



# Calibration Manual

## Digi-Sense<sup>®</sup> TC9100 and TC9600

### Advanced Temperature Controllers

**Models: 89800-11, 89800-12, 89800-13 & 89800-14**



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 the 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
<b>THERMOCOUPLES</b>	
Calibration accuracy +/-0.1% of span or +/-°C for types J, K, T, E, N; +/- 0.2% of span or +/-2°C for types B,R,S. Accuracy span is 1000oF (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
<b>PLATINUM RTD</b>	
Calibration accuracy +/-0.1% of span. Accuracy span is 1000°F (540°C) minimum.	
0.00385	-200 to 800 °C
0.003916	-200 to 630 °C
<b>THERMISTOR</b>	
Calibration accuracy +/-0.4% of span or +/-0.5°C. Accuracy span is 1000°F (540°C) minimum.	
YSI 400	-30 to 100 °C
YSI 700	-15 to 100 °C

**Table 1.** Sensor Input Range

## Segmented Calibration

Segmented Calibration allows you to calibration between any two temperatures along the full range of the probe, providing a more accurate reading between those temperatures. For example, placing all six (6) 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

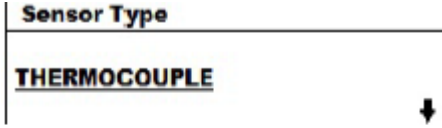
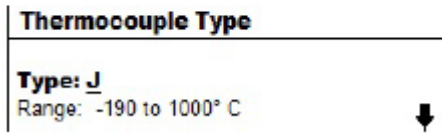
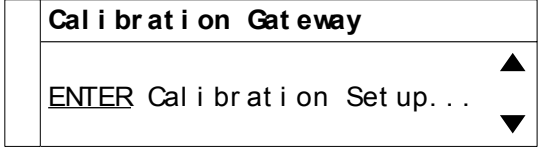
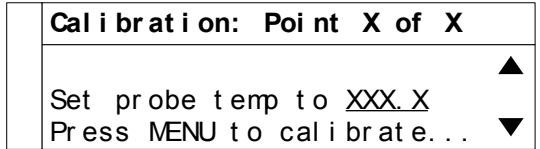
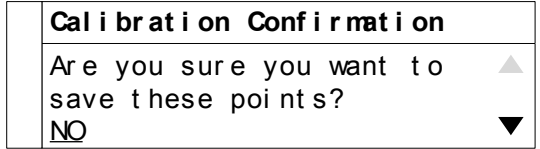
Default calibration points come preloaded in the controller (also see Table 2). These points have been selected and tested to provide accurate temperature readings across the full range. While these calibration points can be adjusted for segmented calibration, it is not suggested that they be changed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

SENSOR TYPE	DEFAULT CALIBRATION POINTS (°C)					
	P1	P2	P3	P4	P5	P6
<b>THERMOCOUPLES</b>						
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
<b>PLATINUM RTD</b>						
0.003850	-200	-150	-100	0	400	800
0.003916	-200	-150	-100	0	400	630
<b>THERMISTOR</b>						
YSI 400	-30 (39.86KΩ)	-15 (16.43KΩ)	0 (7,355Ω)	20 (2,814Ω)	50 (811.300Ω)	95 (177.100Ω)
YSI 700	-15 (43.78KΩ)	-10 (33.20K )	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	Start 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 <b>ENTER</b> Calibration Setup within the Calibration Gateway menu.	
Step 5	Use the UP or DOWN arrows to select the desired temperature Recommend leaving temperature setting at default values for proper calibration of sensor input type.	
Step 6	Press MENU to calibrate at that point <i>NOTE: The unit will say "Calibrating..." for approx. 5 seconds and advance to the next point when complete.</i>	
<b>Repeat Steps 4 and 5 for all six (6) calibration points</b>		
Step 7	To save these new calibration points, select <b>YES</b> when prompted.  To discard these calibration points and restore the previous calibration points, select <b>NO</b> when prompted	

**For Product and Ordering Information, Contact:**



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