SIMPLECIRCUITBOARDS.COM

Thermocouple Amplifier

Version 4

This circuit is based on the Analog Devices AD595 Thermocouple Amplifier. The nice thing about this chip is that it has on-board ice-point reference so there is no need to compensate for it. The output for these boards is 10mV per degree C. For instance, if you are measuring 15 degrees C, the output from this circuit will be 150 mV. –15 degrees C = -150 mV. If you use a DAC board with this, it must be able to handle these voltages.

This version has the ability to monitor 4 temperatures and allows the use of 6 to 16VDC input. The use of a voltage inverter allows temperature measurements above and below 0 degrees Celsius (C) (32 degrees Fahrenheit (F)).

This board uses a Type K thermocouple.

Miscellaneous Information:

- For all thermocouples, the red wire connects to the negative terminal

Specifications:

- Input Power: 6 – 16 VDC
- Output: 10 mV per ^{o}C
- Temperature Range: above and below 0 ^{o}C
- Thermocouple Type: Type K
- Board Dimensions: 4.25 x 2.25 inches

Calibration

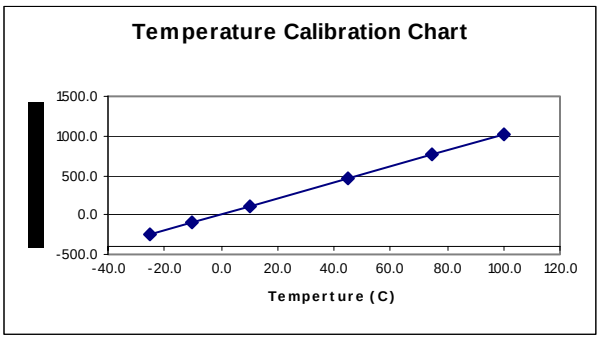
Following is an example of a calibration check that I performed on a similar circuit board of this design. As you can see by the linear regression R-Value of 0.9999, there is almost a perfect linear correlation between temperature and millivolt output. For more precise results, one must use a polynomial equation that has been developed for the thermocouple type range used. For more information on that, go to: http://www.omega.com/temperature/Z/pdf/z198-201.pdf

Thermocouple Board

Temp	MV	Est.
-25.0	-241.7	-24.2
-10.0	-98.4	-10.0
10.0	96.8	9.3
45.0	450.0	44.4
75.0	758.0	75.0
100.0	1016.0	100.6

10.06 mv/1C

R-Value = 0.9999



As you can see from the above table, with this board you will get an output of about 10.06 mV per degrees C. The values in the Est. column are values that were calculated from the linear regression equation that was derived from the Temp and MV data. Using that equation, the largest deviation (error) is 0.8 degrees C.

The equation that I used for this line is: Temp = (mV – 2.5816) / 10.0780

You can use the above method to get the data for your board. The results will vary slightly due to many factors (environmental, TC variations, installation, equipment noise, etc.) so it is highly recommended that you perform your calibration check with the board in place and with the TC that it will use. All TC's vary slightly so if you change your TC, the data might change, too.

For more information on thermocouples, go to:
http://www.omega.com/temperature/Z/zsection.asp

Disclaimer:
These boards are designed for educational use only. In no circumstances should these circuit boards be used in critical situations where failure could mean injury or property damage.

For more information, contact us at:
Info@SimpleCircuitBoards.com