Manual Component Activation Mode and Temperature Log Recall.

Diagnostic Mode

Initiating Diagnostic Mode allows the Service Technician to observe real-time temperature readings from all thermistors without temperature averaging. If errors were registered by the thermistors or the defrost system, "Error Codes" will also be displayed during diagnostic mode.

To initiate Diagnostic Mode, the unit must be ON, then press and hold either COLDER key, and press the UNIT ON/OFF key, then release both keys (See Figure 3-37). If no error codes are registered, the left display area will show real-time temperature of the thermistor, the right display area will show the thermistor location code, and all LCD indicators will illuminate. Pressing either COLDER key or either WARMER key while in Diagnostic Mode will toggle to the next or previous thermistor location, respectively. (See Figure 3-38, 3-39 and 3-40)

NOTE: *If the COLDER and UNIT ON/OFF keys are pressed and held for 10 seconds, Manual Component Activation Mode will be initiated (this is covered later in the section).*

NOTE: *Diagnostic Mode will end 20 seconds after the last key stroke.*

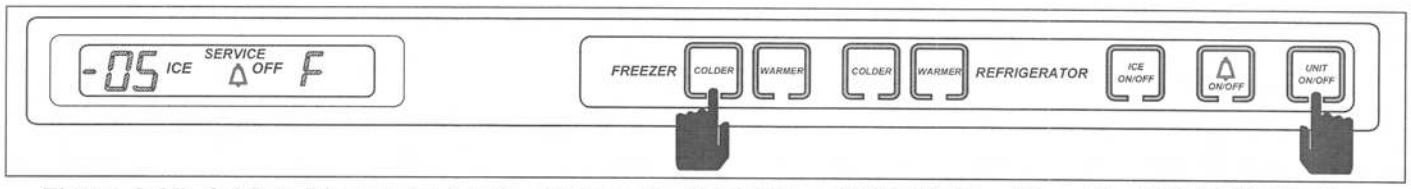

Figure 3-37. Initiate Diagnostic Mode - Press and Hold Either COLDER Key, Then the UNIT ON/OFF Key ("F" Indicates Freezer Compartment)

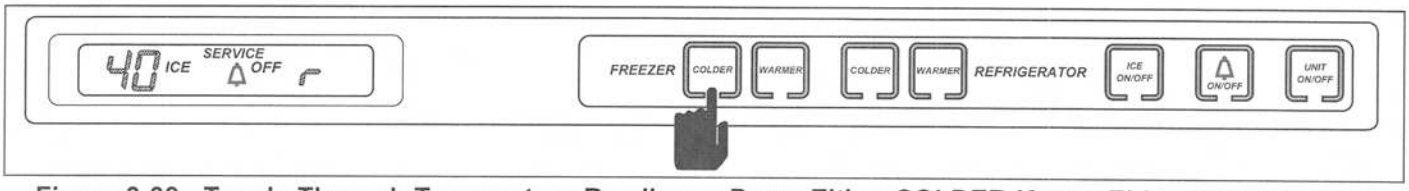

Figure 3-38. Toggle Through Temperature Readings - Press Either COLDER Key or Either WARMER Key ("r" Indicates Refrigerator Compartment)

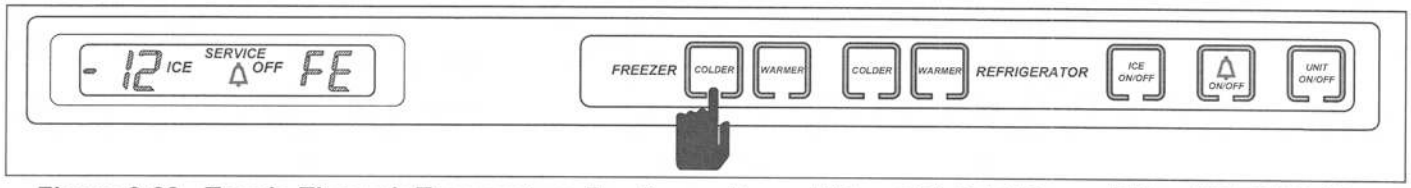

Figure 3-39. Toggle Through Temperature Readings - Press Either COLDER Key or Either WARMER Key ("FE" Indicates Freezer Evaporator)

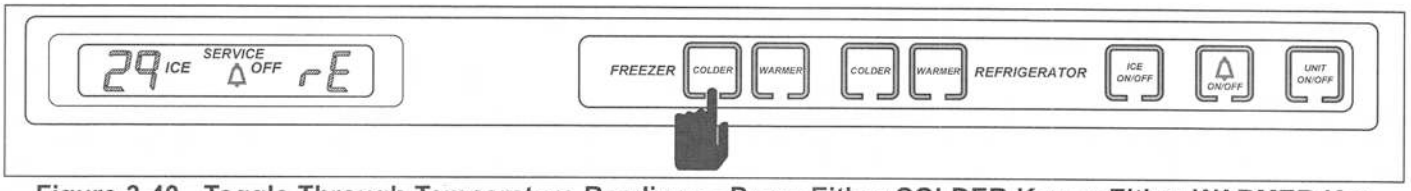

Figure 3-40. Toggle Through Temperature Readings - Press Either COLDER Key or Either WARMER Key ("rE" Indicates Refrigerator Evaporator)

Diagnostic Mode Indicators

If "EE" is observed in the left display area during Diagnostic Mode, the thermistor in that location is open or shorted, or there is a break in that thermistor's wiring (See Figure 3-41).

