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## THERMOGUARD THERMOSTAT V (TG-V)

The TG-V is a programmable microprocessor controller that uses external relays. The TG-V module is replaced as an assembly, no internal repair is available.

Three models are used, the Standard TG-V (P/N 45-1450), the Enhanced TG-V (P/N 45-1486) and the new TG-V with Revision 4 software (P/N 45-1579) (effective 10/94). This new controller replaces P/N 45-1486 and will replace all previous controllers. For complete details of changes, see the Microprocessor Controller TG-V Operating and Setup Manual TK 40284-7.

On earlier Standard TG-V models, the words THERMO KING THERMOGUARD appear below the LCD. On the Enhanced TG-V and Revision 4 models, the words THERMO KING THERMOGUARD V appear below the LCD.

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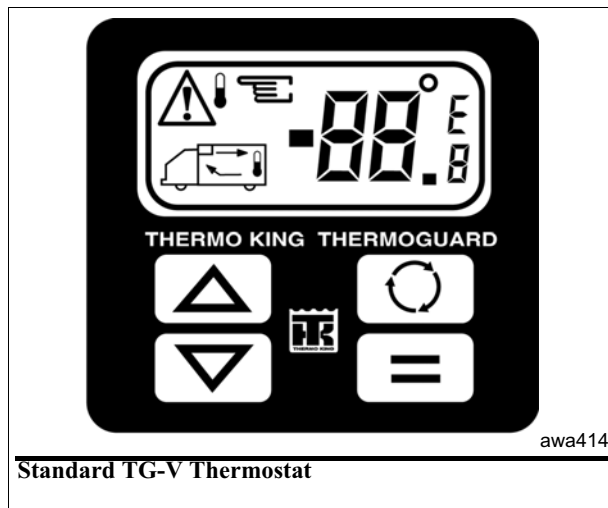
### Software Revision Display (P/N 45-1579)

When the unit On/Off switch is first turned ON, the TG-V display will show the “All Segments Display” for 5 seconds. The controller will then show the “Software Revision Display” for 2 seconds. This display consists of the number “4” in the right large digit position of the display. The rest of the display will be blank. The display will then show the selected standard display.

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### TG-V Features

- **Thermometer:** It displays the return air temperature, and can be programmed to display the optional discharge air temperature with 0.1 degree accuracy.
- **Thermostat:** It provides temperature control from -31.0 to 29.0 C, in 0.5 degree increments.



- **Defrost Control:** When the evaporator coil is cold enough for frost to form, defrost is automatically initiated every 4 hours during pulldown until the return air temperature is in range. At in-range temperatures (between approximately 7 degrees above and 7 degrees below point), the controller is programmable for 2 to 16 hours in 2 hour increments. Defrost interval is set at the factory but can be reprogrammed by your Thermo King Dealer. It can also be programmed to terminate defrost at 30 or 45 minutes.
- **Fuel Saver:** It can be programmed to delay high speed operation for optimum fuel economy.
- **Alarm:** It can detect and display up to four alarm conditions including sensor, microprocessor, and defrost termination failures.

The keypad and the Liquid Crystal Display (LCD) allow the operator to operate the TG-V. The input and output terminals on the back of the TG-V monitor unit conditions and control unit functions.

The TG-V can be programmed to accommodate a variety of unit configurations and functions. It is programmed in the Guarded Access Mode on four or five<sup>1</sup> separate screens. Refer to “Programming in Guarded Access Mode” for specific information.

#### Screen 1 contains the following choices:

1. Accumulate Defrost Time (yes or no)
2. Defrost Termination Time (30 to 45 minutes)
3. 8-minute High Speed Delay (on or off)
4. Heat Lockout (yes or no)
5. Is There a Discharge Sensor (yes or no)
6. Is There a Modulation Valve (yes or no)
7. Fahrenheit or Celsius Temperature Display

#### Screen 2 contains the following choices:

1. Defrost Time Interval Above Lockout (2, 4, 6, 8, 10, 12, 14, 16 hours)
2. Defrost Time Interval Below Lockout (2, 4, 6, 8, 10, 12, 14, 16 hours)

#### Screen 3 contains the following choices:

1. Discharge Sensor Grade (0, 1, 2, 3, 4, 5)
2. Return Sensor Grade (0, 1, 2, 3, 4, 5)

#### Screen 4 contains the following choices:

1. Return Air Temperature Display in Default
2. Setpoint Temperature Display in Default
3. Discharge Air Temperature Display in Default
- 4.<sup>1</sup> Discharge Air and Setpoint Alternate
- 5.<sup>1</sup> Return Air and Setpoint Alternate
6. Defrost Mode display (dF) (Revision 4 ONLY) is available for selection. See Screen 4 for options.

