

# **“Control Cube T<sup>2</sup>”**

## **Two-Stage Digital Temperature Controller**

### **Operating Manual**



The Control Cube T<sup>2</sup> is a compact modular 2-Stage\* digital thermostatic controller that can be used to control temperature within cooling enclosures like refrigerators or freezers when the enclosure is an area that does not have a stable temperature (i.e. an unheated garage or porch). It can also be used for controlling heating (or cooling) of liquids using table-top appliances like slow cookers or electric griddles. The controller requires the appliance have a 110vac power cord, and maximum continuous current requirement of 10A or less.

*\*The controller has dual 10A relays with two socketed power out for the heating and cooling appliances.*

#### **Important Safety Precautions:**

The Control Cube T<sup>2</sup> operates on 110vac, 50/60Hz and can control appliance current of up to 10A. The controller enclosure is not sealed and under no circumstances should be immersed in water, installed exposed to weather or used in a wet environment. There are no user serviceable parts inside the enclosure, and opening the enclosure will void warranty and risk electrical shock. For in-warranty service or replacement contact [info@Perfect-Cheese.com](mailto:info@Perfect-Cheese.com).

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## What Ships

- Control Cube T2 module w/ 9ft 16AWG power cord and two 12" socketed cords; one for heating and one for cooling
- Candelabra lamp cord and polarized plug for heating (optional)
- Replaceable stainless steel temperature probe and cable
- Wall "quick mount" bracket with screws
- Installation / operation manual

## Installation

*Note: A video installation tutorial is available at [www.perfect-cheese.com](http://www.perfect-cheese.com).*

1. Remove all parts from packaging; check that you have all components listed above.
2. Determine best location and best mounting option (shelf or wall mount).
3. If you're wall mounting the CCT2 remove the mounting bracket and screws. Locate bracket and mark and drill pilot holes. Attach the bracket to the wall using the screws (with anchors if you're attaching to drywall or thin paneling).
4. Once the bracket is attached you can mount the Cube and plug in to a wall socket.
5. If the sensor is not attached the display will read "EEE". Once you plug in the temperature sensor it should read the correct temperature
6. The cable can be taped in place around the edge of the door
7. If you want to permanently install the sensor drill a 3/16" diameter or larger hole into the side of your refrigerated enclosure, thread sensor through hole and secure probe near center-back of the enclosure, and apply silicone caulk to seal hole

# Programming the WH7016H+ Temperature Controller



*Note: A video programming tutorial can be seen at [www.perfect-cheese.com](http://www.perfect-cheese.com).*

## **LED Status Description:**

1. **WORKING light:** Remains ON when heating or cooling; flashes during programmed cooling protection delay (PT).
2. **SET light:** Remains ON when Setpoint is displayed; OFF when measured temperature is displayed.

## **Key Functions:**

1. **To change High Temperature Setpoint:** Press SET key once to display high temperature setpoint, then use the ▲ or ▼ keys to increase or decrease value. Once desired setpoint is reached press SET key again.
2. **To change Low Temperature Setpoint:** Press RST key once to display low temperature setpoint, then use the ▲ or ▼ keys to increase or decrease value. Once desired setpoint is reached press RST key again.
3. **Turning controller ON and OFF:** Pressing the RST (Reset) key and holding for 3 seconds will turn the controller OFF. Pressing the RST key again will turn the controller back ON. The RST key can also be used to silence and reset the AH or AL audible alarm.

*Note: The WH7016H+ has two setting menus. The first menu is accessed by pressing and holding SET key for 3 seconds. The second menu is accessed by pressing and holding the SET and ▲ keys simultaneously for 3 seconds.*

## **System Settings – Menu 1**

1. **To change system settings:** Press and hold SET key for three seconds to display system settings, then use the ▲ or ▼ keys to scroll through settings. To change a displayed setting, press SET key once and use the ▲ or ▼ keys adjust to desired value. To exit and save settings press RST key. Note: Controller will exit and save settings automatically after 5 seconds.
2. **Symbol Details (units are degrees unless noted otherwise:**
  - Hd: Heating hysteresis
  - Cd: Cooling hysteresis
  - LS: The minimum set limit
  - HS The maximum set limit
  - CA Temperature calibration
  - PT (looks like P7) Protection Time; cooling relay delay time (minutes)
  - AH High temperature alarm
  - AL Low temperature alarm

Note: Setting the parameters on the 7016H+ is not difficult but it can be confusing until you have a good understanding their function. Before putting the controller into operation in your system we suggest you do a “dry run” going through the menu and seeing the effects of each parameter. If you encounter problems you can email us at [info@perfect-cheese.com](mailto:info@perfect-cheese.com).