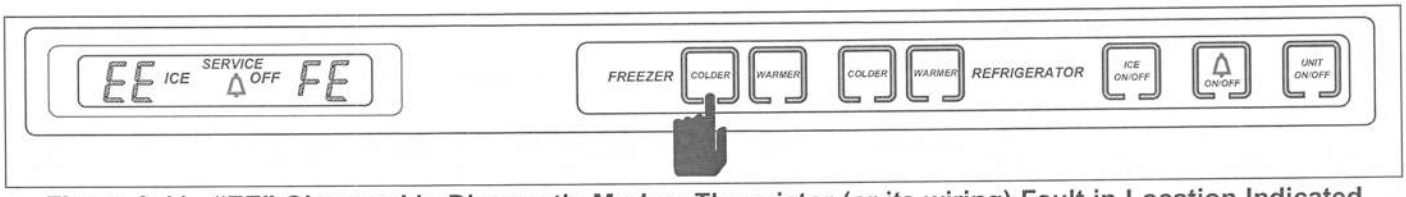

Figure 3-41. "EE" Observed in Diagnostic Mode = Thermistor (or its wiring) Fault in Location Indicated

If "Sr" is observed in the left display area when Diagnostic Mode is initiated, the unit is in Showroom Mode, which was explained earlier in this section (See Figure 3-42).

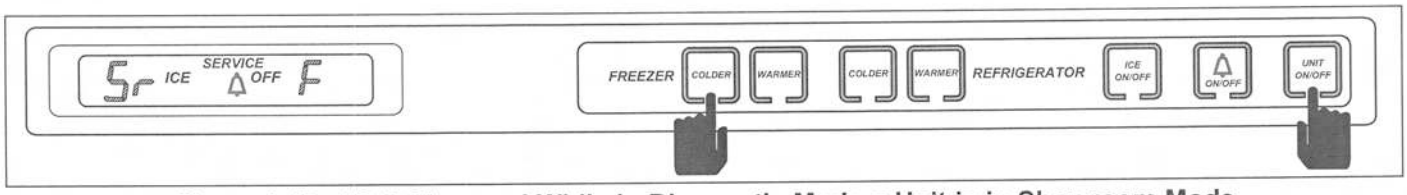

Figure 3-42. "Sr" Observed While in Diagnostic Mode = Unit is in Showroom Mode

If "EC" is observed in the right display area during Diagnostic Mode, numbers at left are "Error Codes" (See Figure 3-43). Error Codes indicate problems logged by specific components. If error codes are logged, they will appear before temperature readings and can be toggled through with the temperature readings as described on the previous page. (See Error Code Table below and instruction on how to clear Error Codes on the next page.)

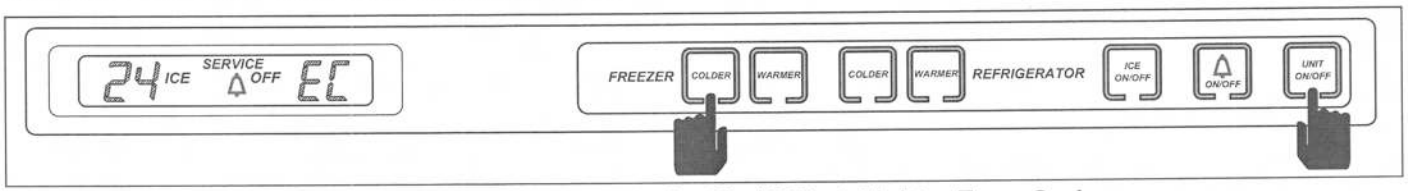

Figure 3-43. Numbers at Left with "EC" at Right = Error Code
(See Table Below and How to Clear Error Codes on next page)

Error Code Table	
CODE	**INDICATION**
05	*Refrig. Cabinet Thermistor read open or shorted for 10+ seconds, or repeatedly read erratic temp's*
06	*Refrig. Evaporator Thermistor read open or shorted for 10+ seconds, or repeatedly read erratic temp's*
07	*Freezer Cabinet Thermistor read open or shorted for 10+ seconds, or repeatedly read erratic temp's*
08	*Freezer Evaporator Thermistor read open or shorted for 10+ seconds, or repeatedly read erratic temp's*
20	*Defrost Under-heat with No Voltage Feedback Through Gray/White Wire at Defrost Start*
21	*Defrost Overheat*
22	*No Voltage Feedback Through Gray/White Wire at Defrost Start*
23	*Defrost Overheat with No Voltage Feedback through Gray/White Wire at Defrost Start*
24	*Defrost Under-heat*
30	*Excessive Icemaker Water Valve Solenoid Activation (Exceeded 15 Seconds)*
40	*Excessive Freezer Compressor Run*
50	*Excessive Refrigerator Compressor Run*

