This proceedure is intended to be used after familiarizing yourself with the operation manual.

WARNING The infrared temperature sensor **must be aimed at a black paint stripe** on the die being heated**. Failure to do this will allow a runaway condition to occur, creating a BURN and FIRE hazard.**

Do not leave the temperature control on while it is un-attended.

Calibration of DMS temperature control to work with Raytek infrared temperature sensors. This necessary for several reasons:

0) Any two dis-similar metals when connected together create a thermocouple (battery whose output changes with temperature). All connections between the sensor and the Analog to Digital converter in the temperature control are possible sources of unwanted voltages that may affect accuracy.

1) The signal output by the sensor is at such a low voltage that very minor resistance differences in the connections between components, both soldered and screwed are large enough to affect measured temperature by tens of degrees.

2) The minor production variations in the components, even from the same lot need to be compensated.

3) The temperature control generates heat, and the difference in temperatures at the various thermocouples needs to be accounted for.

4) The electrical components change in value over time, accelerated by heat (internal or external).

5) There is a plastic fresnel lens under the bullet nose that focuses infrared energy on the sensor. Heat and aging of the plastic distort the lens over time (mostly excess heat).

6) Paints emit IR radiation with different emisivities depending on formulation.

Recommended tools for calibration.
Wax Temperature crayons 213 deg. F. and 350 deg. F.
Fresh black paint stripe on die. Use high temperature BBQ paint.
Portable contact temperature probe, or portable infrared non-contact sensor.

The DMS temperature control has been designed to work with a variety of J type thermocouples. Leaf, passive infrared, active infrared. The Raytek CI1A IR sensor is an active infrared. Active means that the IR detector feeds into an amplifier and other linearizing components at the sensor, then sends the signal on to the temperature control. The temperature control behaves as if it is hooked to a J type thermocouple.

The temperature control has parameters that change the slope and the offset of the received signal.

SLOPE is used to cause the readout to display the correct temperature at room temperature, boiling (212F) and at operating temperature (determined by materials, application and die design) and above (plus or minus offset). SLOPE is used to change to Celsius (different offset required) instead of Farenheight the default.

OFFSET is used to correct for reading above or below actual temperature by the same number of degrees at all points along the slope. Affects room temperature and operating temperature in the same direction and amount.

The following assumes you are calibrating in degrees Farenheight.

The Parameters of the temperature control may be accsesed by holding down the Enter button for about five seconds. P1 will be displayed in the lower readout. Each press of the enter key will advance to the next parameter. You can not back up, step through past P11 and re enter parameter mode. The UP and DOWN buttons raise or lower the displayed parameter. There is no MINUS sign to show that you are looking at a negative number. To determine if you are looking at negative numbers, press the up button. If the parameter goes down you are below zero, if up above zero. There is a chart in the manual with the range of, and the default parameters.

There are TWO sets of slope and offset parameters. Only one set is used at a time.
The reason for two sets is to allow one parameter change to allow using a different sensor without needing to locate the scrap of paper with the vastly different settings (passive infrared for instance).

P5 Slope1, and P6 Offset1 are used when P9 is set to 1.
P7 Slope2, and P8 Offset2 are used when P9 is set to 2.

Plug in the IR sensor. Connect the hot stamp unit power cord, air lines, etc.
Turn on Power switch. Allow electronics to warm up for 30 minutes.

To start with, enter parameter mode and step through P1- P10 parameters, writing down the current settings. At parameter P11 change 0 to 1 press Enter, copy down all L parameter settings.

Verify P9 = 1
P5 Slope1 is in the range of 88 to 92.
P6 Offset1 is in the range of +2 to +10

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Please note, Parameters are somewhat interactive. Changing slope affects offset and vice versa.

For purposes of calibration:
Actual temperature is **die temperature** determined by using temperature crayons or contact thermocouples. Not what is displayed on the DMS temperature control.

Top display should read room temperature +- 5 degrees. If not change Offset1 to correct.
Raise Set Point to 212 deg. Allow to come up to temperature and stabilize. Check temperature with 213 deg. temperature crayon. If crayon melts actual temp is at or above 212 deg. If crayon doesn't melt (shiny), temp is below 212. Make a note whether you are above or below 212.

Raise Set Point to 350 deg. Allow to come up to temperature. Using the 350 deg crayon determine if you are above or below 350 actual temperature. If actual is above at 212 and at 350 set points, adjust Offset1 UP two degrees. Step through parameters to exit. Display temperature my go up two or more degrees. Allow to cool.

If actual temperature is below 212 and 350 lower Offset1 by two deg. Displayed temperature should go down. Allow to warm up.

If actual temperature is below at 212 and above at 350, change the Slope1, not Offset1. The normal range used for Slope1 is 88 to 92, change up or down by one. To get the desired direction of change.

Cool die down to 212, test with crayon, heat to 350, check again, keeping track of above or below actual. Repeat parameter changes.

When the settings are correct, the temperature control and IR sensor will track actual temperature within about five degrees from room temperature to upper set point. *

* Thermocouples are near linear devices. Paint emisivity may vary by temperature and condition.

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