

### EcoCool™ Controller and Configuration Software Installation and Configuration



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Callout  
Column

Icons



# 1 HOW TO USE THIS MANUAL

The following conventions are used in this manual.

## Callout column:

Callouts on the topics described are placed to the left of the text to allow the user to find the desired information quickly.

## Icons

Some parts of the text are highlighted using icons that have the following meanings:

**NOTE:** Draws attention to a specific topic that users should take into account.

**TIP:** Highlights a suggestion that helps users to understand and use the information on the topic described.

**WARNING:** Highlights information that may damage the system or place persons, equipment, data, etc at risk if not known. These sections must always be read prior to use.

# 2 INTRODUCTION

The E71R and E72R EcoCool™ controllers are microprocessor based electronic temperature and defrost controllers for use in compressor-driven commercial freezers and refrigerators. The E71R includes one relay for a refrigeration compressor or refrigeration solenoid valve. The E72R includes one relay for a refrigeration compressor or refrigeration solenoid valve and one relay for a defrost heater and optional fan.

# 3 E71R AND E72R CONTROLLERS

## 3.1 Overview

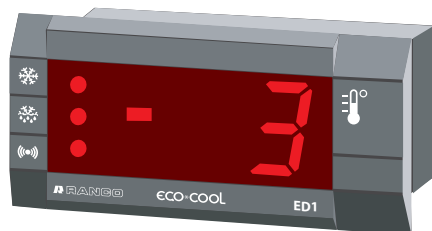


E71R / E72R Controller

**WARNING:** A separate switch must be installed to disconnect the controller, compressor, and fan from line voltage for service.

Both controllers allow configuration of cut-in and cut-out temperatures and defrost scheduling for precise temperature control. An adjustment knob allows the user to select a configured cold setpoint, warm setpoint, or any setpoint within this range. Optionally, the adjustment knob also can be configured with ON/OFF functionality to power off the controller for non-service purposes. To prevent setpoint adjustment with the adjustment knob, a fixed setpoint can be configured. The E71R and E72R can defrost the evaporator using an off-cycle defrost that powers off the compressor for a specified time period or until a specified evaporator temperature is reached. Additionally, the E72R includes a second relay that can be used to energize a defrost heater or reverse cycle solenoid valve to defrost the evaporator coil. Controller configuration is designed on a computer using EcoCool configuration software and is downloaded into the controller from the computer or a copy card.

Three status LEDs (red, yellow, and green) display the system status. Temperature and fault alarms, defrost status, and compressor operation are indicated by the LEDs.



An optional remote digital display shows the control temperature and, during adjustment, changes to the setpoint. It can be configured to show for the duration of the defrost cycle the actual temperature, the temperature that was sensed at the moment the defrost cycle started, or dF. The display also includes three system status LEDs.

### Optional Display

To minimize temperature alarms during start up, defrost, and temperature fluctuations, alarm delay timers can be configured. The controllers can be configured to start defrosting based on the elapsed system-on time, the accumulated run time of the compressor, or the difference in temperature between the evaporator sensor and the control sensor. Defrosting can be terminated by elapsed time, the evaporator or control temperature sensor, or by a temperature switch. If the control temperature sensor fails, the compressor can be powered on, powered off, or follow a configured duty cycle.

The controllers include the following physical features:

- Knob for setpoint adjustment
- Two temperature sensor inputs for a control probe and an evaporator probe
- One digital input for an optional defrost termination switch
- E71R Controller: One relay for a refrigeration compressor
- E72R Controller: One relay for a refrigeration compressor and one relay for a defrost heater and fan
- 90V to 240V AC switching power supply
- Connection for configuration or optional display
- Plastic enclosure and compact size for easy installation in most appliances
- Customizable control parameters
- Flash-memory microprocessor for quick and inexpensive configuration and firmware downloads at the factory or in the field
- Adjustable mounting clips for panel or bracket mounting

## 4 INSTALLATION

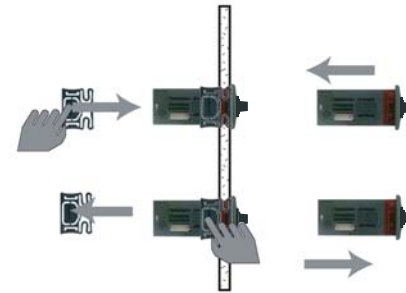
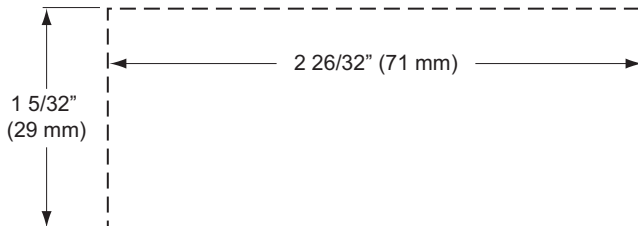
### 4.1 Installing the controller

The controller can be mounted in a panel cutout with the LEDs showing, mounted behind a panel with only the adjustment shaft exposed, or mounted completely within the case.

To mount the controller with the face exposed, cut a 2 26/32" by 1 5/32" (71 mm x 29 mm) hole in the panel. Insert the controller from the outside of the panel and slide a mounting clip onto each side of the controller from behind the panel.

Optionally, the controller can be mounted to a bracket inside the case.

Exposed Face  
Cut-out



#### 4.1.1 Wiring the controller



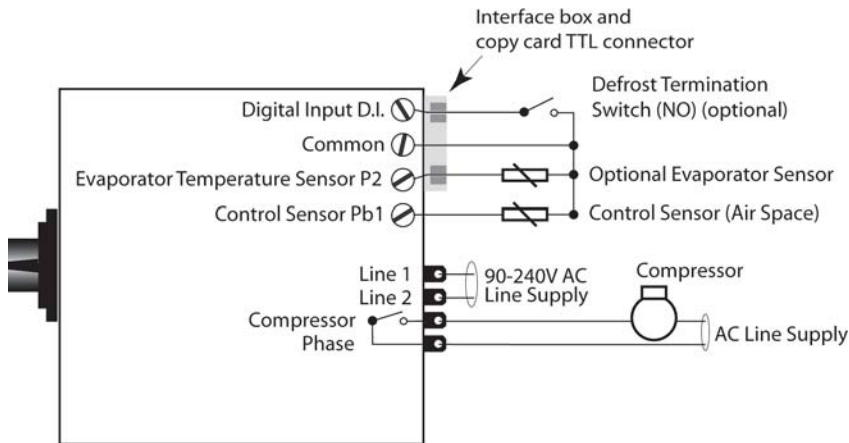
**WARNING:** Before wiring the controller, make sure that the refrigeration unit, fan, heater, and controller are not connected to the electrical supply. Do not apply voltage to the digital input.

**WARNING:** If the compressor and a fan are connected to the same relay on the controller, the total current drawn by the compressor and fan must not exceed the value shown in section 8.4 Terminations.

Use insulated spade connectors to connect the controller to the output loads. If your line voltage uses a neutral line and a phase line, connect the phase line to the phase terminal(s) on the controller. Line 1 and Line 2 connections on the controller are not phase dependent. Connect the control sensor, optional evaporator sensor, and optional defrost termination switch using the screw terminal block.

##### E71R Controller

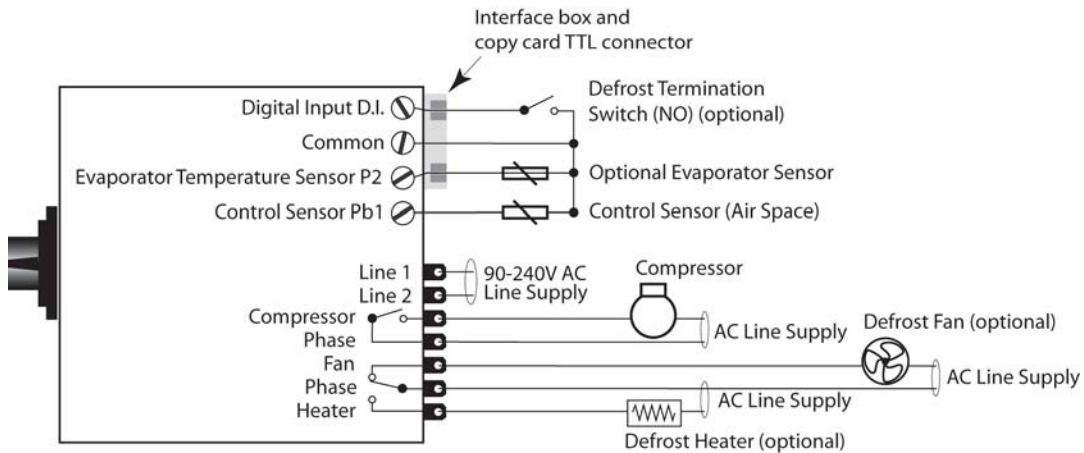
**E71R**  
Wiring Example



**E71R with Control Sensor and Optional Evaporator Sensor**

##### E72R Controller

**E72R**  
Wiring Example



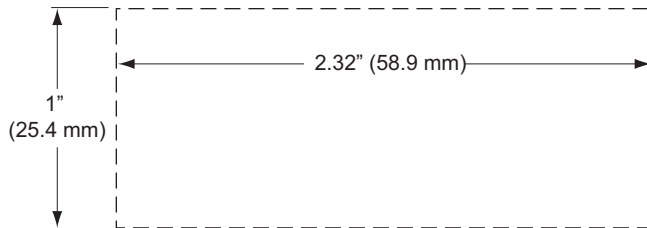
**E72R With Control Sensor, Optional Evaporator Sensor, Defrost Heater, and Defrost Fan**

## 4.2 Mounting the display



The optional display can be flush mounted in a panel cutout up to 30ft (10m) from the controller. To mount the display flush to the panel, cut a 2.32" by 1" (64mm x 31mm) hole in the panel. Insert the display from the outside of the panel. Friction tabs on the sides of the display hold it in place.

Display  
Mounting  
Cut-out



## 4.3 Wiring the display

Use the Interface Box, Copy Card, and Display TTL Connector on the controller to connect to the display.

# 5 FUNCTIONS AND FEATURES

### 5.1.1 User control

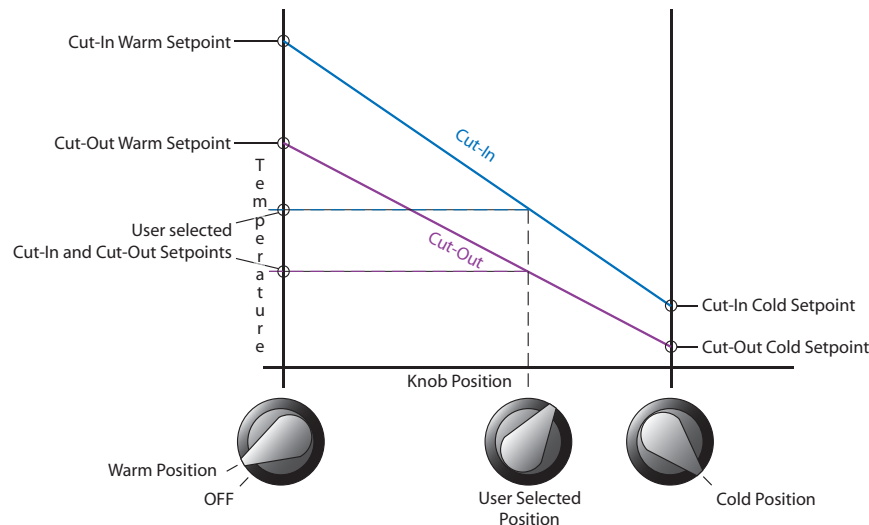
The adjustment knob can be rotated to select any control temperature within the configured range.

The OFF and ON positions of the adjustment knob can be set to specific angles relative to full counter clockwise. Rotating the adjustment knob fully counter clockwise (to OFF) powers off the controller and compressor immediately. However, hazardous voltage remains. The controller, compressor, defrost heater, and defrost fan must be disconnected, prior to service, using a separate switch. If the On/Off Function is enabled and the knob is in the OFF position, rotating the knob clockwise powers on the controller.