<sup>1</sup> NOTE: Applies to Enhanced TG-V and Revision 4 models only.

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Screen 5 contains the following choices:<sup>1</sup>

1. High Speed Pulldown Fresh (yes or no)
2. High Speed Pulldown Frozen (yes or no)
3. Two Minute High Speed Delay at Start-Up (yes or no)
4. Reduced Setpoint Range (yes or no)

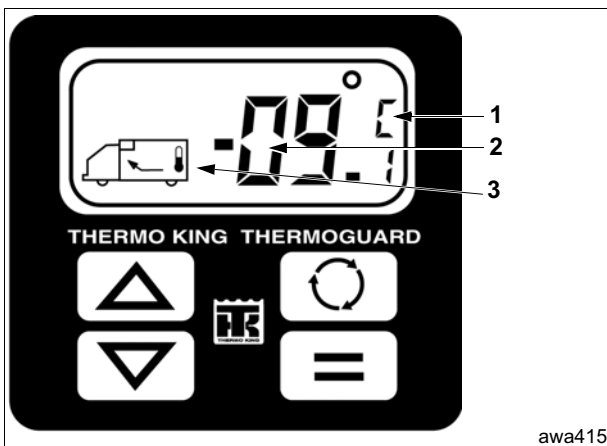
<sup>1</sup> NOTE: Applies to Enhanced TG-V and Revision 4 models only.

## Display Symbols and Control Keys

The following is a list of the display symbols and control keys on the TG-V. You should become completely familiar with the meaning of each symbol and the function of each control key before operating the unit.

### Return Air Symbol

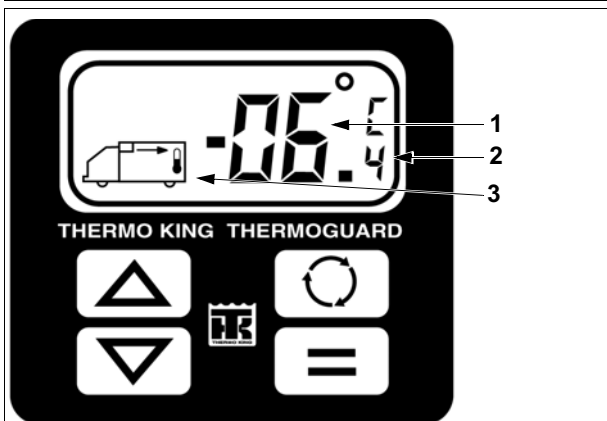
The return air symbol is a truck with an arrow pointing to the temperature control unit from the thermometer. When this symbol appears, the return air temperature is being displayed.



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#### TG-V Display Symbols

1. Celsius Symbol
2. Minus Sign
3. Return Air Symbol



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#### TG-V Display Symbols

1. Temperature (-06) in Whole Degrees
2. Temperature (.4) in Tenths of a degree
3. Discharge Air Symbol

### Discharge Air Symbol (Optional)

The discharge air symbol is a truck with an arrow pointing to the thermometer from the temperature control unit. When this symbol appears, the discharge air temperature is being displayed.

### Setpoint Symbol

The setpoint symbol is a hand pointing to a thermometer. When this symbol appears, the setpoint temperature is being displayed.

### Fahrenheit Symbol

The Fahrenheit symbol appears as a degree symbol and the letter F. When this symbol appears, temperature is being displayed in degrees Fahrenheit.

### Minus Sign

A minus sign appears next to the temperature display to indicate the temperature is below zero.