Clearing Error Codes

If error codes are observed in diagnostic mode, a non-flashing SERVICE indicator will appear on the LCD when Diagnostic Mode ends, indicating error codes are still logged (See Figure 3-44). To clear a non-flashing SERVICE indicator and the error codes, the problem must be corrected and the unit must be ON. Then, the Bell ON/OFF key must be pressed and held for fifteen seconds. The control will emit a short "beep" when the SERVICE indicator and error codes are cleared. (See Figure 3-45)

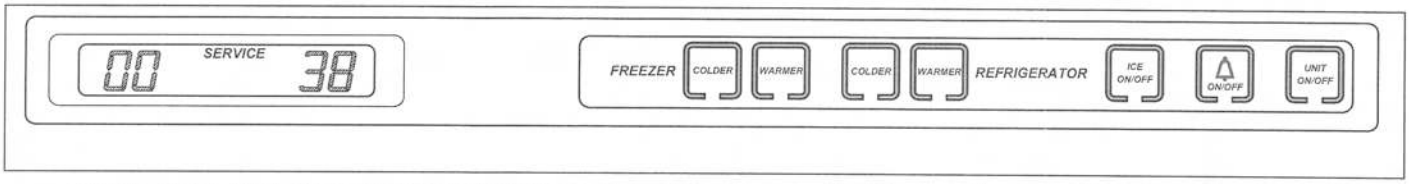

Figure 3-44. Non-flashing SERVICE Indicator after Diagnostic Mode = Error Codes were Registered

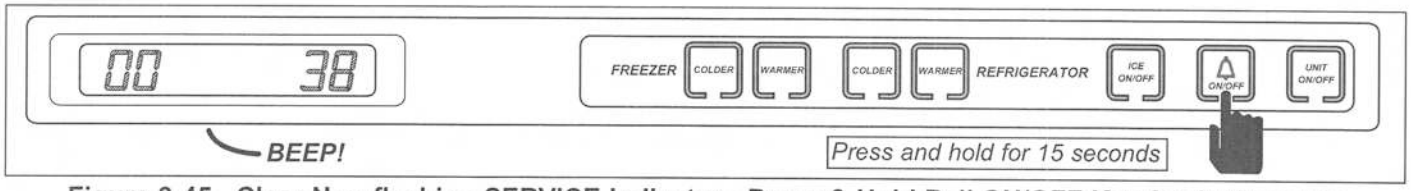

Figure 3-45. Clear Non-flashing SERVICE Indicator - Press & Hold Bell ON/OFF Key for 15 Seconds

Manual Component Activation Mode

Manual Component Activation Mode energizes a cooling system for 5 minutes. When activated, the chosen compartment's compressor and evaporator fan are energized along with the condenser fan. While in Component Activation Mode, the evaporator temperatures for that compartment are displayed on the LCD. This mode also allows the Service Technician to check for proper voltage readings at the activated components without having to wait for the compartment to call for cooling.

To initiate Manual Component Activation Mode, the unit must be ON, then press and hold the desired compartment COLDER key and UNIT ON/OFF key for 10 seconds (See Figure 3-46). The evaporator temperature for that compartment will be displayed in left display area of the LCD and the right display area will show the thermistor location.

NOTE: *If the COLDER and UNIT ON/OFF keys are pressed and held for less then 10 seconds, Diagnostic Mode will be initiated. This was covered earlier in the section.*

NOTE: *It is possible to toggle through the other temperature readings as in Diagnostic Mode, but in this case the temperature readings will last for 5 minutes rather than 20 seconds.*

NOTE: *The compressor overload could prevent the compressor from energizing.*

NOTE: *Manual Component Activation Mode will end 5 minutes after initiated. It is possible to end this 5 minute run time and return to normal operation by switching the unit OFF then back ON. If this is done, note that the electronic control will observe a three minute minimum compressor OFF time when the unit is switched back ON. This is to protect the compressor and its electricals.*