### 5.1.2 Control mode

The controller cycles the compressor or refrigeration solenoid valve to maintain the selected control temperature.

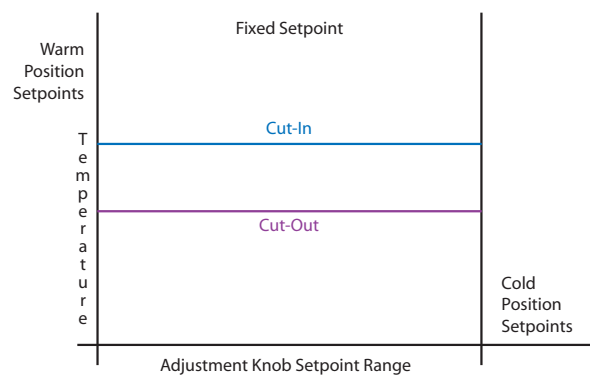
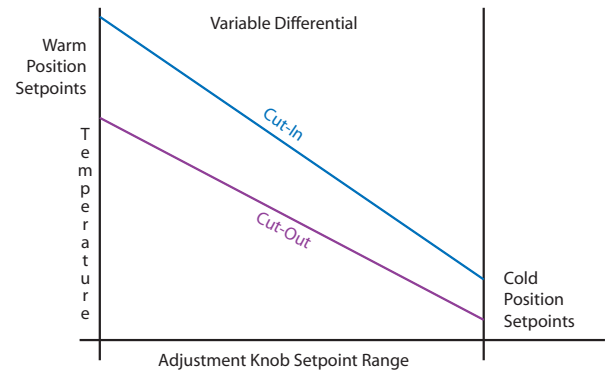
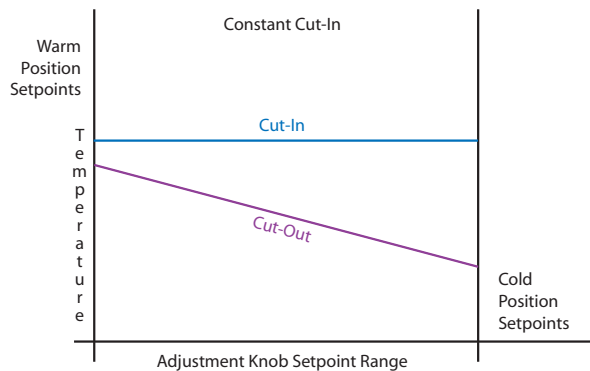
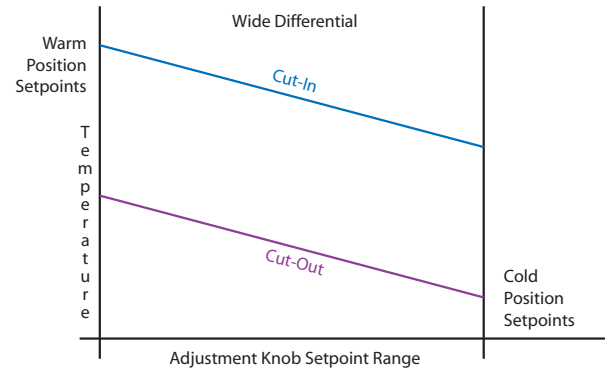
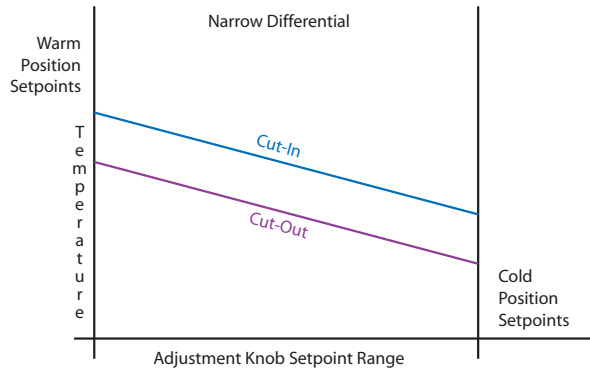
The warm and cold adjustment knob positions are configured using four setpoints. **Cut-In Warm** and **Cut-Out Warm** are the setpoints for the warm position. **Cut-In Cold** and **Cut-Out Cold** are the setpoints for the cold position. The cold position is full clockwise rotation. The warm position is full counter clockwise rotation or, if the On/Off Function is enabled, the specified angle. When the user sets the adjustment knob to a setpoint between the warm and cold positions, the Cut-In and Cut-Out setpoints are calculated by the controller. The setpoints can be configured using Celsius or Fahrenheit units.



When the adjustment knob is set to the warm position and the controlled space temperature is equal to or greater than the Cut-In warm setpoint, the compressor or solenoid valve is energized until the controlled space temperature is equal to or less than the Cut-Out warm setpoint. Similarly, when the adjustment knob is set to cold, the compressor or solenoid valve is energized when the temperature is equal to or greater than the Cut-In cold setpoint and de-energized when the temperature is equal to or below the Cut-Out cold setpoint. For adjustment knob positions between warm and cold, the controller interpolates the cut-in and cut-out setpoints from the four configured setpoints.

The optional display changes from the control temperature to the Cut-Out setpoint during adjustment and reverts to the control temperature three seconds after adjustment. Because the four setpoints are configured independently, the differential can remain constant or change linearly between the cold and warm settings.

Refer to the graphs below for various setting scenarios.

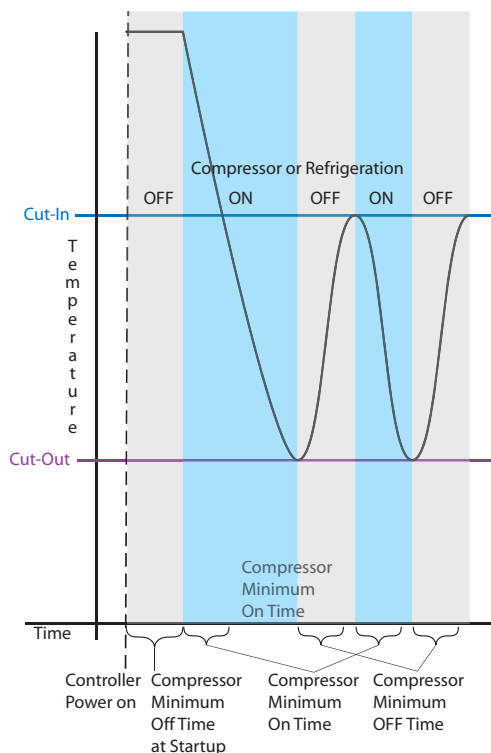


The compressor can be protected against short cycling by three time delays. The **Compressor Minimum Off Time at Start** delay begins counting down when the controller is powered on. The compressor cannot be powered on before this delay expires. If the ON/OFF function is enabled, the timer does not count down while the adjustment knob is in the OFF position. When the compressor is powered on the **Compressor Minimum On Time** delay begins counting down. The compressor is not powered off by the controller before this delay expires regardless of the control temperature or setpoint. However, if the adjustment knob is rotated to OFF the controller and compressor are immediately powered off. When the controller powers off the compressor, the **Compressor Minimum Off Time** delay begins counting down. The compressor is not powered on before this timer expires regardless of control temperature or setpoint.



**TIP:** An excessive Compressor Minimum On Time or Compressor Minimum Off Time can force the temperature past an alarm threshold and trigger a temperature alarm.





### 5.1.3 Status indications

Three LEDs in the face of the controller indicate the status of the controller. The green LED illuminates while the compressor is powered on. The yellow LED illuminates while the controller is in a defrost cycle. The red LED illuminates if the control temperature exceeds an alarm threshold or flashes if a temperature sensor circuit is shorted or open. The remote display includes three red LEDs that provide the same indications (see 5.1.6 Display).

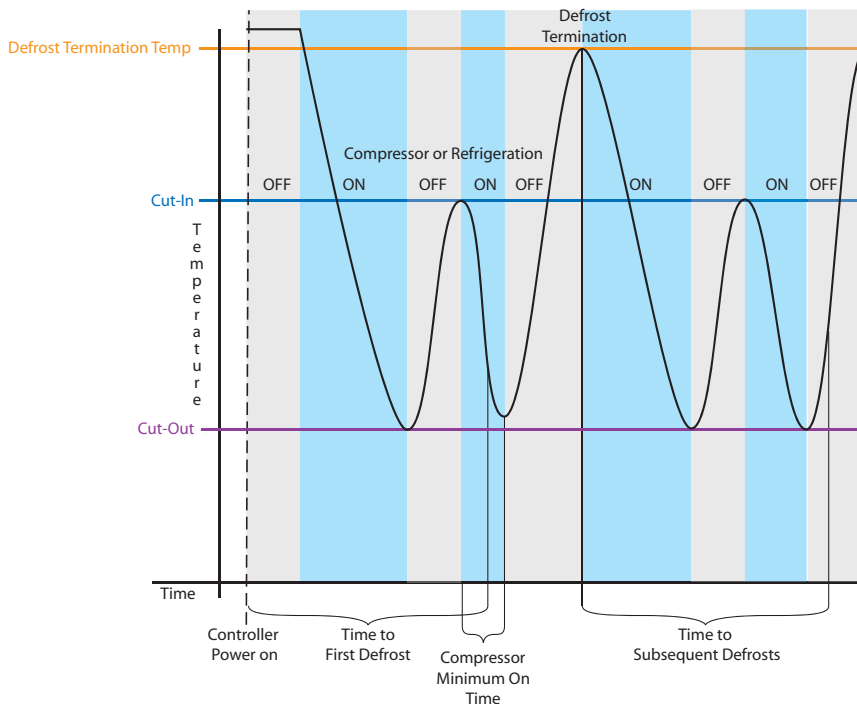


### 5.1.4 Defrost control

The defrost functionality can be based on the appliance operating time between defrosting cycles, the accumulated compressor run time between defrosting cycles, or it can be disabled. If the **Defrost Function** is disabled, all defrosting features are disabled.

The controller can start a defrost cycle when it is powered on or after the expiration of the **Time to First Defrost** delay. If **Defrost Cycle at Power On** is enabled, the controller starts a defrost cycle when it is powered ON or after a power interruption (power cycle). If Defrost Cycle at Power On is disabled, the Time to First Defrost timer starts counting down when the controller is powered on. The controller starts a defrost cycle when the timer expires. After the completion of the first defrost cycle, the **Time to subsequent defrosts** timer starts counting down. When it expires, defrost starts. At the end of the defrost cycle, the timer resets and restarts.