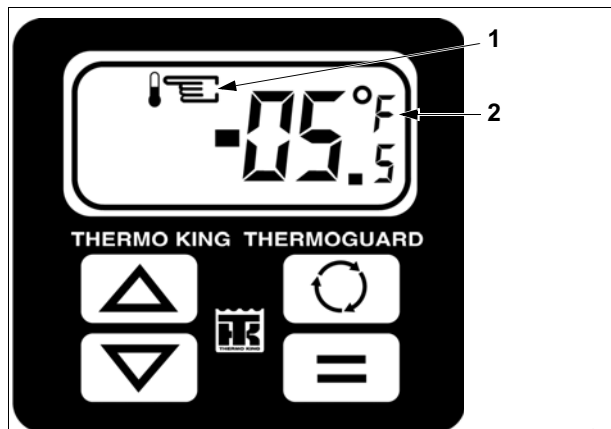
### Celsius Symbol

The Celsius symbol appears as a degree symbol and the letter C. When this symbol appears, temperature is being displayed in degrees Celsius.

### Temperature

When a temperature is displayed:

- The number in the Large LED readout indicates the temperature in whole degrees.
- A Small LED readout that appears after a decimal point indicates the temperature in tenths of a degree.



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#### TG-V Display Symbols

1. Setpoint Symbol
2. Fahrenheit Symbol

### Alarm Symbol

The alarm symbol is an exclamation point inside a triangle. When this flashing symbol appears, an alarm (fault) condition has occurred.

### Alarm Code

When the alarm symbol appears and the Select key is pressed, the Large LED readout displays a two-digit alarm code.

### SELECT Key

(Cycling arrows) is used to select the various displays which can appear on the screen.

### ENTER Key

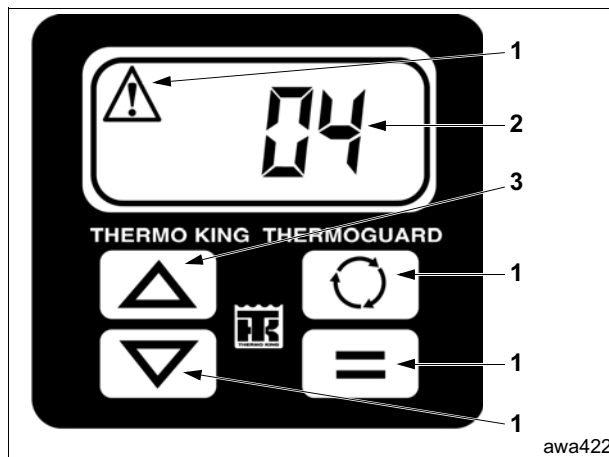
(Equal sign) is used to enter new information into the controller.

### UP Key

(Arrow pointing upward) When the setpoint symbol is on the screen, this key is used to increase the setpoint temperature.

