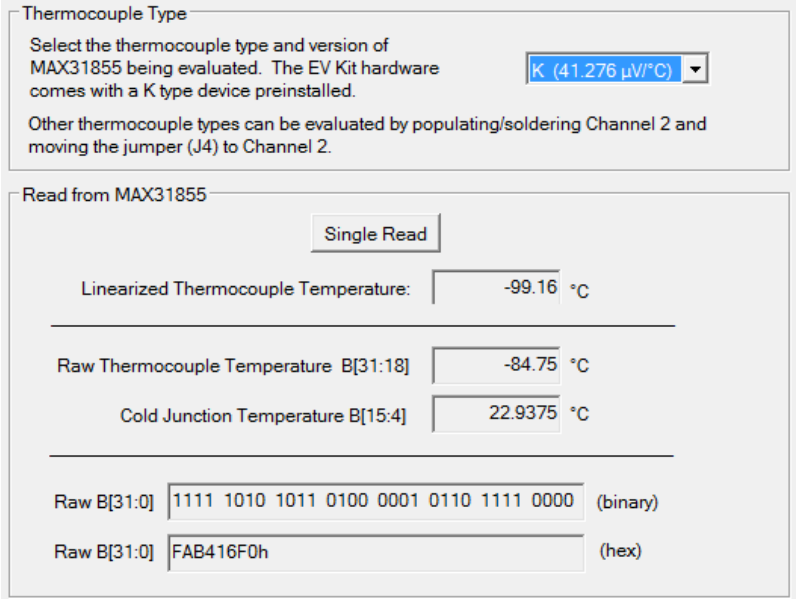
MAX31855 Linearized Thermocouple Temperature



1. Subtract the **Cold Junction Temperature** from the **Raw Thermocouple Temperature** data.

   -84.75°C – 22.9375°C = -107.6875°C

2. Calculate the thermocouple voltage based on the MAX31855's µV/°C for that thermocouple type (See Table 1 in MAX31855 Datasheet).

   -107.6875°C * 0.041276mV/°C = -4.44490925mV

3. Calculate the cold junction equivalent thermocouple voltage using the formula below with the NIST temperature-to-voltage coefficients A0, A1, A2… and exponential constants C0, C1 and C2.

   $$mV = A0 + A1 * Temp + A2 * Temp^2 + \ A3 * Temp^3 + \cdots + C0 * e^{C1*(Temp-C2)^2}$$

   NOTE: C0, C1 and C2 only have values for the K-Type thermocouple in the 0°C to 1372°C temperature range.

   $$-1.76 * 10^{-2} + (3.89 * 10^{-2} \ * 22.9375) + (1.86 * 10^{-5} * 22.9375^2) + (-9.95 * 10^{-8} * 22.9375^3) + \cdots + 1.19 * 10^{-1} * e^{-1.18*10^{-4}*(22.9375-1.27*10^2)^2} = 0.916753mV$$

4. Add the cold junction equivalent thermocouple voltage calculated in step 3 to the thermocouple voltage calculated in step 2.

   -4.44490925mV + 0.916753mV = -3.528157mV

5. Use the result of step 4 and the NIST voltage-to-temperature (inverse) coefficients B0, B1, B2... to calculate the cold-junction-compensated, linearized temperature value.

   $$Temp = B0 + B1 * mV + B2 * mV^2 + B3 * mV^3 + \cdots$$

   $$0 + (2.52 * 10^1 * -3.528157) + (-1.17 * -3.528157^2) + (-1.08 * -3.528157^3) + \cdots = \ -99.16°C$$