## Time Initiated Defrost

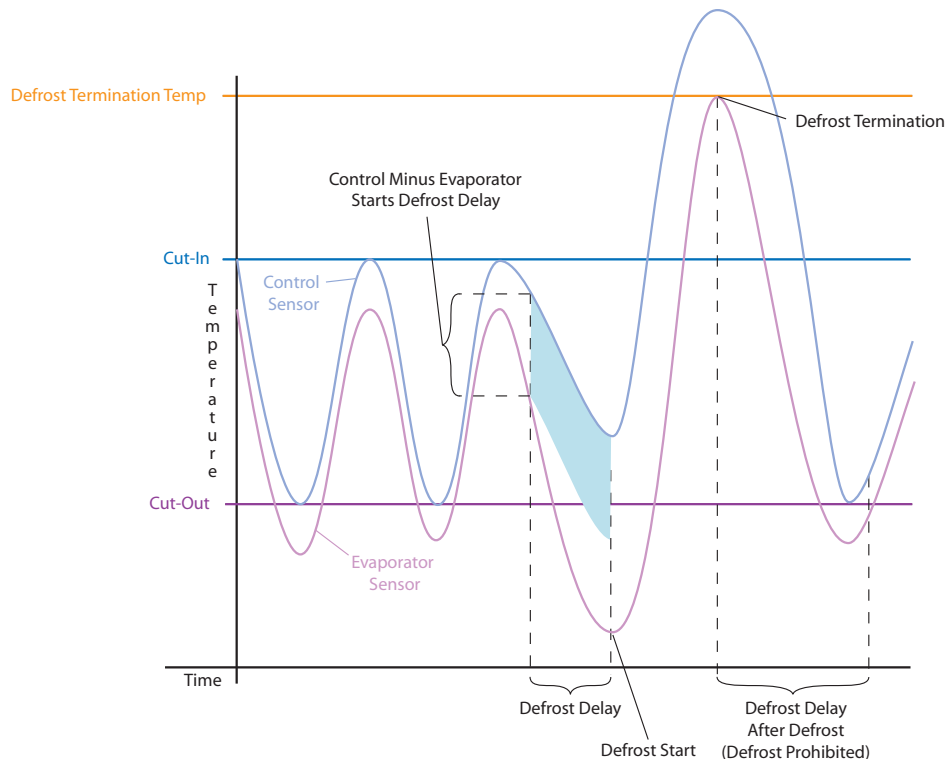


The controller can also be configured with a **Temperature Initiated Defrost Function** to start defrosting if it senses too great a difference between the control temperature and the evaporator temperature. **Temperature Initiated Defrost Time Delay** begins counting down if the evaporator temperature is less than 32°F (0°C) and an excessive temperature difference is sensed. Defrost starts if the temperature difference still exists when the delay expires. This temperature initiated defrost delay prevents defrost from starting if the air space temperature temporarily increases (e.g. the door is left open). The temperature difference and delay are both configured.

Temperature Initiated Defrost Time Delay after Defrost begins counting down when refrigeration starts after defrost. This delay is typically longer than Temperature Initiated Defrost Time Delay to prevent another defrost before the sensed temperatures return to normal. When Temperature Initiated Defrost Time Delay after Defrost expires, the controller resumes use of Temperature Initiated Defrost Time Delay as described above. Temperature Initiated Defrost Time Delay after Defrost permits a shorter Temperature Initiated Defrost Time Delay without the risk of starting defrost due to a lagging control temperature after defrost.

Temperature initiated defrost is independent of time initiated defrost and can start before the Time to subsequent defrosts timer expires.

## Temperature Initiated Defrost



The E71R controller allows only off-cycle defrost by powering off the compressor. The E72R controller includes the following Defrost Method options:

- **Off Cycle:** powers off the compressor
- **Electric:** powers off the compressor and powers on a heating element
- **Reverse Cycle:** powers on the compressor and powers on a valve that reverses the cooling cycle to pump heat into the evaporator coil

Defrost heat and an optional evaporator fan are controlled by the second relay on the E72R.

When defrosting begins, the **Defrost Duration** timer starts counting down real time. Defrosting ends when one of the following occurs, depending on your configuration:

- The Defrost Duration timer expires
- The control temperature increases to the Defrost Termination Temperature
- The evaporator temperature (evaporator sensor) rises to the Defrost Termination Temperature
- The optional defrost termination switch is closed

If evaporator or control sensor termination is enabled, defrosting can terminate before the Defrost Duration timer expires. In this case the timer serves as a failsafe.

When defrost is terminated, the optional **Drip Time** delay starts counting down. If the E72R is being used, the defrost relay switches position: The defrost heater is powered off or the reverse cycle solenoid returns to the cooling position, and the evaporator fan is powered on. The compressor is not powered on until the Drip Time delay expires. If the E71R is being used, the compressor remains powered off during the drip time. This delay is used primarily with electrical or reverse cycle defrost to allow water removal between terminating heat and powering on the compressor. When the Drip Time delay expires, the Time to subsequent defrosts timer resets and begins counting down to the next defrost cycle.

With both the Time to subsequent defrosts timer and the Temperature Initiated Defrost Function enabled the appliance is protected against excessive ice buildup, which may accumulate quickly in abnormally high humidity environments.

## 5.1.5 Alarms

If the controlled temperature exceeds an alarm threshold or a sensor circuit fails, the red alarm LEDs on the controller and optional display indicate the type of fault that has occurred. Additionally, the optional display identifies a sensor failure. The table below shows faults and indications.

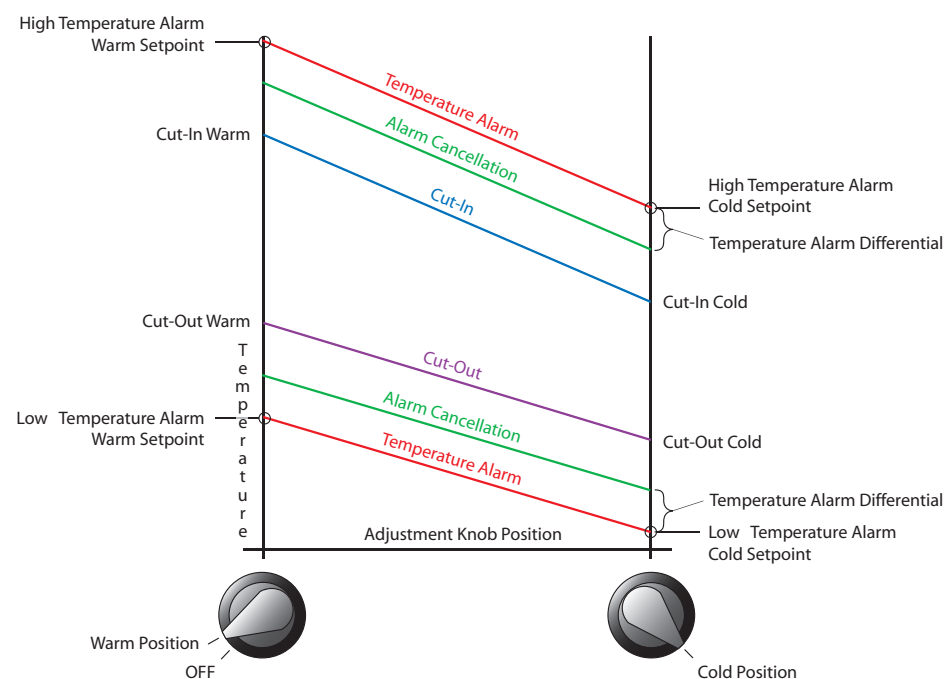
Alarm LED Indications

Fault	Display	Red Alarm LED
Temperature Alarm	Control sensor temperature	Illuminated
Control Sensor Circuit Failure	E1	Flashing
Evaporator Sensor Circuit Failure	Alternates between E2 and the control sensor temperature	Flashing

### 5.1.5.1 Temperature

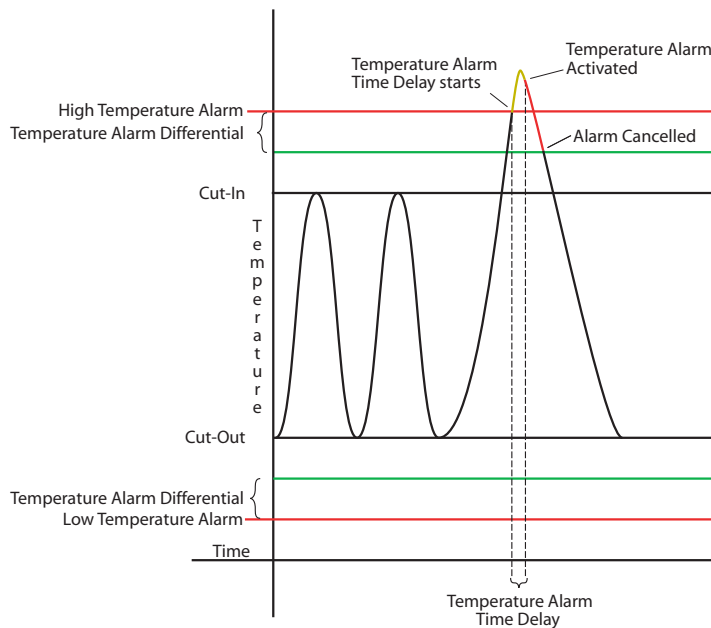
If temperature alarms are enabled, four setpoints define the high and low temperature alarms for the cold and warm positions. Similar to the temperature setpoint, the high temperature alarm threshold is interpolated across the adjustment range from the configured high temperature alarm cold and high temperature alarm warm setpoints. The low temperature alarm threshold is interpolated from the low temperature alarm setpoints at the cold and warm positions. The **Temperature Alarm Differential** prevents alarm cancellation until the control temperature returns past the alarm threshold by the amount of the differential. A high temperature alarm remains on until the temperature decreases to less than the high temperature alarm minus the differential. A low temperature alarm remains on until the temperature increases to more than the low temperature alarm plus the differential.

Setpoints



## Temperature Alarms

If the control temperature crosses an alarm threshold, the **Temperature Alarm Time Delay** begins counting down. If the timer expires and the temperature has not returned past the alarm differential, the red alarm LED on the controller (and optional display) illuminates. If the control temperature returns past the threshold by the amount of the differential before the alarm delay expires, the pending alarm is cancelled, and the timer is reset. When the temperature returns past the threshold by the amount of the differential the alarm is cancelled and the Temperature Alarm Time Delay is reset. The Temperature Alarm Time Delay reduces the possibility of temperature fluctuations causing false alarms.



A **Temperature Alarm Disable Time after Start** up timer prevents alarms while the appliance decreases the temperature after being powered on. A **Temperature Alarm Delay After Defrost** prevents false alarms while the appliance decreases the temperature after defrost. This allows for a shorter **Temperature Alarm Time Delay** and a longer delay time after defrost only.

### 5.1.5.2 Faults

#### Sensor Failure

If a sensor circuit is shorted or open, the **Sensor Fault Monitoring Time** timer starts counting down. If the timer expires before the fault is corrected the red alarm LED flashes. Refer to 5.1.7 Sensor failure mode. When the fault is fixed, the timer resets and the red alarm LED is extinguished (if a temperature alarm is in effect the LED is illuminated). If a sensor failure alarm and a temperature alarm occur at the same time, the red alarm LED flashes to indicate the sensor failure.



During a control sensor failure, the optional display shows E1.

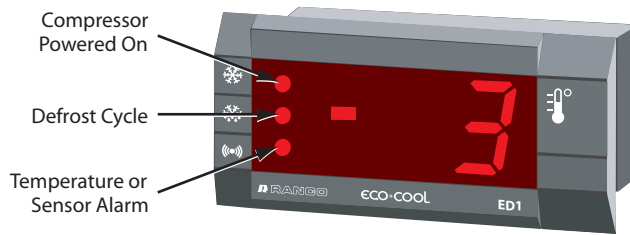


During an evaporator sensor failure, the optional display shows E2 for one second, the temperature of the control sensor for three seconds, and repeats. If both sensors fail, the display shows E1.

**NOTE:** When the controller is powered on, an LED flashing sequence indicates that the controller firmware is operating properly. Each LED flashes for one second in sequence and then all three illuminate for two seconds. If the red alarm LED remains illuminated after the controller is powered on, a check sum error has occurred and the controller's firmware must be updated using a computer and the interface box or a copy card (refer to 6.2.8) No additional external alarm indication is available.

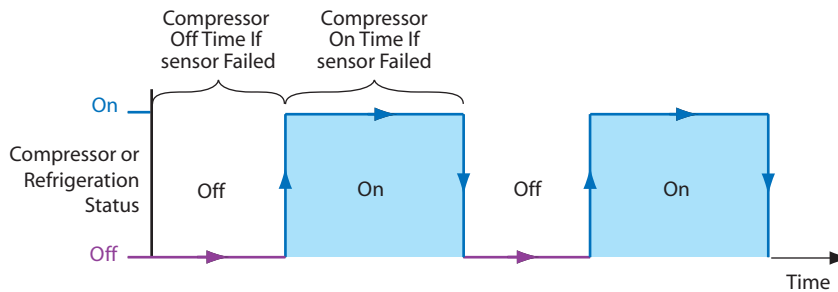
## 5.1.6 Display

The optional display has two digits, a negative sign, and three status LEDs. It displays the range -99 to 99 and the characters dF. Normally the display shows the control sensor temperature. The display shows the selected cut-out setpoint during adjustment and for three seconds after the adjustment is made. Sensor faults, temperature alarms, compressor or solenoid valve operation, and defrost are indicated by the display LEDs as they are by the controller LEDs.