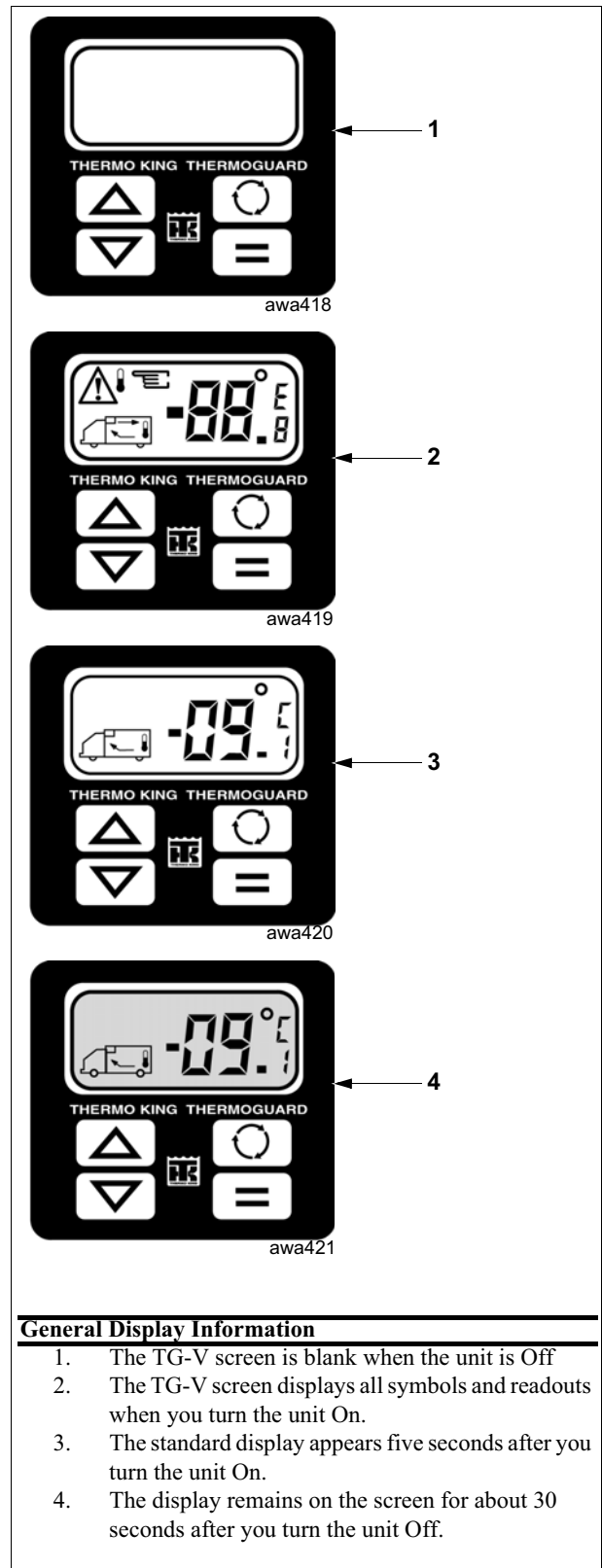
### DOWN Key

(Arrow pointing downward) When the setpoint symbol is on the screen, this key is used to decrease the setpoint temperature.



#### TG-V Display Symbols and Control Keys

1. Alarm Symbol
2. Alarm Code appears when SELECT Key is pressed
3. UP Key
4. SELECT Key
5. ENTER Key
6. DOWN Key



#### General Display Information

1. The TG-V screen is blank when the unit is Off
2. The TG-V screen displays all symbols and readouts when you turn the unit On.
3. The standard display appears five seconds after you turn the unit On.
4. The display remains on the screen for about 30 seconds after you turn the unit Off.

## General Display Information

When the Thermo King unit is switched OFF, the controller screen will be blank; nothing will be on the display.

When the Thermo King unit is switched ON, all symbols and readouts will be displayed for about 5 seconds. Make sure that all display segments are operational.

After 5 seconds the standard display will appear. This display remains on the screen during normal operation. The standard display is set to Return Air Temperature at the factory, however, the controller can be programmed to show Discharge Air, Return Air, or Setpoint as the standard display.

When the Thermo King unit is switched OFF, it is normal for the display to remain on for about 30 seconds as it slowly fades.

**NOTE:** *With the power off or battery disconnected, all settings are saved in the controller memory and become active when the unit is switched ON.*

## Displaying Operating Data

During normal operation, the standard display is on the screen. Return Air Temperature is the factory standard display setting (this may be changed). Other operating data can also be displayed. Repeatedly press and release the SELECT key to display other data in the following order:

1. Discharge Air Temperature (optional)
2. Setpoint Temperature
3. Alarms (can only be displayed when an alarm condition has been sensed by the controller)

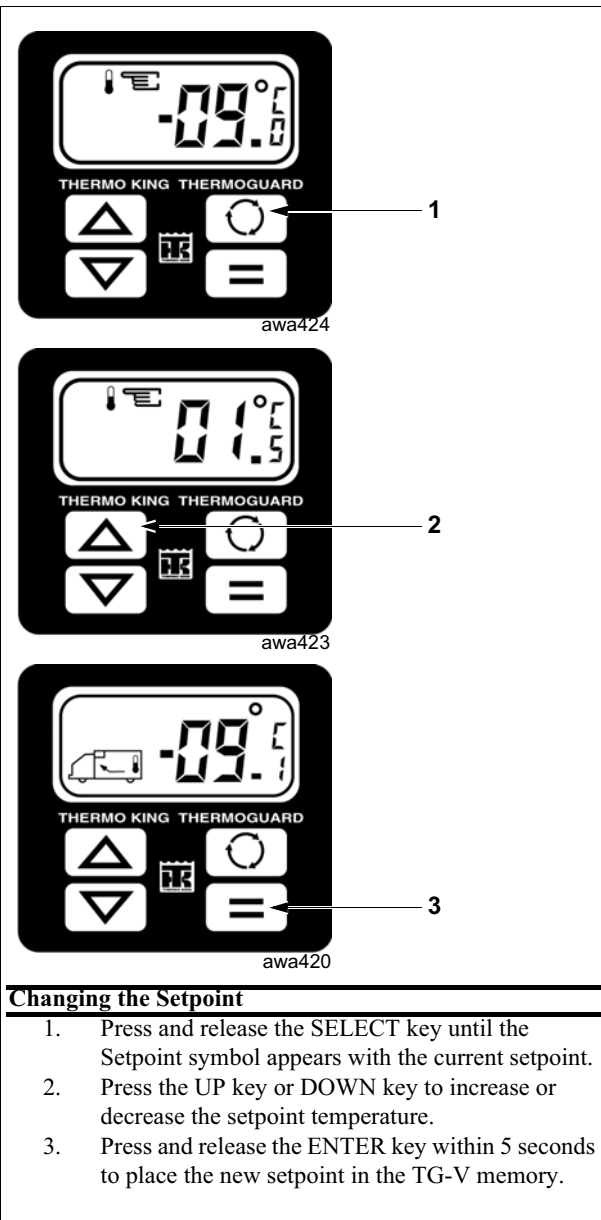
**NOTE:** *When viewing another display, the screen will automatically return to the standard display if no other keys are pressed for 10 seconds.*