### **2.1. (Hd) Heating Hysteresis:**

**Function:** The Heating Hysteresis is a “offset” or temperature differential that is added to the Low Temperature Setpoint.

**To change the Heating Hysteresis (Hd):** Press and hold the SET key for 3 seconds. **Hd** will be displayed. Use the ▲ or ▼ keys to set to desired value. When ready exit the settings menu by pressing SET key or waiting 5 sec.

**Operation:** When the system is heating once the measured temperature is higher than the Low Temperature Setpoint (Rst key) + Hd heating will stop.

**Example:** Low Setpoint (Rst key) is 54 deg. and (Hd) Heating hysteresis is set to 1 deg. When temperature increases to 55 deg. heating will be turned off. Once temperature drops below 54 the heating relay will turn on..

### **2.2 (Cd) Cooling Hysteresis:**

The Cooling Hysteresis is a “offset” or temperature differential that is subtracted from the High Temperature Setpoint.

**To change the Cooling Hysteresis (Cd):** Press and hold the SET key for 3 seconds, then the ▲ once to display the Cooling hysteresis (Cd). Press SET key to display the current hysteresis setting and use the ▲ or ▼ keys adjust to desired value. When ready exit the settings menu by pressing RST or waiting 5 sec.

**Operation:** When the system is cooling once the measured temperature is below the High Temperature Setpoint (Set key) - Cd cooling will stop.

**Example:** High Setpoint (Set key) is 56 deg. and (Cd) cooling hysteresis is set to 1 deg. When temperature decreases to 55 deg. heating will be turned off. Once temperature rises above 56 the cooling relay will turn on.

## **2.3 (HS) and (LS) Upper and Lower Limit Settings**

**Function:** Establishes the “range” of temperature control.

Default setting: Full range of controller (-50°C - 110°C/ -58°F - 230°F )

**To change the Limit Settings:** Press and hold the SET key for 3 seconds, then the ▲ two times to display the Lower Limit (LS). Pressing ▲ a third time will display the High Limit (HS). When ready exit the settings menu by pressing RST or waiting 5 sec. *Note: The setpoint needs to be set within the new range before the limit settings are changed.*

**Operation:** Use the (HS) and (LS) settings to reduce the range of temperature control.

**Example:** (HS) is set to 90 deg. and (LS) is set to 70 deg. The controller will display and/or control when the temperature is within this range.

## **2.4 (CA) Calibration**

**Function:** Adds (or subtracts) an “offset” in the measured vs. displayed temperature. For most applications this setting should be zero. Default setting is 0 deg.

**To change the Calibration offset:** Press and hold the SET key for 3 seconds, then the ▲ four times to display the calibration setting (CA). When ready exit the settings menu by pressing RST or waiting 5 sec.

**Operation:** If the CA value is positive it will be added to the measured probe temperature. If the CA value is negative it will be subtracted.

*Example: Calibration offset (CA) is set to – (minus) 2 deg. and the probe temperature is 50 deg. Displayed value will be 48 deg.*

## **2.5 (PT) Delay Protection**

**Function:** Adds an “on” delay (in minutes) before power is applied to the cooling appliance. *This should be set to 2 minutes or more for refrigerators to prevent the compressor from over-cycling.*

**Default setting:** 0 min.

**To change the Delay Protection:** Press and hold the SET key for 3 seconds, then the ▲ five times to display the delay protection setting (PT). When ready exit the settings menu by pressing RST or waiting 5 sec.

## **2.6 (AH) and (AL) Alarm High and Alarm Low Settings**

**Function:** Enables audible alarm if temperature is below Low Setpoint (-) AL. and/or above High Setpoint (+) AH.

**Default setting:** 0.0 (alarms disabled)

**To change the AH or AL setting:** Press and hold the SET key for 3 seconds, then the ▲ six times to display AH. Pressing the ▲ key a seventh time will display AL.. If the setting is 0.0 then the alarm is disabled; any other value enables the alarm. When ready exit the settings menu by pressing RST or waiting 5 sec.