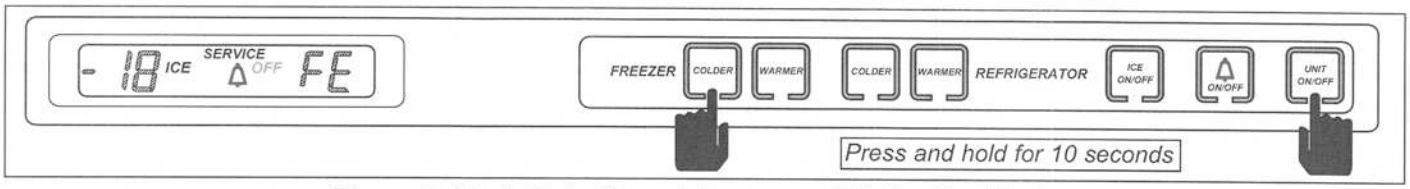

Figure 3-46. Initiate Manual Component Activation Mode - Press and Hold Desired COLDER Key and UNIT ON/OFF Key for 10 Seconds

Temperature Log Recall Mode

The electronic control system is equipped with a temperature history data storage system. This system logs/stores the average temperature of each individual thermistor every two hours, along with any event indicators (explained later in this section), that may have occurred. These two-hour periods are referred to as *"indexes"*. Up to 168 indexes can be stored for each compartment, making it possible to observe the preceding fourteen days of the unit's temperature history *(each index equals 2 hour temperature average; 2 hours X 168 indexes = 14 days)*. After 168 indexes are stored, each new index will bump the oldest index. Index number "1" being the most recent two-hour temperature average and index number "168" being the oldest. Accessing this temperature history data so it can be viewed on the LCD is accomplished by initiating Temperature Log Recall Mode.

There are two ways to initiate Temperature Log Recall Mode. One allows viewing of compartment temperature history only (see below), the other allows viewing of compartment temperature history and evaporator temperature history (see following page).

Initiate Temperature Log Recall Mode To View Compartment Temperature History Only - Begin with the unit ON. Now, press and hold the desired compartment WARMER key, then press the UNIT ON/OFF key, then release both keys (See Figure 3-47). The left display area on the LCD will show average compartment thermistor temperature and in the right display area will be the index number. The first index number will be "1", indicating the most recent two-hour temperature average. The right display area will also flash the thermistor location code at 3 second intervals (See Figure 3-48).

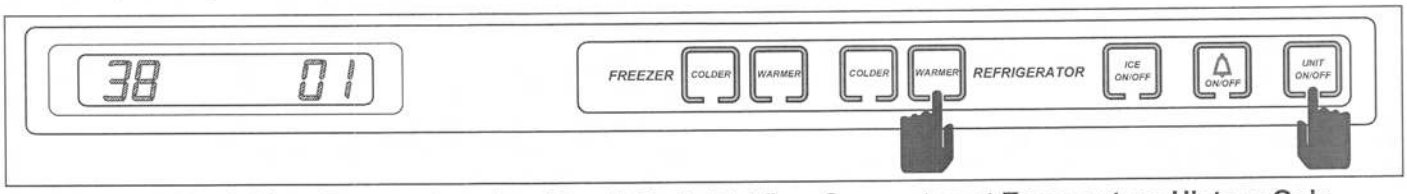

Figure 3-47. Initiate Temperature Log Recall Mode To View Compartment Temperature History Only - Press and Hold Desired WARMER Key, Then Press UNIT ON/OFF Key

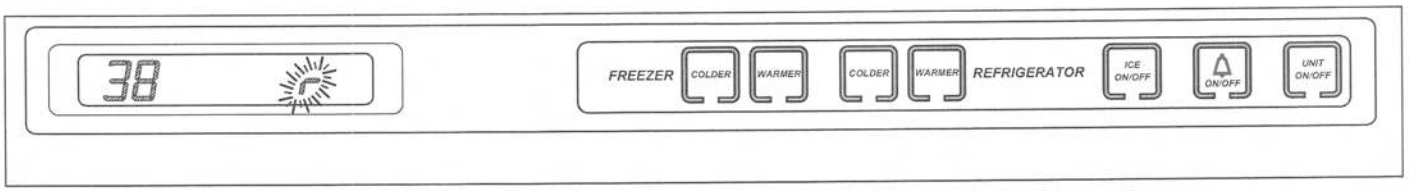

Figure 3-48. Thermistor Location Code Flashes Every Three Seconds

To toggle up through the indexes (from 1 to 168), press the same WARMER key in multiple key strokes (See Figure 3-49). To toggle down through the indexes (from 168 to 1), press the corresponding COLDER key in multiple key strokes (See Figure 3-50).