## Entering the Setpoint

The setpoint temperature of the Thermo King unit can be easily and quickly changed. To change the setpoint:

1. Press and release the SELECT key repeatedly until the setpoint symbol is on the screen.
2. Press the UP or DOWN key until the setpoint is at the correct temperature setting.
  - Pressing and releasing either key repeatedly will cause the temperature to change by .5 degrees each key press.
  - Holding either key down will cause the temperature to scroll automatically, one degree at a time.
3. To enter the new setpoint into memory: Press and release the ENTER key within 5 seconds.
  - The display will blink once as the new setpoint is entered into memory.
  - The new setpoint will remain on the screen for about 5 seconds, then,
  - The standard screen will automatically appear.

**CAUTION:** *If the ENTER key is not pressed within 5 seconds, the original setpoint will appear on the screen for 5 seconds, the standard screen will automatically appear, and the Thermo King unit will be controlled at the original setpoint.*



## Displaying and Clearing Alarm Codes

When the TG-V controller senses an alarm condition, a flashing alarm symbol appears on the display. A two digit alarm code is used to identify the type of alarm.

1. To display the alarm code, repeatedly press and release the SELECT key until the alarm screen is displayed.

**NOTE: If more than one alarm has been sensed, all alarm codes present will automatically alternate on the screen.**

2. To clear the alarms, press the ENTER key while the alarm screen is showing. The alarms will clear and the standard display will appear on the screen.

**Displaying and Clearing Alarm Codes**

1. When the Alarm symbol flashes on the screen, press and release the SELECT key until the Alarm Code appears.
2. Record the Alarm Code(s) and make repairs as required.
3. To clear the Alarm Code(s), press the ENTER key while the Alarm Code is showing.
4. The standard display appears.

**NOTE: Alarms may continue to appear as the unit operates if the alarm condition is not corrected.**

## Alarm Codes

The following alarms codes are used:

- 03 Return Air Sensor Failure: The return air sensor has failed or is disconnected.
- 04 Discharge Air Sensor Failure (Optional): The discharge air sensor has failed or is disconnected.
- 14 Defrost Terminate On Time Limit (before 10/94): The defrost cycle did not terminate properly and was terminated by a defrost timer limit.
- 14 Defrost Circuit Failure (after 9/94): The unit is still in defrost after end of the defrost time limit, indicating a defrost circuit failure.
- 29 Defrost Initiation Failure (after 9/94): The unit attempted to enter defrost three times in rapid succession, indicating a shorted air switch, shorted manual defrost switch or other defrost circuit failure.
- 88 Microprocessor Failure: The TG-V has failed and must be replaced.

## Additional Operating Information

### Sensor Failure

In addition to generating an alarm, the failure of a sensor will cause the display screen for that sensor to show a minus sign and dashes in place of temperature. The alarm symbol, the minus sign and the dashes will blink continuously.

### Temperatures Outside of Display Range

The temperature display is -40.0 to 37.8 C. If the sensor temperature is out of this range, the temperature display will flash the appropriate temperature extreme. For example, if the cargo temperature were 43 C, the display would read 37.8 C and would blink continuously. The display would stop blinking once the temperature dropped below 37.8 C.

**A Minus sign and dashes appear when a sensor fails**