"HOW TO"
DO AN ICE POINT FIELD CHECK ON TEMPERATURE SENSORS

WHAT IS AN ICE POINT?

An Ice Point is the melting (and freezing) point of ice, 0°C. The ice point is frequently used as a calibration checkpoint on resistance temperature detectors and as the reference junction for Thermocouples.
An Ice Point is done when there is concern that an RTD may need to be recalibrated.

HOW DO YOU DO AN ICE POINT FIELD CHECK?

The Ice Point is the easiest and most accurate to do in the field!

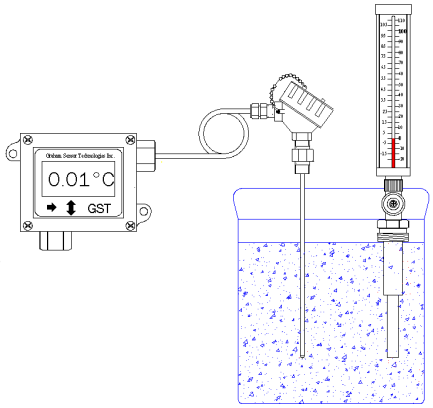
Apparatus Required:

- DVM – 4 ½ digit or better
- Dewar Flask or insulated container with 6" minimum height (18" would be the best)
- Distilled water
- Shaved or crushed ice
- Digital multimeter with an accuracy of +/- 0.01%
    - 10X Diameter of the probe must be in the ice (ex: ¼" the absolute minimum depth 2.5")

Procedure:

In a Dewar flask or suitable container, place distilled water and shaved or crushed clear ice made from bottled water. The bath should have enough water to provide a good thermal contact with the RTD, but not enough to float the ice. The spaces between the ice particles must be filled with water (no air pockets) and the ice must extend all the way to the bottom of the Dewar flask. Left to itself, a cavity may form as the conducted heat melts the ice, hence stirring is required every few minutes. The tool used for stirring should not be removed from the Dewar flask during the test, to avoid introducing heat sources.

Thoroughly clean the Test Instrument with bottled water and insert it into the bath, leaving a minimum of 1" ice at the bottom and sides of the Dewar flask. Oil and dirt will affect the temperature!



When you push down on the ice pack, the water should rise only ¼" above the ice pack. The ice point bath is the most widely used and simplest fixed point. The ice bath may be realized with an error of less than 0.01°C. Contamination of any surfaces and or touching the ice with your hands may be jeopardizing the accuracy of the ice point. Wipe down the Dewar flask and ice crusher with bottled water prior to performing this test. Immersion Error may occur if the Thermometers are not immersed at least 2" to 3" into the bath. Allow the sensors temperatures to stabilize for at least 5 minutes, stirring the ice frequently, and draining off excess water. Add ice as necessary. Sensor accuracy is a function of production tolerance and any additional calibration, which the sensor may get. ***Note:*** *Calibration can improve the accuracy of an RTD by 10X over production tolerance.*

HOW DO YOU MEASURE THE ICE POINT RESISTANT OF THE SENSOR?

If measuring a 3 wire RTD, it must be done in two stages. There is no standard colour coding for RTD's, sometimes we use 2 whites and 1 red wire, and other times we use 2 reds and 1 white (this is done interchangeably). The 2 wires are always connected together at the RTD bulb so you can tell what lead wire resistance is and what the bulb's resistance is.

1. Set the DVM to the lowest resistance range. @00C the RTD will read between 99.90 and 100.10 after you have removed the lead wire resistance.

2. Connect one red wire and one white wire to the meter and log the resistance value, depending how long the leads are the resistance value will be above 100Ω. **NOTE:** you can tell if the RTD has reached equilibrium by looking at the readings and noting if the value keeps dropping.

3. Connect one white wire and the other white wire to the meter. Log this value. Depending on how long the sensor is and how long the wire is the value can be anywhere from 0.01Ω to 20 or 30Ω for really long runs of wire.

4. Subtract the second reading from the first will give you the RTD resistance value at the said temperature looking at the table below.

RTD READING BELOW 0°C

Temp C	-0	-0.1	-0.2	-0.3	-0.4	-0.5	-.06	-0.7	-0.8	-0.9
-2	99.2181	99.1790	99.1399	99.1008	99.0617	99.0226	98.9835	98.9443	98.9052	98.8661
-1	99.6091	99.5700	99.5309	99.4918	99.4527	99.4136	99.3745	99.3354	99.2963	99.2572
-0	100.0000	99.9609	99.9218	99.8827	99.8437	99.8046	99.7655	99.7264	99.6873	99.6482
Temp C										
+0	100.000	100.039	100.078	100.117	100.156	100.195	100.234	100.274	100.313	100.352
+1	100.391	100.430	100.469	100.508	100.547	100.586	100.625	100.664	100.703	100.742
+2	100.781	100.820	100.860	100.899	100.938	100.977	101.016	101.055	101.094	101.133

RTD READING ABOVE 0°C

THERMOCOUPLE READINGS BELOW 0°C
You must have an ICE Point reference

DEG F	**DEG C**	**B** Platinum – 30% Rhodium Vs Platinum-6% Rhodium	**E** Chromel Vs Constantan	**J** Iron Vs Constantan	**K** Chromel Vs Alumel	**T** Copper Vs Constantan	**R** Platinum-13% Rhodium Vs Platinum	**S** Platinum-10% Rhodium Vs Platinum
30.0°	-1.111°		-0.065	-0.056	-0.044	-0.043	-0.006	-0.006
31.0°	-0.556°		-0.033	-0.028	-0.022	-0.022	-0.003	-0.003
32.0°	**0.000°**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
33.0°	0.556°	0.000	0.033	0.028	0.022	0.022	0.003	0.003
34.0°	1.111°	0.000	0.065	0.056	0.044	0.043	0.006	0.006
35.0°	1.667°	0.000	0.098	0.084	0.066	0.065	0.009	0.009
36.0°	2.222°	-0.001	0.131	0.112	0.088	0.086	0.012	0.012