## 5.1.7 Sensor failure mode

If a sensor circuit becomes shorted or open, the **Sensor Fault Monitoring Time** timer begins counting down. If the timer expires before the fault is corrected, the controller issues an alarm (refer to 5.1.5 for display indication) and uses the configured **Sensor Failure Mode** to power off, power on, or duty cycle the compressor. The compressor on time and compressor off time of the duty cycle can be configured. When fault is fixed, the timer resets and the alarm is cancelled.



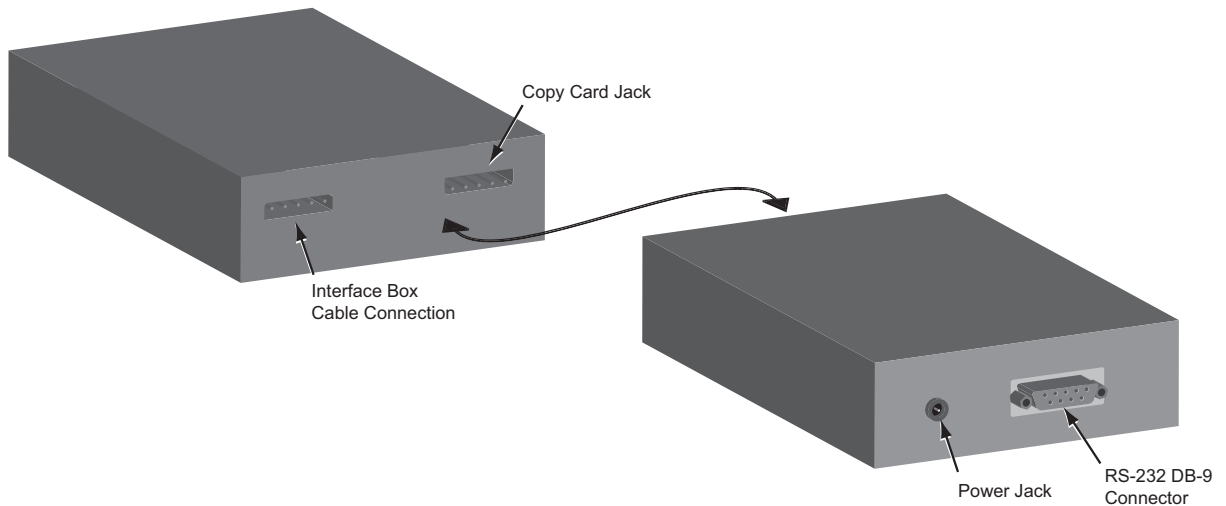
Duty Cycle

## 6 DEVICE AND SOFTWARE CONFIGURATION

### 6.1 Controller and interface box

#### 6.1.1 Interface box overview

The interface box allows communication between the controller and a computer for configuration download and upload and for firmware installation.



#### 6.1.2 Connect the interface box to the computer and E71R or E72R controller

Connect the power adapter to the interface box and plug in the adapter.

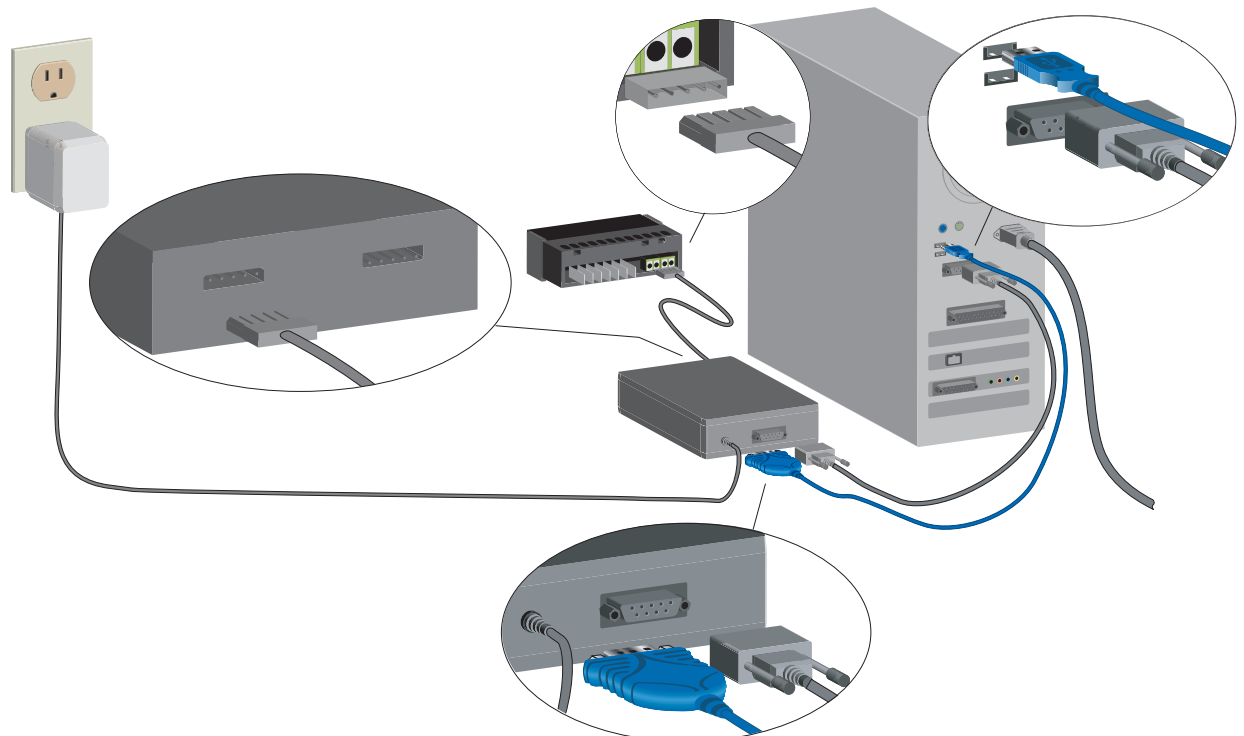
Connect the interface box to the computer using either the RS232 db9 serial cable OR the USB to RS232 db9 converter cable (shown in blue below).

Ensure that the controller is not connected to power; power is supplied by the interface box.

Connect the controller to the interface box.



**WARNING:** The controller must not be connected to power while configuring it with the interface box.



## 6.2 EcoCool configuration software

### 6.2.1 Minimum computer requirements

To use the EcoCool configuration software your computer must meet or exceed the following minimum requirements:

- Processor: Intel® Pentium® 4 500 MHz
- Operating System: Microsoft® Windows® XP or Microsoft Vista®
- RAM: 64 MB
- Physical port: Available db9 RS232 or USB 1.0

### 6.2.2 Software overview

Use the EcoCool configuration software to configure and save controller configurations, download a configuration file to a controller, upload a configuration file from a controller, create configuration reports, or update the controller firmware. To simplify configuration, there are eight parameters tabs.

### 6.2.3 Install and start EcoCool configuration software

Insert the EcoCool configuration software CD into your computer.

Open the EcoCool configuration software folder on the CD, click the setup.exe icon, and follow the installation prompts.

To start EcoCool configuration software click Start, select EcoCool configuration software, and click E72R.

**NOTE:** The EcoCool configuration software can be used without connecting the interface box to your computer.

### 6.2.4 Uninstalling EcoCool configuration software

To remove EcoCool configuration software from your computer, open the Add or Remove Programs control panel and select EcoCool configuration software. After uninstalling EcoCool configuration software the EcoCool configuration software folder, containing configuration and reports subdirectories, remains in the Program Files directory. To completely uninstall EcoCool configuration software, manually delete the EcoCool configuration software folder from the Program Files directory. All configuration files and reports are erased when the EcoCool configuration software folder is deleted.

**TIP:** All configuration files and reports are erased if the EcoCool configuration software folder is deleted.

### 6.2.5 Tabbed configuration parameters

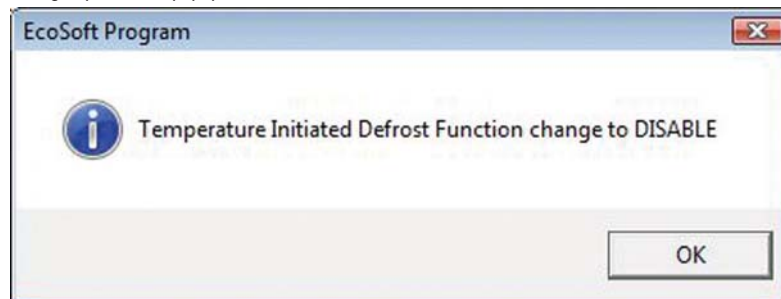
Select from the eight tabs on the left side of the program to create or edit programs for the controllers.



- **Configuration:** temperature units, defrost method, sensor use, adjustment knob on and off positions
- **Setpoints:** compressor cut-in (power on) and cut-out (power off) temperatures for adjustment knob warm and cold positions
- **Compressor:** short cycle prevention timers
- **Display:** display behavior during defrost cycles and temperature offset
- **Fan:** fan operation during compressor off cycle (for higher temperature application without defrost)
- **Alarm:** temperature and timer settings for excessively high or low temperatures
- **Fault:** controller response to sensor failure
- **Defrost:** defrost timer, temperature, and failsafe parameters

Settings made on one tab can affect parameters on other tabs. If a change causes a parameter on another tab to be disabled a popup window indicates the change.

Changed parameter popup window:



### 6.2.5.1 Configuration

Use the configuration tab to specify the general operation of the controller and the controller's use of parameters that are programmed on other tabs.

#### Controller Operation temperature Units

Select **Fahrenheit** or **Celsius** as the unit of temperature measurement and control. Changing this parameter changes the temperature unit throughout the controller program and recalculates temperature values shown in the tabs and on the display.

#### Defrost Method

Select the method of defrosting to be used. Defrosting is started according to the parameters on the Defrost tab.

- **Electric** can be used by the E72R controller to control the defrost relay during a defrost cycle. The E71R does not have a defrost relay, but powers off the compressor during an electric defrost.
- **Off Cycle** can be used by the E71R and E72R controllers to cause the compressor to remain powered off for the duration of the defrost cycle.
- **Reverse Cycle** can be used by the E72R controller to actuate a solenoid valve that reverses the cooling cycle to act as a heat pump to defrost accumulated ice. The compressor remains powered on during defrost.

#### Evaporator Temperature Sensor

Select **Enabled** if the controller is using an evaporator temperature sensor (see 5.1.4 Defrost Control). Select **Disabled** if the controller is not using an evaporator temperature sensor.

**NOTE:** If Enabled is selected and an evaporator temperature sensor is not connected to the controller, the controller indicates a sensor failure.

#### Defrost Termination Method

- Select **Disable** to force defrost to terminate only due to elapsed time (Defrost Duration on the Defrost tab).
- Select **Evaporator Sensor** to use the sensed evaporator temperature to end defrosting (Defrost Termination on the Defrost tab).
- Select **Control Sensor** to use the control temperature to end defrosting (Defrost Termination on the Defrost tab).
- Select **Switch (NO)** to use a separate normally open defrost termination switch. Defrost is terminated when the switch is closed. If Switch is selected, the controller will still end a defrost cycle based on the elapsed time even if the switch is not closed.

If either sensor is selected, enter the **Defrost Termination Temperature** for the sensor on the Defrost tab. The selection of **Defrost Termination Method** does not affect how defrosting starts or the **Temperature Initiated Defrost Function** on the Defrost tab.



## On/Off Function

Select Enable to allow the adjustment knob to power off the compressor and controller and to adjust the setpoint. Select Disabled to allow only setpoint adjustment by the adjustment knob.

