

# Tom's Nifty Temperature Controller

## Operating Instructions – Rev 2

### Introduction

Your Digital Temperature Controller uses advanced algorithms to arrive at a target temperature with minimal “overshoot”, or going way past your target temperature, and excellent stability, or minimal “wobbling” above and below your target temperature.

There are very few settings necessary to operate the device successfully. In summary:

- POST – Power-On Self Test: Shows current settings
- Normal Operation
  - Selecting Display Mode: Choose between seeing your target & measured temp or target temp & percentage of time your blanket is on.
  - Setting Target Temperature
  - Auto-Tune: Automatically calibrates the controller to your blanket. Truly magical!
- Primary Set-up (probably done once):
  - Temp Alarms: Enables LED alarms
  - Fahrenheit or Celsius Display Modes
- Secondary Set-up Options (probably done once)
  - Maximum & Minimum Temperatures allowed: Nice to protect yourself from stupidity. Protects you from setting a temp that might burn your wood.
  - Decimal Point: Enables fractional temps

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# Display



## "Process Value" or 'PV' Display

When in Normal mode Displays the Current Temperature as read by the sensor.



## "Set Value" or 'SV' Display

When in Normal mode Displays the Desired Temperature as set by the user.



## Status LEDs

Out1: Output Status  
Out2/AL2: Alarm 2  
AL1: Alarm 1  
AT : Auto-Tune

On = Blanket receiving power  
On = Alarm 2 Active  
On = Alarm 1 Active  
On = Training Mode



## Buttons

From Left to Right: 'SET' 'AT' 'UpArrow' 'DownArrow'

# POST – The Power-On Sequence

## What Do All Those Lights Mean?

1. All lights go on as a “self test”

...then

2. *PV or Upper Display* - “C” or “F” is displayed to reflect temp units are in Celsius or Fahrenheit

*SV or Lower Display* - Thermocouple type. Should show a funky “y” indicating unit is set for a K-type thermocouple (what you have from the workshop)

...then

3. *PV or Upper Display* – Displays the Temp Upper Limit Allowed.

You cannot enter a temp higher than this number

*SV or Lower Display* – Displays the Temp Lower Limit Allowed.

You cannot enter a temp lower than this number

...then

4. Goes to “*Temp Display*” mode

PV shows the current measured temperature

SV shows the current target temperature

# Normal Operations

## Display Modes

Press **SET** once to switch between Display Modes. You can do this at anytime

- **TEMP DISPLAY MODE**  
*PV or Upper Display* – Measured Temp  
*SV or Lower Display* – Target Temp
- **PERCENT MODE**  
*PV or Upper Display* – Measured Temp  
*SV or Lower Display* – Percent of Time Power to Blanket is ON

## Setting Target Temperature

1. Verify you are in "TEMP DISPLAY" mode
2. Press <<**AT** button once
  - a. Right-most digit of *TARGET TEMP* starts flashing
3. Press **↑** or **↓** buttons to set digit value
4. Press <<**AT** button to advance to next digit
5. Repeat steps 2 and 3 until temp desired is shown
6. Press **SET** once to set the new target temp

## Auto-Tune

Auto-Tune sets the controller to work properly with your blanket. It is the “very cool feature” of your system. Once tuned, the controller will reach your set temperature with little to no overshoot and then maintain that temp within a degree or less.

1. Have your blanket connected to the thermocouple (clamp).
  - a. Higher precision might be attained if the blanket in your bender but this isn’t really necessary
2. Set the target temp to something modest. You can pick any temp you like, for example 200° F. See setting Target Temp above for instructions for setting target temp.
3. Press and Hold <<**AT** button for about 5 seconds or until the green AUTO-TUNE LED lights
4. Turn on the blanket
5. Wait (about 5 minutes). During this time the temp will likely zoom past your target temp. No worries! Just wait until the AUTO-TUNE LED goes out

Once set, the controller will maintain any temp properly. In other words, you don’t need to tune to every temp you might use.

A change of blanket requires you to “auto-tune” to that new blanket.

# Setup Operations

## Primary Setup Parameters

Probably never need to go here unless you need to switch the temp scale to either C° or F° or want to set the ALARM values for when those AL1 and AL2 LEDs glow. A nifty addition to the box would be two big LEDs for these alarms, and maybe a Klaxon, but that's a new workshop ☺.

