



Calibration Manual

Digi-Sense[®] TC9000 and TC9500 Advanced Temperature Controllers

Models 89800-01, 89800-02, 89800-03, and 89800-04



THE STANDARD IN PRECISION MEASUREMENT



Introduction

Each temperature controller has built into the operation menus a calibration gateway. This gateway allows the temperature controller to be calibrated to six temperature points, allowing for consistent and accurate temperature readings. The calibration process allows for both full-range calibration and segmented calibration. Each unit comes preloaded with tested default calibration temperature points.

WARNING: Do not enter the calibration gateway unless you have the proper calibration equipment to calibrate the sensor inputs associated with this controller. Changing calibration settings can cause errors in sensor temperature readings and operation of the controller.

Full-Range Calibration

This process provides accurate temperature measurements along the entire range of a given type of temperature probe. Ranges of each type of temperature probe are provided on the controllers menu screen, as well as in Table 1 below.

| SENSOR TYPE | RANGE |
|--|--------------------------------|
| THERMOCOUPLES | |
| Calibration accuracy $\pm 0.1\%$ of span or $\pm 1^{\circ}\text{C}$ for types J, K, T, E, N; $\pm 0.2\%$ of span or $\pm 2^{\circ}\text{C}$ for types B, R, S. Accuracy span is 1000°F (540°C) minimum. | |
| Type J | -190 to 1000°C |
| Type K | -200 to 1372°C |
| Type N | -200 to 1300°C |
| Type R | 0 to 1768°C |
| Type S | 0 to 1768°C |
| Type T | -200 to 400°C |
| Type B | 600 to 1800°C |
| Type E | -200 to 1000°C |
| PLATINUM RTD | |
| Calibration accuracy $\pm 0.1\%$ of span. Accuracy span is 1000°F (540°C) minimum. | |
| 0.003850 | -200 to 800°C |
| 0.003916 | -200 to 630°C |
| THERMISTOR | |
| Calibration accuracy $\pm 0.4\%$ of span or $\pm 0.5^{\circ}\text{C}$. Accuracy span is 266°F (130°C) minimum. | |
| TYPE 400 | -30 to 100°C |
| TYPE 700 | -15 to 100°C |

Table 1. Sensor Input Range

Segmented Calibration

Segmented calibration allows you to calibrate between any two temperatures along the full range of the probe, providing a more accurate reading between those temperatures. For example, placing all six calibration points between 0.0°C and 600°C will yield more accurate temperature readings between those temperatures than the full-range calibration would.

WARNING: Measurements outside the calibrated segment may be notably skewed

Default Calibration Points

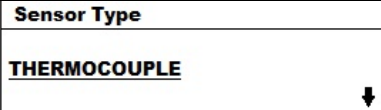
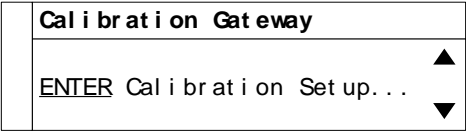
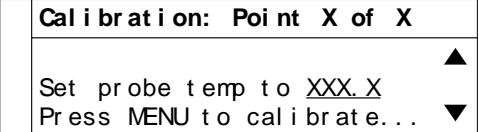
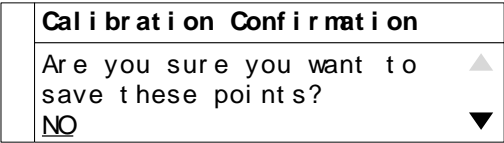
Default calibration points come preloaded in the controller (also see Table 2). These points have been selected and tested to provide accurate temperature readings across the full range. While these calibration points can be adjusted for segmented calibration, it is not suggested that they be changed for full-range calibration due to nonlinearity of temperature probes.

| SENSOR TYPE | DEFAULT CALIBRATION POINTS (°C) | | | | | |
|----------------------|---------------------------------|------------------|----------------|----------------|------------------|------------------|
| | P1 | P2 | P3 | P4 | P5 | P6 |
| THERMOCOUPLES | | | | | | |
| Type J | -185 | -85 | 0 | 230 | 660 | 995 |
| Type K | -195 | -95 | 0 | 230 | 660 | 1367 |
| Type N | -195 | -95 | 0 | 230 | 660 | 1295 |
| Type R | 0 | 50 | 250 | 650 | 1350 | 1750 |
| Type S | 0 | 100 | 250 | 650 | 1120 | 1750 |
| Type T | -195 | -95 | 0 | 195 | 290 | 395 |
| Type B | 600 | 800 | 1000 | 1200 | 1500 | 1795 |
| Type E | -195 | -95 | 0 | 260 | 660 | 950 |
| PLATINUM RTD | | | | | | |
| 0.003850 | -200 | -150 | -100 | 0 | 400 | 800 |
| 0.003916 | -200 | -150 | -100 | 0 | 400 | 630 |
| THERMISTOR | | | | | | |
| Type 400 | -30 (39.86KΩ) | -15 (16.43KΩ) | 0 (7,355Ω) | 20 (2,814Ω) | 50 (811.300Ω) | 95 (177.100Ω) |
| Type 700 | -15 (43.78KΩ) | -10 (33.20KΩ) | 0 (19.59KΩ) | 20 (7,496Ω) | 50 (2,162Ω) | 95 (472.4Ω) |

Table 2. Default Calibration Points

Calibration Mode Setup

Equipment requirements: Fluke 753 or equivalent calibrator for use in thermocouple and RTD calibration, and an IET decade box for thermistor calibration.

| Step | Instruction | Screen |
|--|---|--|
| Step 1 | Connect the calibrator to the appropriate temperature connector on the back of the controller. |  |
| Step 2 | Select input sensor type and the specific sensor type within the setup menu. | |
| Step 3 | Advance the menu to the Calibration Gateway screen. | |
| Step 4 | Select <u>ENTER</u> Calibration Setup within the Calibration Gateway menu. |  |
| Step 5 | Use the UP or DOWN arrows to change the default temperature setting. Recommend leaving temperature setting at default values for proper calibration of sensor input type. |  |
| Step 6 | Press MENU to calibrate at the stated temperature set point. NOTE: The unit will say "Calibrating..." for approximately 5 seconds and then advance to the next point when complete. | |
| <i>Repeat Steps 4 and 5 for all six (6) calibration points</i> | | |
| Step 7 | To save these new calibration points, select <u>YES</u> when prompted for confirmation. To discard these calibration points and restore the previous calibration points, select <u>NO</u> when prompted. |  |

For Product and Ordering Information, Contact:



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