## Potentiometer (Adjustment Knob)

These settings are unavailable if On/Off Function is disabled. Enter the Potentiometer Off Position to set the angle of the adjustment knob, relative to full counter clockwise, that powers off the controller and compressor. Enter the Potentiometer On Position to set the angle of the adjustment knob, relative to full counter clockwise, that powers on the controller.

## 6.2.5.2 Setpoints

Use the Setpoints tab to specify the controller setpoints - refrigeration Cut-In and Cut-Out values during normal operation.

**NOTE:** To define a fixed non-adjustable setpoint, configure the Cut-In Warm setpoint equal to the Cut-In Cold setpoint. Configure the Cut-Out Warm setpoint equal to the Cut-Out Cold setpoint. Refer to the Fixed Setpoint graph in section 5.1.2.

### Cut-In Warm

Specify the setpoint that causes the compressor to power on when the adjustment knob is set to the warm position (counter clockwise).

### Cut-Out Warm

Specify the setpoint that causes the compressor to power off when the adjustment knob is set to the warm position (counter clockwise).

### Cut-In Cold

Specify the setpoint that causes the compressor to power on when the adjustment knob is set to the cold position (clockwise).

### Cut-Out Cold

Specify the setpoint that causes the compressor to power off when the adjustment knob is set to the cold position (clockwise).

Cut-in and cut-out setpoints for positions between warm and cold are calculated as linear interpolations from the configured cold and warm setpoints.

**NOTE:** If the On/Off Function is enabled on the Configuration tab, the Potentiometer On Position specifies the adjustment knob angle that selects the warm setpoint.

### 6.2.5.3 Defrost

Use the Defrost tab to specify the conditions that cause defrosting to start and end.

#### Defrost Function

Define the defrost schedule timing interval or disable the defrost function. Selecting **System Run Time** specifies that the time interval between defrost (**Time to subsequent defrosts**) is defined by the time that the controller is powered on and restarts if the controller is power cycled. Selecting **Compressor Run Time** specifies that the defrost timing interval is defined as the accumulated time that the compressor is powered on and restarts if the controller is power cycled. The defrost function can also be disabled.

**NOTE:** If you use Temperature Initiated Defrost, you must still select System Run Time or Compressor Run Time as a failsafe maximum time between defrosting cycles.

#### Defrost Cycle at Power On

Select **Enable** to start a defrost cycle each time the controller is switched on or the appliance is power cycled in addition to the scheduled and temperature initiated defrost cycles. Select **Disable** to only allow scheduled and temperature initiated defrosting.

#### Defrost Termination Temperature

Specifies the temperature that causes defrosting to end (and drip time to start – if drip time is defined). This is either the Control Sensor temperature or the Evaporator Sensor temperature as chosen on the Configuration tab. This parameter is unavailable if the Defrost Function is disabled. If the defrost termination method is based on the digital input **Switch (NO)** (set on the Configuration tab) this setting is disregarded by the controller.

**WARNING:** The controller terminates defrost when the digital input dry contacts close – Do not apply voltage.

#### Time to First Defrost

Specifies how long the controller waits before starting a defrosting cycle each time it is powered on. The timer that is used, System Run Time or Compressor Run Time, is specified in Defrost Function. This parameter is unavailable if Defrost Cycle at Power On is enabled.

#### Time to Subsequent Defrosts

Specify how long the controller waits to start the second and subsequent defrost cycles after being powered on. The timer starts when the **Drip Time** timer expires or, if drip time is not being used, when the defrost terminates either on failsafe time (**Defrost Duration**) or temperature (**Defrost Termination Temperature**). A temperature initiated defrost cycle can occur before the **Time to Subsequent Defrosts** timer expires.

### Defrost Duration

Specifies the maximum duration of a defrost cycle (also called failsafe). When the **Defrost Duration** time expires the defrost cycle ends and, if Drip Time is configured, the Drip Time starts. If Drip Time is not configured, the controller immediately powers on the compressor and resumes refrigeration.

### Drip Time

Specifies how long the controller waits to resume refrigeration after defrost. During drip time, the compressor and defrost relay (E72R only) are de-energized to allow water to drip off of the coil.

**NOTE:** If the evaporator fan is wired to the NC contact on the defrost relay (E72R only), the fan will power on at the end of defrost. To delay the fan action until drip time is expired use an external fan delay thermostat.

### Temperature Initiated Defrost Function

Select **Enable** to allow defrost based on a comparison of the air space temperature and the evaporator temperature. Specify the difference in sensed temperature (control sensor minus evaporator sensor) that initiates defrosting. Enter the **Temperature Initiated Defrost Time Delay** to specify how long the measured temperature difference must exist before defrost starts. Enter the **Temperature Initiated Defrost Time delay after Defrost** to specify how long the controller waits after the termination of a defrost cycle or drip time (depending on configuration) before it allows a temperature initiated defrost. This delay allows the sensed temperatures to return to normal before a temperature initiated defrost cycle can occur.

**NOTE:** Evaporator Temperature Sensor on the Configuration tab must be enabled to configure and use the Temperature Initiated Defrost Function.

## 6.2.5.4 Alarm

Use the Alarm tab to specify temperature conditions that illuminate the alarm LED on the controller and on the display.

The screenshot shows the 'EcoSoft Program' window with the 'Controller Configuration' tab selected. The 'Alarm' sub-tab is active. The 'Temperature Alarm Enable' section has 'Enable' selected. The 'Temperature Alarm' section includes four setpoint fields: 'High Temperature Alarm - Warm Position(\*F):' set to 23, 'Low Temperature Alarm - Warm Position(\*F):' set to -13, 'High Temperature Alarm - Cold Position(\*F):' set to 7, and 'Low Temperature Alarm - Cold Position(\*F):' set to -24. Below these are 'Temperature Alarm Differential (\*F):' set to 4, 'Temperature Alarm Time Delay (hh:mm):' set to 0:30, 'Temperature Alarm Disable Time after Start up (hh:mm):' set to 2:00, and 'Temperature Alarm Delay After Defrost (hh:mm):' set to 1:00. At the bottom left is a 'Download (or Upload) In Progress:' section. On the right side, there is a 'PC' section with 'Input / Output File:' showing a file list including 'Chilled.prm', 'EcoSoft.prm', 'Frozen Food.prm', and 'Ice Cream.prm'. Below this is a 'File Name:' field and 'Save Configuration File' and 'Open Configuration File' buttons. Further down is a 'Report' section with 'Excel' selected and a 'Generate' button. At the bottom right is a 'Controller Configuration' section with buttons for 'Download Config. to Controller', 'Upload Config. from Controller', 'Update Controller Firmware', 'Default Value', and 'Exit'.

### Temperature Alarm Enable

Select **Enable** to enable temperature alarms or select **Disable** to disable the setting and display of temperature alarms.

**NOTE:** Temperature Alarm Enable does not affect alarms due to a control or evaporator sensor short or open circuit, or a firmware (check sum) error.

### High Temperature Alarm – Warm Position

Specifies the sensed high temperature setpoint that causes an alarm when the adjustment knob is in the warm position. Control sensor temperatures equal to or greater than this threshold cause an alarm when the adjustment knob is in the warm position.

#### Low Temperature Alarm – Warm Position

Specifies the sensed low temperature setpoint that causes an alarm when the adjustment knob is in the warm position. Control sensor temperatures equal to or less than this threshold cause an alarm when the adjustment knob is in the warm position.

#### High Temperature Alarm – Cold Position

Specifies the sensed high temperature setpoint that causes an alarm when the adjustment knob is in the cold position. Control sensor temperatures equal to or greater than this threshold cause an alarm when the adjustment knob is in the cold position.

#### Low Temperature Alarm – Cold Position

Specifies the sensed low temperature setpoint that causes an alarm when the adjustment knob is in the cold position. Control sensor temperatures equal to or less than this threshold cause an alarm when the adjustment knob is in the cold position.

If the user selects a control setpoint between the warm and cold positions, the alarm thresholds are calculated by the controller as linear interpolations from the temperature alarm setpoints.

#### Temperature Alarm Differential

Specifies the amount of temperature correction required to cancel a temperature alarm. A high temperature alarm is cancelled when the temperature is less than the alarm threshold minus the differential. A low temperature alarm is cancelled when the temperature is greater than the low temperature alarm threshold plus the differential.

#### Temperature Alarm Time Delay

Specifies the minimum time that a sensed control temperature must be beyond a temperature alarm threshold before a temperature alarm occurs.

#### Temperature Alarm Disable Time after Start up

Specifies how long temperature alarms are disabled after the controller is powered on.

#### Temperature Alarm Delay After Defrost

Specifies the maximum time delay before an alarm is activated when the control temperature is beyond an alarm threshold after defrost is terminated by time or temperature or after drip time has ended - if used.

### 6.2.5.5 Compressor

Use the Compressor tab to set compressor protection delays for the minimum power on and power off periods for the compressor. These minimum time periods can be used to protect the compressor against short cycling.

**NOTE:** Although the Compressor Minimum Off Time can be set as short as zero seconds, time should be provided to protect the compressor against short-cycling.

The screenshot shows the EcoSoft Program window with the 'Controller Configuration' tab selected. The 'Compressor' sub-tab is active, displaying three settings: 'Compressor Minimum Off Time at Start Up (mm:ss)' set to 0, 'Compressor Minimum On Time (mm:ss)' set to 1, and 'Compressor Minimum Off Time (mm:ss)' set to 2. Each setting has a dropdown menu for minutes and a text input for seconds. To the right, the 'PC' section shows the 'Input / Output File' path as 'c: [OS]' and a list of files including 'Chilled.prm', 'EcoSoft.prm', 'Frozen Food.prm', and 'Ice Cream.prm'. Below this is a 'File Name' field and buttons for 'Save Configuration File' and 'Open Configuration File'. The 'Report' section has radio buttons for 'Excel' (selected) and 'Text', with a 'Generate' button. The 'Controller Configuration' section includes buttons for 'Download Config. to Controller', 'Upload Config. from Controller', 'Update Controller Firmware', 'Default Value', and 'Exit'. At the bottom, there is a 'Download (or Upload) In Progress:' status bar.

### Compressor Minimum Off Time at Start Up

Specifies how long the compressor remains powered off when the controller is powered on.

### Compressor Minimum On Time

Specifies the minimum time that the compressor is powered on regardless of whether the control temperature decreases to less than the Cut-Out setpoint. Specify how long the compressor remains powered on before normal controller programming powers it off.

**NOTE:** The adjustment knob off position immediately powers off the compressor.

### Compressor Minimum Off Time

Specifies how long the compressor remains powered off before the controller powers it on. This timer must expire and the temperature must be greater than the Cut-In setpoint for the controller to power on the compressor.

## 6.2.5.6 Fault

Use the Fault tab to specify a controller's response to an open or shorted control sensor.

### Sensor Failure Mode

Select **Comp. Relays fails OPEN** to power off the compressor if the control sensor circuit becomes open or shorted.  
 Select **Comp. Relays fails CLOSE** to power on the compressor if the control sensor circuit becomes open or shorted.  
 Select **Duty Cycle** to power cycle the compressor using the specified duty cycle regardless of the temperature.

### Compressor On Time If sensor Failed

Specify the compressor power ON portion of the duty cycle.

### Compressor Off Time If sensor Failed

Specify the compressor power OFF portion of the duty cycle.