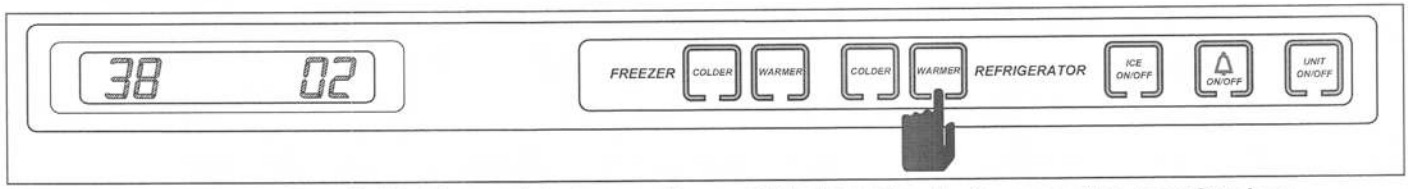

Figure 3-49. Toggle Up Through Indexes - Press WARMER Key in Consecutive Key Strokes

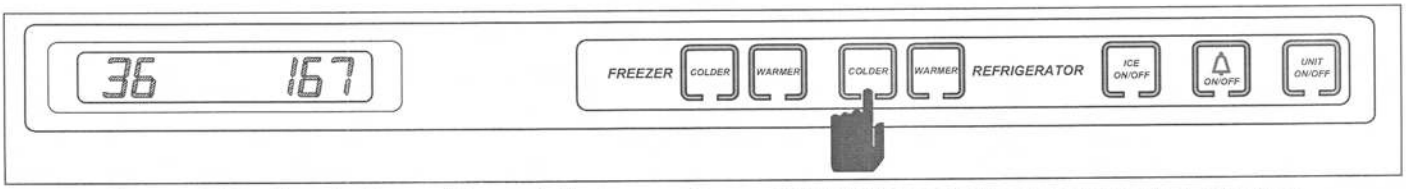

Figure 3-50. Toggle Down Through Indexes - Press COLDER Key in Consecutive Key Strokes

Initiate Temperature Log Recall Mode To View Compartment and Evaporator Temperature History - Begin with the unit ON and in Diagnostic Mode (See Figure 3-51). While in Diagnostic Mode, toggle through the readings until the desired thermistor temperature is displayed on the LCD (See Figure 3-52). Now, press the WARMER key for that compartment and the UNIT ON/OFF key simultaneously (See Figure 3-53). The left display area on the LCD will show average thermistor temperature and in the right display area will be the index number "1" indicating the most recent 2-hour temperature average (See Figure 3-53). The right display area will also flash the thermistor location code at three second intervals (See Figure 3-54).

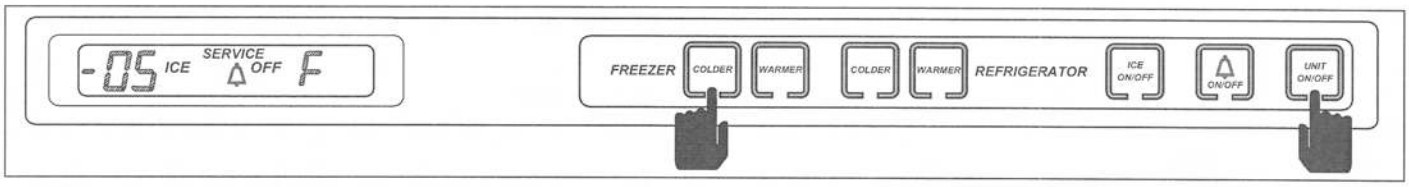

Figure 3-51. Initiate Diagnostic Mode - Press and Hold Either COLDER Key, then the UNIT ON/OFF Key

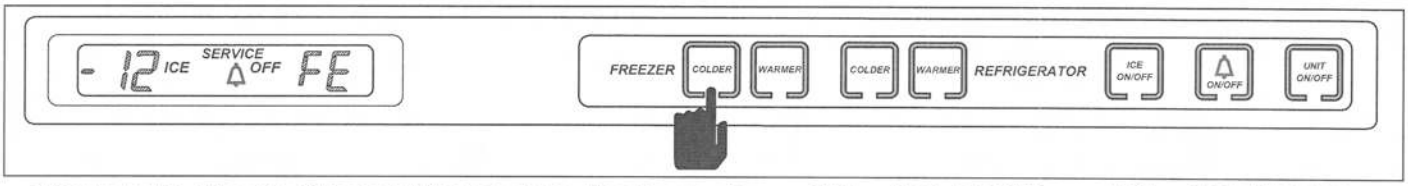

Figure 3-52. Toggle Through Temperature Readings - Press Either COLDER Key or Either WARMER Key Until Desired Thermistor Temperature is Displayed

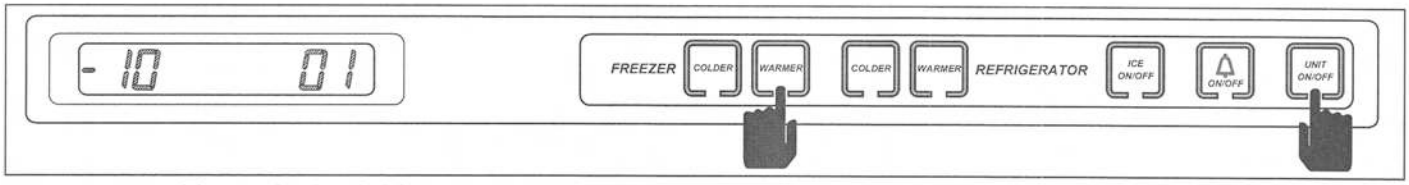

Figure 3-53. Initiate Temperature Log Recall Mode To View Temperature History - Press and Hold Desired WARMER Key and UNIT ON/OFF Key

