Sensor Troubleshooting

TCS Technical Bulletin

Symptom:

If the temperature input is reading the high end or low end of the temperature range (see Table 1 for high/low ranges) continue to use this document. If the temperature input is not reading or tracking the actual temperature properly see TCS Technical Bulletin TB1005 Sensor Calibration.

Cause:

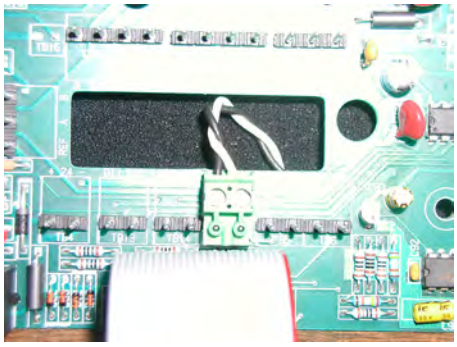
There are many reasons why a temperature input might be reading an incorrect value including shorts/opens, incorrect/failed sensors, wiring mistakes, and DIP switch settings.

Solution:

If the temperature reading is at the high limit the circuit is open, or at the low limit the circuit is shorted (see Table 1 for high/low ranges).

1. Check wiring.

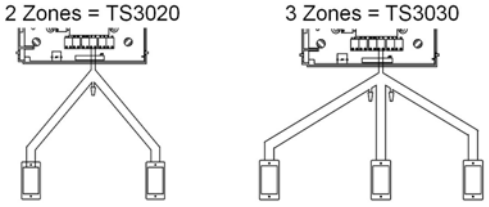
   a. If you are using a three wire sensor, verify that you are using the Black and Red or Black and White wires (the Red and White wires can be twisted together or one of them can be clipped/discarded).



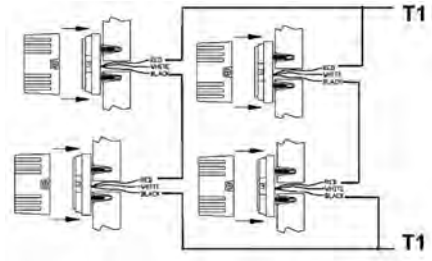
   b. Ensure that no wires are shorting together.

   c. If using you are averaging sensors or using a 2 or 3 space averaging kit, please see wiring diagrams below.

Multizone Averaging Kits (Wired in Series)



Sensor Averaging (Wired Series / Parallel)



NOTE: Must be a square number of sensors (4, 9, 16, etc.)

2. Measure the sensor's resistance (Ohms) with a multi-meter (see Table 2 for expected resistance values).

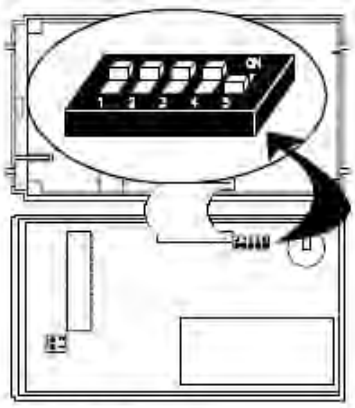
   a. Remove terminal block from the controller and take a reading.

   b. If the measurement at the controller end was open or shorted go to the sensor and measure its resistance.

   c. If the resistance is appropriate at the sensor but not the controller, either the wire used is defective or the sensor is wired incorrectly. If the resistance is appropriate at either end then the sensor is not the problem.

2800 Laura Ln Middleton, WI 53562 800.288.9383 www.tcsbasys.com

3. Verify the DIP switches are properly set (Thermostats Only).



SENSOR SELECTION

The dipswitches in the cover (shown above connected with ribbon cable) as well as the programming must be set when using remote room, discharge, and/or outdoor sensors. Use the following guide to determine the dipswitch settings for your application.

Using built-in room sensor only. (This is the default setting.)

Using built-in room sensor with discharge air sensor only.

Using built-in room sensor with outdoor air sensor only.

Using built-in room sensor with both discharge and outdoor air sensors.

Using remote room sensor only.

Using remote room sensor with discharge air sensor only.

Using remote room sensor with outdoor air sensor only.

Using remote room sensor with both discharge and outdoor air sensors.

NOTE: Enabling (turning on) a DIP switch with no discharge and/or outdoor air sensor connected will cause the room temp reading to rise or fall approximately 5 degrees.

Table 1 - RTD Sensor High and Low Limits

Product	RTD Input	Low Limit (°F)	High Limit (°F)
Thermostats *(all models)*	Room Temp Discharge Air Temp Outdoor Air Temp	40 0 -40	90 150 160
SZ10258	Zone Tmep Discharge Air Temp	40 50	90 150
SZ1144	Refrig Temp (typ 4)	-40	60
SZ1145	General Temp (typ 4)	20	120
SZ2141	Freezer/Cooler Temp (typ 6)	-40	160
SZ2144	Freeze Temp (typ 3) Refrig Temp (typ 3)	-40 20	160 220
SZ2161	Loop Suply/Return (typ 2) Condenser Supply/Return (typ 2) Boiler Temp Outdoor Air Temp	20 20 40 -40	120 120 240 160
SZ2165	Hot Supply/Return (typ 2) Chilled Supply Return (typ 2) Mixed Water Outdoor Air Temp	40 0 20 -40	240 100 220 160
SZ2166	Chilled Supply Return (typ 2) Hot Supply/Return (typ 2) Mixed Water Outdoor Air Temp	0 40 20 -40	100 240 220 160
SZ2182	Space/Return Temp (typ 2) Discharge Air Temp (typ 2) Mixed Air Temp Outdorr Air Temp	20 20 20 -40	120 220 220 160
SZW244	General Temp (typ 4)	0	150

Table 2 - Temperature to Resistance Conversion Chart

°F	°C	Ohms
-50	-45.556	820.560
-40	-40.000	842.590
-30	-34.444	864.570
-20	-28.889	886.541
-10	-23.333	908.511
0	-17.778	930.290
10	-12.222	952.069
20	-6.667	973.844
30	-1.111	955.619
40	4.444	1017.394
50	10.000	1039.059
60	15.556	1060.759
70	21.111	1082.294
80	26.667	1103.854
90	32.222	1125.439

°F	°C	Ohms
100	37.778	1146.869
110	43.333	1168.379
120	48.889	1189.889
130	54.444	1211.105
140	60.000	1232.500
150	65.556	1253.746
160	71.111	1275.010
170	76.667	1296.290
180	82.222	1317.570
190	87.778	1338.580
200	93.333	1359.715
210	98.889	1380.790
220	104.444	1401.855
230	110.000	1422.920
240	115.556	1444.830