**NOTE: Don't muck with the other variables other than the ones mentioned here! Auto-Tune sets them for you. When you get your Master's in Applied Physics, you can set your own parameter values.**

## Entering the Setup Parameters Menu

Press and hold the **SET** button for 5 seconds or until the display changes

- Values get set as in "Setting Target Temp".
  - Press **↑** or **↓** buttons to set digit value
  - Pressing **<<AT** advances the digit displayed
  - Pressing **SET** sets the edited value and advances to the next parameter
  - Press and Hold **SET** about 5 seconds to exit or just wait until it times out and returns to normal display mode

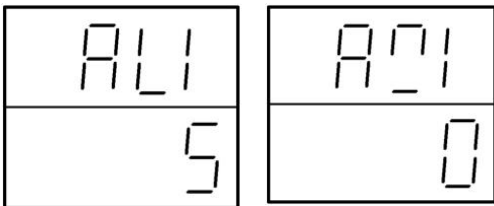
## Setting the ALARM LEDs

I use the Alarm LEDs to give me a visual clue when it's safe to bend. Not sure how useful as I'm staring at the actual temp but why not! Alarm setting is the first 4 parameters in the Setup Parameter Menu

### ALARM 1 - LOW TEMP WARNING

My use, you can do whatever makes sense for you...

#### ALARM 1      ALARM Function 1



**AL 1** is the temperature value that is used by the Alarm 1.

Next parameter is **Alarm 1 Function**. Determines how the Alarm 1 number is used.

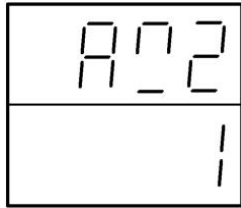
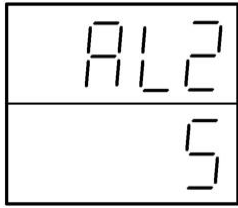
1. **AL1 - Alarm 1**. Sets a temperature value for use with next parameter. **See NOTE for mine**
2. **A01 - Mode for Alarm 1**. Many options (look in controller sheet), but these 2 are useful
  - a. "2" will set ALARM 1 LED when the actual temp is higher than AL1 temp.
  - b. "3" will set ALARM 1 LED when the actual temp is lower than AL1 temp.

**NOTE: I set AL1 to 270° F and A01 to "3".**  
This means Alarm 1 is on when the blanket temp is LOWER than 270° F and it is not safe to bend.

## **ALARM 2 - HIGH TEMP WARNING**

My use, you can do whatever makes sense for you...

### **ALARM 2      ALARM Function 2**



**AL 2** is the temperature value that is use by the Alarm 2

Next parameter is **Alarm 2 Function**. Determines how the Alarm 2 number is used

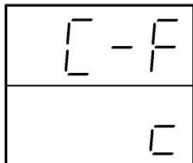
1. **AL2** - *Alarm 2*. Sets a temperature value for use with next parameter. **See NOTE for mine**
2. **A02** - *Mode for Alarm 2*.
  - a. "2" will set ALARM 2 LED when the actual temp is higher than AL2 temp.
  - b. "3" will set ALARM 2 LED when the actual temp is lower than AL2 temp.

**NOTE:**      **I set AL2 to 350° F and A02 to "2".**

This means Alarm 2 is on when the blanket temp is HIGHER than 350° F and it is getting pretty toasty in there.

## **Setting the display for either C° or F° scale readout.**

Scale setting is the 16<sup>th</sup> parameter in the Setup Parameter Menu. It looks like:



Top line shows the variable you can change. This is the Temp Scale selection

**C** = *Celsius*

**F** = *Fahrenheit*

Use the **UP** and **DOWN** arrow to change this setting. Press **SET** to enter your selection.

## Secondary Setup Parameters

### Entering Secondary Setup Menu

Press and hold the **↑** and **↓** buttons for 5 seconds or until the display changes.

- Values get set as in “Setting Target Temp”.
  - Press **↑** or **↓** buttons to set digit value
  - Pressing **<<AT** advances the digit displayed
  - Pressing **SET** sets the edited value and advances to the next parameter
  - Press and Hold **SET** about 5 seconds to exit or just wait until it times out and returns to normal display mode

### Setting Upper & Lower Temps Limits

The 1<sup>st</sup> and 2<sup>nd</sup> parameters in the Secondary Setup Menu control the minimum and maximum temperatures you can input. These provide a nice “safety mechanism” so you don’t accidentally burn your wood.

1. **LSP** – *Lower Set Parameter*. Sets the lowest temp you can set.  
**I use “0”**
2. **USP** – *Upper Set Parameter*. Sets the highest temp you can set.  
**I use “400” and maybe “350” is even better.** This makes sure you don’t screw it up 😊

### Setting Number of Decimal Points

The 5<sup>th</sup> parameter is for setting the number of decimal points you want to have. For our application, I use “0” so that I can only input integers. Adding decimal points makes entering your target temps just that much more of a hassle.

I list the 3<sup>rd</sup>, 4<sup>th</sup>, and 6<sup>th</sup> parameter names just for completeness.

3. **HY1** – *Hysteresis*. Don’t touch this. It should be “1”
4. **HY2** – *Hysteresis 2*. Don’t touch this. It should be “1”
5. **dP** – *Decimal Point*
  - a. Set to “0” if you just want integers.
  - b. Set to “1” if you want a single decimal point.
6. **Lck** – *Password Setting*.  
Please, oh PLEASE do not change this. No one knows what it might do.  
Really! People are baffled!. I envision bad things.