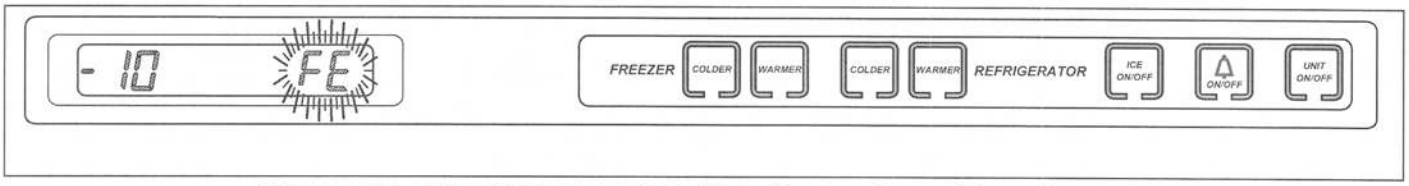

Figure 3-54. Thermistor Location Code Flashes Every Three Seconds

To toggle up through the indexes (from 1 to 168), press the same WARMER key in multiple key strokes (See Figure 3-55). To toggle down through the indexes (from 168 to 1), press the corresponding COLDER key in multiple key strokes (See Figure 3-56).

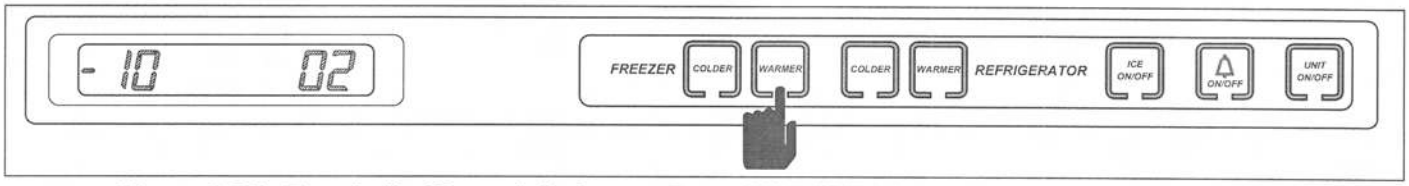

Figure 3-55. Toggle Up Through Indexes - Press WARMER Key in Consecutive Key Strokes

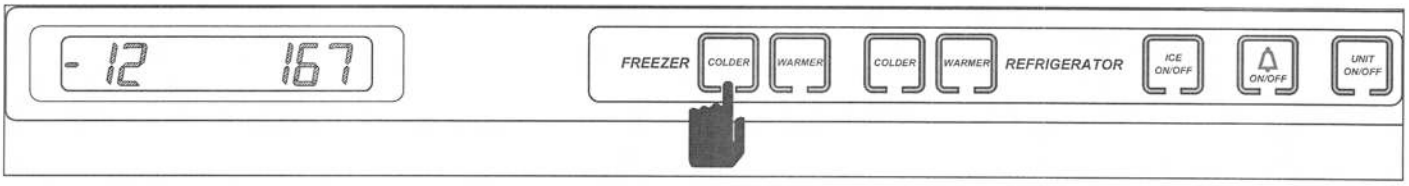

Figure 3-56. Toggle Down Through Indexes - Press COLDER Key in Consecutive Key Strokes

Temperature Log Event Indicators

The diagrams below illustrate possible event indicators that may be observed while in Temperature Log Recall Mode. (See Figures 3-57 through 3-60)

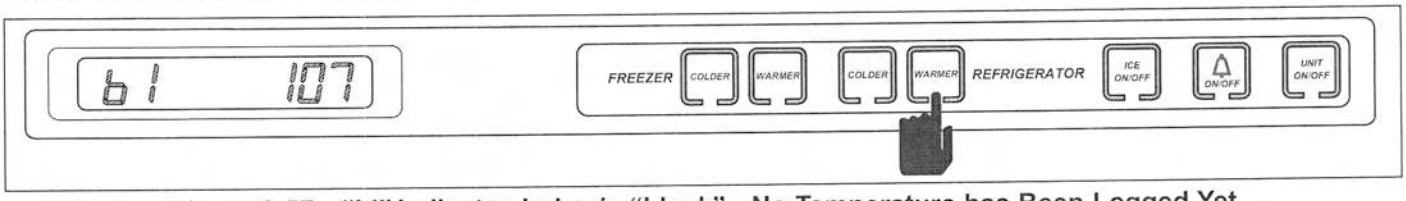

Figure 3-57. *"bl"* Indicates Index is "blank" - No Temperature has Been Logged Yet
(Only possible within first 14 days of unit operation, or after new control board is installed during service)