**To silence and reset the alarm:** Press RST.

### **System Settings – Menu 2**

3. **To change Menu 2 system settings:** Press and hold SET and ▲ keys simultaneously key for three seconds to display menu 2 settings, then use the ▲ or ▼ keys to scroll through settings. To change a displayed setting, press SET key once and use the ▲ or ▼ keys adjust to desired value. To exit and save settings press RST key.

4. **Symbol Details:**

C or F: (C= Celsius F= Fahrenheit)

H or L: (Needs to be set to L for this type of sensor)

ST (looks like S7): Increment setting; 1.0 or 0.1

3. **Changing Settings:**

Use same procedure as described earlier. Note that changing Menu 2 settings will reset Menu 1 settings to their default. Also, you must press RST key to exit Menu 2 settings .

4. **Fault messages**

**EEE** - Temperature probe failure or not connected to controller

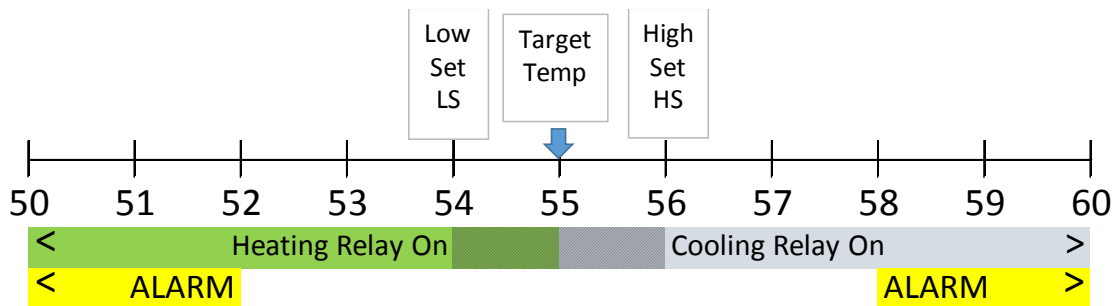
**LLL** - Temperature below control range lower limit

**HHH** – Temperature above control range higher limit

## 5. Typical settings for a refrigerated enclosure

The chart below illustrates how the controller settings function. The application is for a refrigerated enclosure and the **target maintenance temperature is 55 deg. F.** Option settings are:

Low Set (LS) = 54 deg  
High Set (HS) = 56 deg  
Low differential (Ld) = 1 deg  
High differential (Hd) = 1 deg  
Alarms (AH and AL) = 1 deg  
Cooling delay (PT) = 2 min



Assuming the fridge is room temperature when starting, the cooling relay will close until the target temperature (55) is reached. If the temperature drops below Low Set (54) the heating relay will close and stay on until the temperature reaches the target temperature. The audible alarm will sound if temp < 52 or > 58.

## Specifications

- Willhi WH7016H+ digital 2-Stage controller
- 110vac; two 10A relays
- 2-Stage, dual mode (both heating and cooling)
- 10A maximum current rating with 16AWG power cords
- -50 °C to 110 °C / -58 °F to 230 °F temperature control range
- Fahrenheit / Celsius selectable
- Adjustable increments (0.1 and 1.0 degrees).
- Display resolution: 0.1 degree; control resolution: 1 degree
- .1 to 25 degree adjustable hysteresis
- High and low temperature audible alarm function
- Operator settable parameters: range, setpoint, hysteresis, offset, high and low temperature alarm.
- Bright, 3 digit LED display
- 16AWG 9 ft. long power cord; (2) 10" long power-out cords
- 16AWG 6 ft. or 10 ft. long extension cord (optional)
- Detachable / replaceable sensor lead – 7 ft. sensor lead length
- Non-skid poly-foam base
- Wall "quick mount" bracket
- 8' long lamp cord with candelabra socket and polarized plug (optional)

## Limited Warranty

*The Control Cube T2 controller is warrantied for a period of one year from the date of purchase. Warranty covers defects in workmanship and failure to function properly from causes not attributable to damage, misuse or improper operation. Perfect Cheese will either replace or repair an under-warranty component at its discretion. Components that fail after expiration of warranty can be repaired by Perfect Cheese at a reasonable charge. There are no user serviceable parts inside the module's main enclosure and any attempt to open will void any warrantee.*