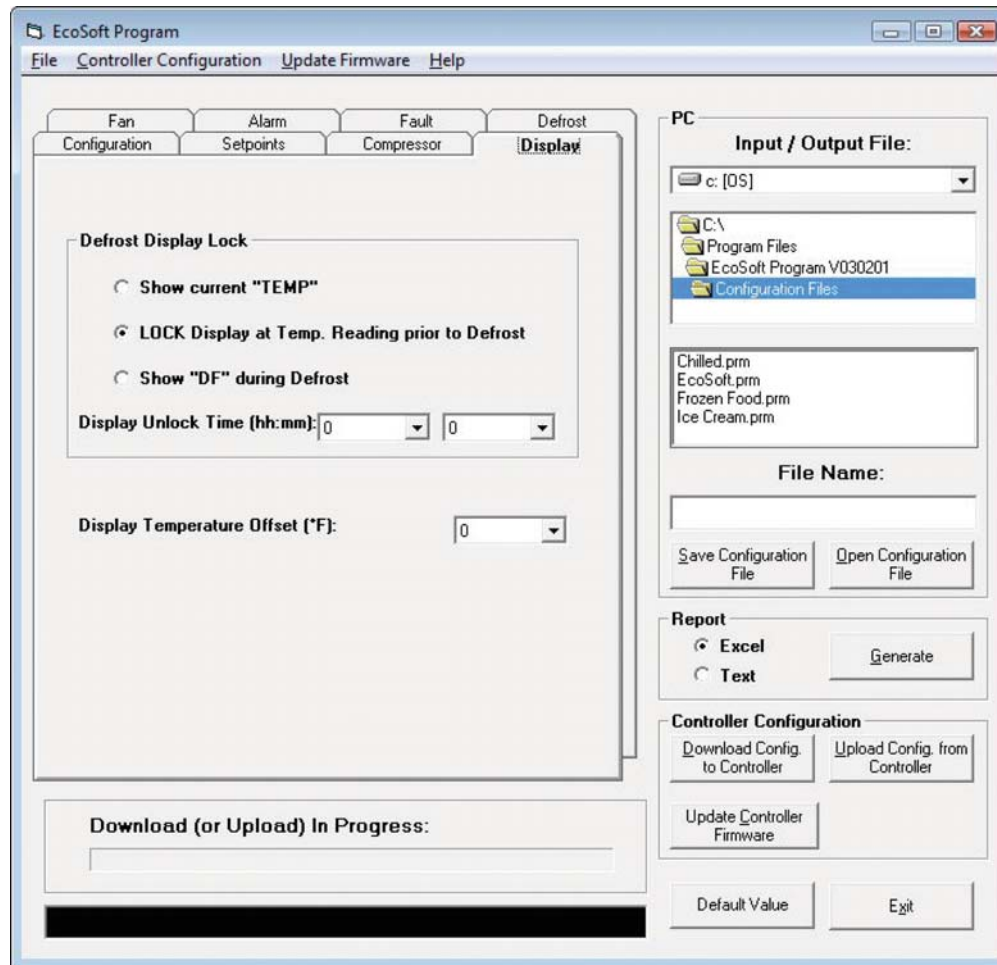
### Sensor Fault Monitoring Time

Specify how long a sensor failure (open or short circuit) must exist before the controller enters failure or fault mode.



## 6.2.5.7 Display

Use the Display tab to specify what is displayed during defrost and to specify a display temperature offset.



### Defrost Display Lock

Select **Show current "TEMP"** to display the sensed control temperature during defrost.

Select **LOCK Display at Temp. Reading prior to Defrost** to display, for the entire defrost cycle, drip time, and until the first compressor cut-out after defrost, the temperature that was sensed at the moment the defrost cycle started.

Select **Show "DF" during Defrost** to display, for the entire defrost cycle, drip time, and until the first compressor cut-out after defrost, DF.

**NOTE:** Show "DF" during Defrost causes the display to show DF after defrost has terminated.

### Display Unlock Time (hh:mm)

This countdown timer cancels the display lock and resumes display of the current control temperature when it expires. The timer starts counting down when defrost terminates (whether due to elapsed time or sensed temperature) or at the end of the drip time depending upon the configuration.

### Display Temperature Offset

The sum of the Display Temperature Offset and the control sensor temperature is displayed.

**NOTE:** Display Temperature Offset affects the display only and does not change setpoints or configuration parameters.

### 6.2.5.8 Fan

Use the Fan tab to configure fan operation when Defrost Function is disabled.

The screenshot shows the 'EcoSoft Program' window with the 'Controller Configuration' tab selected. The 'Fan' sub-tab is active. The main configuration area includes:

- Evaporator Fan Operation during Compressor off-cycle:** Radio buttons for 'Enabled' and 'Disabled' (selected).
- Fan Delay Method:** Radio buttons for 'Temperature', 'Time' (selected), and 'Both'.
- Fan Start Evaporator Temperature (\*F):** A dropdown menu set to '41'.
- Fan Start Time Delay (mm:ss):** Two dropdown menus set to '1' and '0'.
- Fan Shut downTime Delay (mm:ss):** Two dropdown menus set to '0' and '0'.

At the bottom left, there is a 'Download (or Upload) In Progress:' status bar. On the right side, there is a 'PC' section with 'Input / Output File:' (showing 'c: [OS]'), a file list (including 'C:\Program Files\EcoSoft Program V030201\Configuration Files'), a 'File Name:' field, and buttons for 'Save Configuration File' and 'Open Configuration File'. Below this is a 'Report' section with radio buttons for 'Excel' (selected) and 'Text', and a 'Generate' button. At the bottom right, there is a 'Controller Configuration' section with buttons for 'Download Config. to Controller', 'Upload Config. from Controller', 'Update Controller Firmware', 'Prepare CopyCard To Read Config.', 'Default Value', and 'Exit'.

Defrost Function may be disabled in medium and warm temperature applications where defrost occurs naturally during the compressor off cycle (see 6.2.5.3 Defrost). With Defrost Function disabled, **Evaporator Fan Operation during Compressor off-cycle** allows the fan to be powered on or powered off during the entire compressor off cycle.

Disabling both Defrost Function and Evaporator Fan Operation during Compressor off-cycle prevents the evaporator fan from running during the compressor off cycle. In this case, **Fan Delay Method** can delay powering on the evaporator fan when refrigeration cycles on. The delay can be based on a time, evaporator temperature, or both. If Fan Delay Method is based on time, **Fan Start Time Delay** starts counting down when refrigeration resumes after defrost and powers on the evaporator fan when it expires.

If Fan Delay Method is based on evaporator temperature, **Fan Start Evaporator Temperature** powers on the evaporator fan when the evaporator temperature decreases to the **Fan Start Evaporator Temperature** setpoint.

If Fan Delay Method is based on **Both** time and temperature, the Fan Start Time Delay timer must expire and the evaporator temperature must decrease to the Fan Start Evaporator Temperature setpoint before the evaporator fan powers on.

If Evaporator Fan Operation during Compressor off-cycle is disabled, **Fan Shut down Time Delay** can delay the evaporator fan power-off when the compressor cycles off.

### 6.2.6 Saving and opening configuration files

By default, configuration files are saved to the C:\Program Files\EcoSoft Program\Configuration Files directory, but you can specify any directory. To save a configuration file, enter a file name in the **File Name:** field and click **Save Configuration File**. Configuration files are named in EcoCool so that multiple configurations can be stored on your computer. However, the configuration file name is not included with the configuration file when it is downloaded to a controller or copy card. Therefore, configuration files must be named when they are uploaded. All file names automatically get the .prm file name extension.

To open a configuration file, select the configuration file and click **Open Configuration File**.

The screenshot shows a 'PC' dialog box with the title 'Input / Output File:'. It features a dropdown menu for the drive (showing 'c: [OS]'), a file list (including 'C:\Program Files\EcoSoft Program V030201\Configuration Files'), a 'File Name:' field, and buttons for 'Save Configuration File' and 'Open Configuration File'.

## 6.2.7 Transferring configuration files

You can use the interface box and your computer to transfer configuration files between EcoCool configuration software and a controller. Configuration files can be downloaded to the controller or copy card and uploaded to your computer.

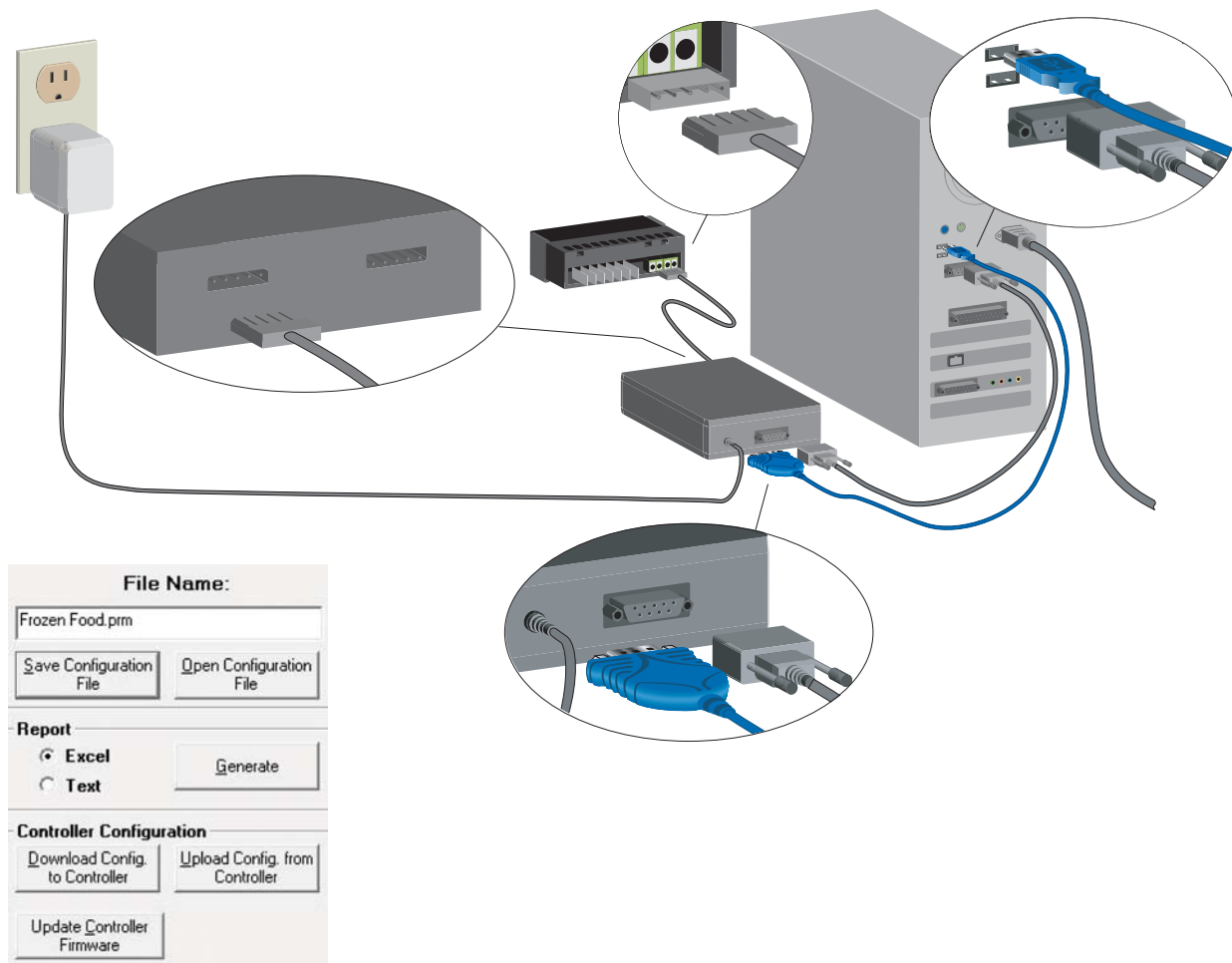
Disconnect power to the controller. Power is supplied by the interface box.

Connect the controller to the interface box as shown below.

Connect the interface box to the computer using either the RS232 db9 serial cable OR the USB to RS232 db9 converter cable (shown in blue below).



**WARNING:** The controller must not be connected to power while configuring it with the interface box.



### 6.2.7.1 Downloading a configuration file to a controller from EcoCool configuration software:

Start EcoCool configuration software.

Create a configuration or select the configuration file and click **Open Configuration File** to load the values into EcoCool configuration software.

Click **Download Config. to Controller**.

Follow the on screen prompts.

Disconnect the controller from the interface box.