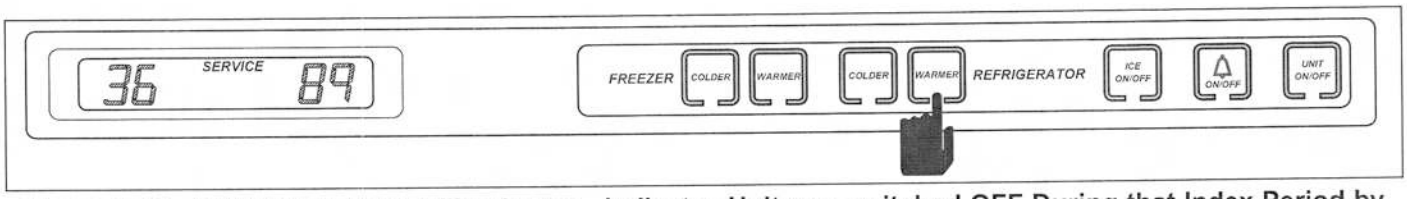

Figure 3-58. SERVICE Indicator Illuminates - Indicates Unit was switched OFF During that Index Period by Pressing UNIT ON/OFF Key

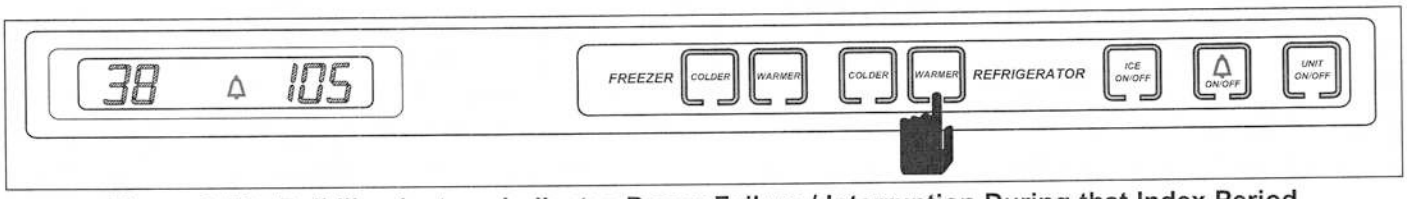

Figure 3-59. Bell Illuminates - Indicates Power Failure / Interruption During that Index Period

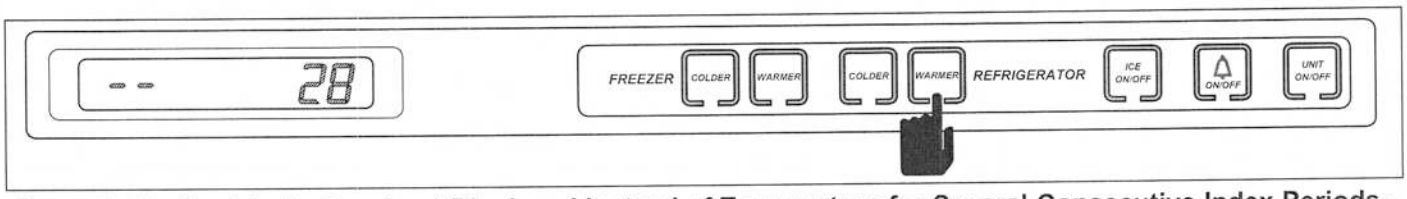

Figure 3-60. Double Dashes (- -) Displayed Instead of Temperature for Several Consecutive Index Periods - Indicates Bad EEPROM on Control Board. Board Must be Replaced

NOTE: *Double dashes will also be observed when in Manual Compartment Disable Mode. Only when double dashes are observed in Temperature Log Recall Mode for several consecutive indexes should the control board be replaced.*

NOTE: *If Manual Compartment Disable Mode has been activated during any of the 168 indexes, average temperatures will continue to be logged. No event indicator will appear with these temperatures.*

NOTE: *If the unit was in Showroom Mode during any of the 168 indexes, average temperatures will continue to be logged. No event indicator will appear with these temperatures.*

NOTE: *If the unit was switched OFF by pressing the UNIT ON/OFF key during any of the 168 indexes and there was still 115V AC supplied to the control board, the average temperatures will continue to be logged. This means temperatures would be expected to rise and the SERVICE indicator would be present in all indexes in which the unit was switched OFF.*

NOTE: *Temperature Log Recall Mode will end 20 seconds after the last key stroke.*

Temperature Log Index Chart

NOTE : *The chart below applies to the hours in which the control has power. Temperature history data will only be stored when the control has 115V AC supplied to it. If power to the unit is interrupted by switching the unit OFF at the UNIT ON/OFF key or due to a power failure, the average temperatures for that time period are stored with the event indicator. The temperature history data is stored in a non-volatile memory, so the data is not erased if power is interrupted.*