### 6.2.7.2 Uploading a configuration file from a controller to EcoCool configuration software:

Start EcoCool configuration software.

Click **Upload Config. from Controller**.

Follow the on screen prompts.

Disconnect the controller from the interface box.

The configuration is loaded into EcoCool configuration software and can be viewed or modified.

To save the configuration file, enter a filename and click **Save Configuration File**.

**NOTE:** Be sure that the correct File Name is displayed before you click Save Configuration File.

Disconnect the controller from the interface box.



## 6.2.8 Transferring firmware between EcoCool configuration software and a controller

You can use the interface box and your computer to transfer firmware between EcoCool configuration software and a controller or copy card. Controller firmware can be updated in a controller using a copy card or EcoCool configuration software. Firmware can be reinstalled in a controller, if it becomes corrupted, using EcoCool configuration software. Firmware must be re installed on a controller if, when it is powered on, the LED startup sequence reports a check sum error (refer to 5.1.5.2).

**NOTE:** When firmware is installed on the controller, the existing configuration is erased.

### 6.2.8.1 Installing firmware on a controller using EcoCool configuration software:

Disconnect power to the controller.

Connect the controller to the interface box as shown in section 6.2.7.

Start EcoCool configuration software.

Upload the configuration to EcoCool configuration software to create a backup file.

Click **Update Controller Firmware**.

Follow the on screen prompts

Disconnect the controller from the interface box.

### 6.2.8.2 Uploading firmware from a controller:

Disconnect power to the controller.

Connect the controller to the interface box as shown in 6.2.7.

Start EcoCool configuration software.

Click **Update Controller Firmware** and follow the on screen prompts

Disconnect the controller from the interface box.

## 6.2.9 Generating reports

```
*** Parameterization Program ***
***** EcoSoft Parameters Set *****
Report File Name: C:\Program Files\EcoSoft Program\EcoSoft_Param_Set_Report.txt

*** Compressor Section ***
Compressor Minimum Off Time: 2:00 mm:ss
Compressor Minimum On Time: 1:00 mm:ss
Compressor Minimum Off Time At Start Up: 2:00 mm:ss

*** Setpoints Section ***
Cut In Cold Temperature: -15°F
Cut In Warm Temperature: -5°F
Cut Out Cold Temperature: -18°F
Cut Out Warm Temperature: -8°F

*** Configuration Section ***
Controller operation Temperature Units: Fahrenheit
Defrost Method:
  Electric Method: Enabled
  Off Cycle Method: Disabled
  Reverse Cycle Method: Disabled
Evaporator Sensor: Enabled
Defrost Termination Method:
  Defrost Termination Method: Disabled
  Evaporator Sensor: Disabled
  Control Sensor: Enabled
  Digital Switch: Disabled
on/off Function: Enabled
Freezer Potentiometer Off Position: 5 degrees
Freezer Potentiometer On Position: 9 degrees
```

1	A	B	C	D	E	F
Parameter	Description	Value	Min	Max		
2	1	Freezer Cut-in warm	-5°F	-40°C (40°F)	40°C (104°F)	
3	2	Freezer Cut-out warm	-8°F	-40°C (40°F)	40°C (104°F)	
4	3	Freezer Cut-in cold	-15°F	-40°C (40°F)	40°C (104°F)	
5	4	Freezer Cut-out cold	-18°F	-40°C (40°F)	40°C (104°F)	
6	5	Compressor ON time delay at Controller Power Up	2 min 0 sec	0 sec	59 min 59 sec	
7	6	Compressor Minimum (ON) time	1 min 0 sec	0 sec	59 min 59 sec	
8	7	Compressor Minimum (OFF) time	2 min 0 sec	0 sec	59 min 59 sec	
9	8	Potentiometer off position	5°	5°	5°	
10	9	Potentiometer on position	9°	9°	61°	
11	10	On-Off logical function	1	0=disable or 1=enable		
12	11	Controller Operation Temperature Units	1	0=Celsius or 1=Fahrenheit		
13	12	Sensor failure mode (compressor and fan relay failure mode)	2	0=Relays fail OPEN 2=Relays fail CLOSE 3=Duty cycle		
14	13	Compressor On Time if Sensor failed	0 hour 0 min	0 min	59 hour 59 min	
15	14	Compressor Off Time if Sensor failed	2 hour 0 min	0 min	59 hour 59 min	
16	15	Defrost Function	1	0=disable 1=System run time 2=Compressor run time		
17	16	Defrost Method	1	1=Electric 2=Off cycle 3=reverse cycle		
18	17	Time to first defrost(initial frost build time)	8 hour 0 min	10 min	42 hour 59 min	
19	18	Time to subsequent defrost	8 hour 0 min	10 min	42 hour 59 min	
20	19	Defrost duration Time (failsafe)	0 hour 30 min	1 min	4 hour 59 min	
21	20	Defrost Termination temperature	48°F	-40°C (-40°F)	40°C (104°F)	
22	21	Drip time	3 min 0 sec	0 sec	59 min 59 sec	
23	22	Defrost Cycle at power on	0	0=disable or 1=enable		
24	23	Evaporator Temp. Sensor	1	0=disable or 1=enable		
25	24	Defrost Termination Method	2	0=disable 1=Evap. Sensor 2=Control Sensor 3=Digital Switch (close)		
26	25	Temperature Initiated Defrost Function	0	0=disable or 1=enable		

You can create a configuration parameters text file or spreadsheet file for Microsoft® Excel®.

Create, open, or upload a configuration file.

Select **Excel** or **Text** and click Generate.

By default, the file is saved in the C:\Program Files\EcoSoft Program xxx\Report Files directory.

PC

Input / Output File:

c: [OS]

C:\Program FilesEcoSoft Program V030201Report Files

File Name:

Ice Cream

Save Configuration FileOpen Configuration File

Report

ExcelTextGenerate

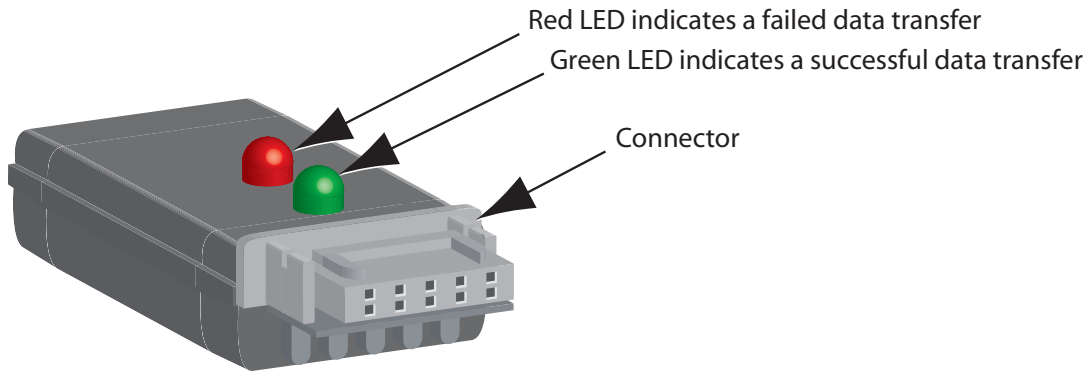
## 6.2.10 Restoring default values

Click **Default Value** to load default values into all parameters on all tabs in the EcoCool configuration software. Popup windows indicate which parameters are being changed.

You can download the default values to a controller by following the steps in section 6.2.6.

## 6.3 Copy card

You can use a copy card to transfer firmware and configuration files into a controller or EcoCool configuration software. A firmware or configuration transfer into a controller using a copy card is fast, automatic, and does not require removal of the controller from the case. Configuration files and firmware cannot be uploaded from a controller into a copy card. During a data transfer, both LEDs flash. When the data transfer completes successfully, the green LED remains illuminated and the red LED is extinguished. If the red LED remains illuminated and the green LED is extinguished, the transfer failed.



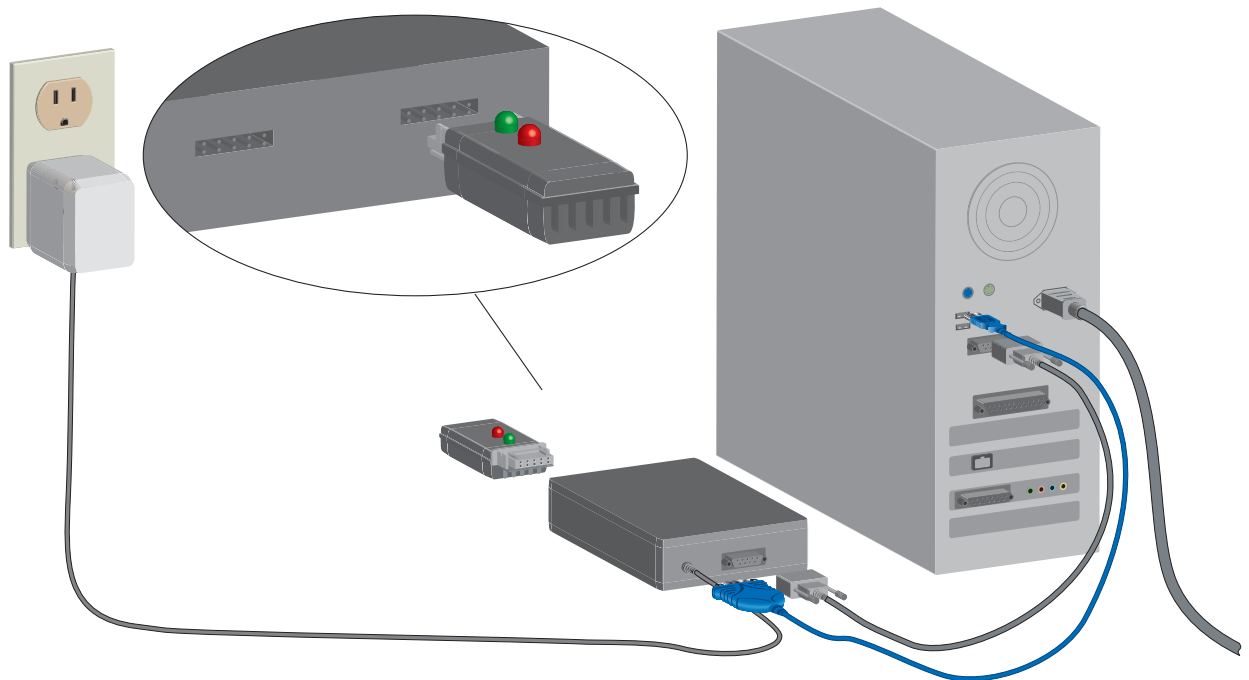
### 6.3.1 Transferring firmware between a copy card and EcoCool configuration software

A bidirectional transfer between the copy card and the interface box places the newer firmware in both devices. If the newer firmware is in the copy card, it is copied into EcoCool configuration software. If the newer firmware is in EcoCool configuration software, it is copied into the copy card.

Connect the power adapter to the interface box and plug in the adapter.

Connect the interface box to the computer using the included RS232 db9 serial cable OR USB to RS232 db9 converter cable.

Connect the copy card to the interface box. The copy card fits only one of the interface box connectors.



Click **Update Controller Firmware**.

During the file transfer, both LEDs on the copy card are illuminated.

When the data transfer is completed, the green LED remains illuminated and the red LED is extinguished.

If the red LED remains illuminated and the green LED is extinguished, the transfer failed.

Disconnect the copy card from the interfaced box.

### 6.3.2 Downloading a configuration from EcoCool configuration software into a copy card

Open a configuration file in the EcoCool configuration software.

Connect the copy card to the Interface Box.

Click **Download Config to Controller**.

Click **OK** and follow the on screen prompts.

During the file transfer, both LEDs on the copy card are illuminated.

When the data transfer is completed, the green LED remains illuminated and the red LED is extinguished.

If the red LED remains illuminated and the green LED is extinguished, the transfer failed.

**NOTE:** Firmware is not transferred during a configuration download from EcoCool configuration software.

### 6.3.3 Uploading a configuration from a copy card into EcoCool configuration software

Connect the copy card to the Interface Box.