TEMPERATURE LOG INDEX CHART

Index= Hours Past	Index= Hours Past	Index= Hours Past	Index= Hours Past
1 = 2 Hrs	43 = 86 Hrs	85 = 170 Hrs	127 = 254 Hrs
2 = 4 Hrs	44 = 88 Hrs	86 = 172 Hrs	128 = 256 Hrs
3 = 6 Hrs	45 = 90 Hrs	87 = 174 Hrs	129 = 258 Hrs
4 = 8Hrs	46 = 92 Hrs	88 = 176 Hrs	130 = 260 Hrs
5 = 10Hrs	47 = 94 Hrs	89 = 178 Hrs	131 = 262 Hrs
6 = 12 Hrs	48 = 96 Hrs *(4 Days)*	90 = 180 Hrs	132 = 264 Hrs *(11 Days)*
7 = 14 Hrs	49 = 98 Hrs	91 = 182 Hrs	133 = 266 Hrs
8 = 16 Hrs	50 = 100 Hrs	92 = 184 Hrs	134 = 268 Hrs
9 = 18 Hrs	51 = 102 Hrs	93 = 186 Hrs	135 = 270 hrs
10 = 20 Hrs	52 = 104 Hrs	94 = 188 Hrs	136 = 272 Hrs
11 = 22 Hrs	53 = 106 Hrs	95 = 190 Hrs	137 = 274 Hrs
12 = 24 Hrs *(1 Day)*	54 = 108 Hrs	96 = 192 Hrs *(8 Days)*	138 = 276 Hrs
13 = 26 Hrs	55 = 110 Hrs	97 = 194 Hrs	139 = 278 Hrs
14 = 28 Hrs	56 = 112 Hrs	98 = 196 Hrs	140 = 280 Hrs
15 = 30 Hrs	57 = 114 Hrs	99 = 198 Hrs	141 = 282 Hrs
16 = 32 Hrs	58 = 116 Hrs	100 = 200 Hrs	142 = 284 Hrs
17 = 34 Hrs	59 = 118 Hrs	101 = 202 Hrs	143 = 286 Hrs
18 = 36 Hrs	60 = 120 Hrs *(5 Days)*	102 = 204 Hrs	144 = 288 Hrs *(12 Days)*
19 = 38 Hrs	61 = 122 Hrs	103 = 206 Hrs	145 = 290 Hrs
20 = 40 Hrs	62 = 124 Hrs	104 = 208 Hrs	146 = 292 Hrs
21 = 42 Hrs	63 = 126 Hrs	105 = 210 Hrs	147 = 294 Hrs
22 = 44 Hrs	64 = 128 Hrs	106 = 202 Hrs	148 = 296 Hrs
23 = 46 Hrs	65 = 130 Hrs	107 = 214 Hrs	149 = 298 Hrs
24 = 48 Hrs *(2 Days)*	66 = 132 Hrs	108 = 216 Hrs *(9 Days)*	150 = 300 Hrs
25 = 50 Hrs	67 = 134 Hrs	109 = 218 Hrs	151 = 302 Hrs
26 = 52 Hrs	68 = 136 Hrs	110 = 220 Hrs	152 = 304 Hrs
27 = 54 Hrs	69 = 138 Hrs	111 = 222 Hrs	153 = 306 Hrs
28 = 56 Hrs	70 = 140 Hrs	112 = 224 Hrs	154 = 308 Hrs
29 = 58 Hrs	71 = 142 Hrs	113 = 226 Hrs	155 = 310 Hrs
30 = 60 Hrs	72 = 144 Hrs *(6 Days)*	114 = 228 Hrs	156 = 312 Hrs *(13 Days)*
31 = 62 Hrs	73 = 146 Hrs	115 = 230 Hrs	157 = 314 Hrs
32 = 64 Hrs	74 = 148 Hrs	116 = 232 Hrs	158 = 316 Hrs
33 = 66 Hrs	75 = 150 Hrs	117 = 234 Hrs	159 = 318 Hrs
34 = 68 Hrs	76 = 152 Hrs	118 = 236 Hrs	160 = 320 Hrs
35 = 70 Hrs	77 = 154 Hrs	119 = 238 hrs	161 = 322 Hrs
36 = 72 Hrs *(3 Days)*	78 = 156 Hrs	120 = 240 Hrs *(10 Days)*	162 = 324 Hrs
37 = 74 Hrs	79 = 158 Hrs	121 = 242 Hrs	163 = 326 hrs
38 = 76 Hrs	80 = 160 Hrs	122 = 244 Hrs	164 = 328 Hrs
39 = 78 Hrs	81 = 162 Hrs	123 = 246 Hrs	165 = 330 Hrs
40 = 80 Hrs	82 = 164 Hrs	124 = 248 Hrs	166 = 332 Hrs
41 = 82 Hrs	83 = 166 Hrs	125 = 250 Hrs	167 = 334 Hrs
42 = 84 Hrs	84 = 168 Hrs *(7 Days)*	126 = 252 Hrs	168 = 336 Hrs *(14 Days)*