Click **Upload Config from Controller**.

Enter a name for the configuration file.

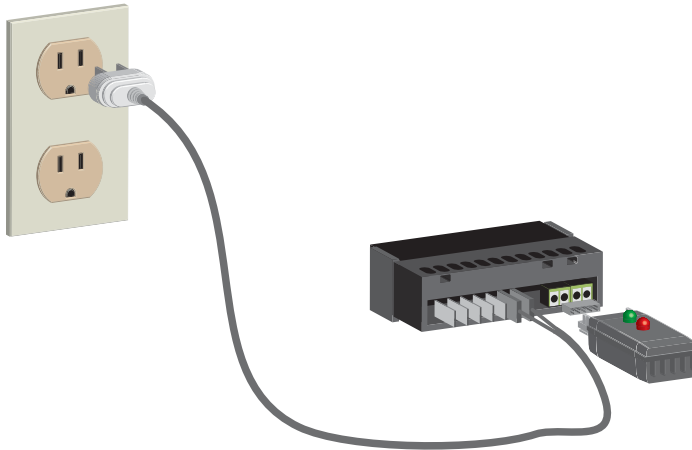
Click **Save Configuration File**.

Disconnect the copy card from the Interface Box.

**NOTE:** Firmware is not transferred during a configuration upload to EcoCool configuration software.

### 6.3.4 Installing firmware or a configuration file into a controller from a copy card

**NOTE:** If the copy card contains both a later version of firmware than the controller and a configuration file, both will be installed onto the controller. If only a newer version of firmware is on the copy card, the configuration will be erased from the controller when the firmware is installed. If you are updating firmware only, back up the controller configuration to the copy card that contains the firmware.



Disconnect power to the controller.

Disconnect power to any device, such as a compressor or fan, that is connected to the controller. These devices do not need to be disconnected from the controller.

Connect the copy card to the controller.

Connect power to the controller to start the installation.

During the file transfer, both LEDs on the copy card are illuminated.

When the data transfer is completed, the green LED remains illuminated and the red LED is extinguished.

If the red LED remains illuminated and the green LED is extinguished, the transfer failed.

Disconnect copy card from the controller.

Disconnect power to the controller.

The controller is ready for use.

Connect power to the controller.

Connect power to any device, such as a compressor or fan, that is connected to the controller.

# Parameter list

The Parameter List Table includes the default value, range, and resolution of all parameters that can be set using the EcoSoft Program.

Case name, location or ID: \_\_\_\_\_

Configuration name (e.g. Ice Cream.prm): \_\_\_\_\_

Tab	Ref	Parameter Description	Default	Min	Max	Resolution	Configuration Value
Configuration	1	Controller Operation Temperature Units	Fahrenheit	°C (Celsius) or °F (Fahrenheit)			
	2	Defrost Method	Electric	Electric, Off Cycle, or Reverse Cycle			
	3	Evaporator Temperature Sensor	Enabled	Enabled or Disabled			
	4	Defrost Termination Method	Evaporator Sensor	Disable, Evaporator Sensor, Control Sensor or Switch (NO)			
	5	On/Off function	Enabled	Enabled or Disabled			
	6	Potentiometer Off Position (Degrees)	10°	5°	57°	1°	
	7	Potentiometer On Position (Degrees)	15°	9°	61°	1°	
Setpoints	8	Cut-in warm	-10°C (14°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
	9	Cut-out warm	-20°C (-4°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
	10	Cut-in cold	-19°C (-2°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
	11	Cut-out cold	-26°C (-15°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
Compressor	12	Compressor Minimum Off Time at Start Up	0 min 0 sec	0 min 0 sec	59 min 59 sec	1 sec	
	13	Compressor Minimum On Time	1 min	0 min 0 sec	5 min 59 sec	1 sec	
	14	Compressor Minimum Off Time	2 min	0 min	59 min 59 sec	1 sec	
Display	15	Defrost Display Lock (display indication during defrost)	LOCK Display at Temp. Reading prior to Defrost	Display the current TEMP read by control sensor, LOCK the display on the temperature value read by control sensor when defrost starts and until the Cut-Out value is reached, or Display the characters dF during defrost and until the Cut-Out value is reached			
	16	Display Unlock Time (hh:mm)	0 hrs 0 min	0 hrs 0 min	1 hr 59 min		
	17	Display Temperature Offset	0	-40°C (-40 °F)			40°C (104°F)
Fan NOTE: All Fan Tab options are disabled unless Defrost Function is disabled.	18	Evaporator Fan Operation during Compressor off-cycle	Enabled	Enabled or Disabled. Although enabled by default, all Fan Tab options are disabled unless Defrost Function is disabled.			
	19	Fan Delay Method	Time	Temperature, Time, or Both			
	20	Fan Start Evaporator Temperature	5°C (41°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
	21	Fan Start Time Delay	1 min	0 min 0 sec	9 min 59 sec	1 sec	
	22	Fan Shut down Time Delay	0 min	0 min	9 min 59 sec	1 sec	

Tab	Ref	Parameter Description	Default	Min	Max	Resolution	Configuration Value
Alarm	23	Temperature Alarm Enable	Disable	Enable or Disable			
	24	High Temperature Alarm – Warm Position (°C or °F)	-5°C (23°F)	-40°C (-40°F)			40°C (104°F)
	25	Low Temperature Alarm – Warm Position (°C or °F)	-25°C (-13°F)	-40°C (-40°F)			40°C (104°F)
	26	High Temperature Alarm – Cold Position (°C or °F)	-14°C (7°F)	-40°C (-40°F)			40°C (104°F)
	27	Low Temperature Alarm – Cold Position (°C or °F)	-31°C (-24°)	-40°C (-40°F)			40°C (104°F)
	28	Temperature Alarm Differential (°C or °F)	2°C (4°F)	1°C (2°F)			10°C (18°F)
	29	Temperature Alarm Time Delay	30 min	0 min			4 hr 59 min
	30	Temperature Alarm Disable Time after start up	2 hours	0 min			17 hr 59 min
	31	Temperature Alarm Delay After Defrost	1 hr	0 min			17 hr 59min
Fault	32	Sensor Failure Mode	Comp. Relays fails CLOSE	Comp. Relays fails OPEN, Comp. Relays fails CLOSE, or Duty Cycle			
	33	Compressor On Time If sensor Failed (hh:mm)	1 min	1 min			59 hr 59 min
	34	Compressor Off Time If sensor failed (hh:mm)	1 min	1 min			59 hr 59 min
	35	Sensor Fault Monitoring Time (mm:ss)	1 min	5 sec			59 min 59 sec
Defrost	36	Defrost Function	System Run Time	Disable, System Run Time, or Compressor Run Time			
	37	Defrost Cycle at Power On	Disable	Enable or Disable			
	38	Defrost Termination Temperature	5°C (41°F)	-40°C (-40°F)	40°C (104°F)	0.5°C (1°F)	
	39	Time to First Defrost (hh:mm)	6 hr	10 min	42 hr 59 min	1 min	
	40	Time to subsequent defrosts ( hh:mm )	6 hr	10 min	42 hr 59 min	1 min	
	41	Defrost Duration	1 hr	1 min	4 hr 59 min	1 min	
	42	Drip Time	0 min	0 min	59 min 59 sec	1 min	
	43	Temperature Initiated Defrost Function	Disable	Enable or Disable			
	44	Temperature Defrost Initiation Space minus Evap. (°C or °F)	20°C (20°F)	0°C (0°F)	80 °C (80°F)		
	45	Temperature Initiated Defrost Time Delay (mm:ss)	20 min	0 sec	59 min 59 sec		
	46	Temperature Initiated Defrost Time Delay after Defrost	50 min	0 min 0 sec	59 min 59 sec	1 sec	

## 7 TROUBLESHOOTING

Problem	Solution
The red alarm LED remains illuminated after controller startup; a check sum error has occurred.	Re-install the firmware using EcoSoft Program (6.2.8) or a copy card (6.3.4).
A temperature alarm occurs soon after startup.	Increase the Temperature Alarm Disable Time after Start up (see 6.2.5.4).
A temperature alarm occurs soon after defrost.	Increase the Temperature Alarm Delay after Defrost (see 6.2.5.4).
A high temperature alarm does not reset when the temperature decreases or a low temperature alarm does not reset when the temperature increases.	Decrease the Temperature Alarm Differential (see 6.2.5.4).
A temperature alarm occurs when the temperature is at the setpoint.	Adjust the temperature alarm setpoints (see 6.2.5.4).
EcoSoft Program cannot communicate with the controller after connecting the interface box to your computer.	<p>Check all cable connections:</p> <ul style="list-style-type: none"> <li>• Between controller and interface box</li> <li>• Between interface box and computer</li> <li>• Power supply cable to interface box</li> </ul> <p>If everything appears okay reboot the computer and start EcoSoft Program again.</p>
The display shows E1.	<p>Check the control sensor, wires, and connections</p> <p>If all connections appear okay replace the control sensor.</p>
The display shows E2.	<p>Check the evaporator sensor, wires, and connections.</p> <p>If all connections appear okay replace the evaporator sensor.</p> <p>If no evaporator sensor is in use, disable the evaporator sensor (see 6.2.5.1).</p>
The evaporator sensor is not working properly.	Make sure the controller is configured to use an evaporator sensor (see 6.2.5.1).

## 8 TECHNICAL SPECIFICATIONS

### 8.1 Electrical rating

- Supply voltage nominal range: 90V AC to 240V AC (switching power supply)
- Frequency: 50Hz or 60Hz + 1% sinusoidal
- Power consumption: Maximum 3W Actual measured: 2.3W

### 8.2 Temperature control range

-40°F 0 to 104°F (-40°C to 40°C)

### 8.3 Accuracy

± .9°F (± 0.5°C)

### 8.4 Terminations

Compressor/Solenoid Single Pole Single Throw (SPST) Relay, Normally Open (NO):

Compressor:

16FLA, 96LRA @ 120V AC,

12FLA, 72LRA @ 240V AC

Solenoid:

800 VA @ 120V AC

720 VA @ 240V AC

Electrical Lifetime: 100,000 cycles

FAN/DEFROST Single Pole Double Throw (SPDT) Relay

Normally Open (NO) – Defrost:

Heater:

10A Resistive @ 120V AC

5A Resistive @ 240V AC

Solenoid:

.4 VA @ 120V AC or 240 V AC

Normally Closed (NC) – Optional Fan:

1FLA, 6LRA @ 120V AC,

1FLA, 6LRA @ 240V AC

Electrical Lifetime: 30,000 cycles

Spade terminals:

- Power input, phase and neutral (2 terminals)
- Compressor relay (2 terminals)
- Defrost Heater Output; (2 connectors – NO & NC contacts) (3 terminals)

Screw terminals:

- NTC control and evaporator temperature sensors (two terminals)
- Digital Input (dry contact switch) (one terminal)
- Common (one terminal)

There is one TTL connector for the remote display and configuration by computer or copy card.

### 8.5 Environmental requirements

Ambient operating temperature: 14°F to 131°F (-10°C to +55°C proposed IEC ratings; and -10°C to +65°C, tested to UL 873)

Storage/ transport Temperature: -22°F to 167°F (-30°C to +75°C)

Operating Humidity Range: 10 to 90% R.H., non-condensing

### 8.6 Electromagnetic compatibility (EMC)

Emission:

U.S. FCC Part 15, Subpart B and Industry Canada ICES-003

Immunity:

Burst: -1 KV unsymmetrical criteria B

Surge: -1.0 KV Phase to Neutral criteria B. -2.0 KV Phase to Earth and Neutral to Earth criteria B.

### 8.7 Certifications

UL Recognized Component 



File E139433

## 9 RESPONSIBILITY AND RESIDUAL RISKS

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- Use on equipment that allows dangerous parts to be accessed without the use of tools.
- Installation and/or use on equipment that is not compliant with the current standards and regulations in force.

## 10 DISCLAIMER

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