

Title: How do I use linear scaling if I have non-integer values?



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Information in this article applies to:

HMI500 Series & EZware

HMI Product(s)

HMI500 Series

Controller (PLC) Product(s)

All

Summary

When numeric data is displayed, the HMI can scale/convert your input values by checking the “do conversion” check box and entering the integer input and engineering high and low values. When the engineering high and low values are given as non-integers, the following method can be used to determine the necessary corresponding integer low and/or high values.

Solution

The HMI500's Numeric Data conversion, otherwise known as linear scaling, can be thought of mapping an input axis (values) to an engineering axis by using the straight line equation

$$e = M * i + B$$

where

e : engineering value

i : input value

M : slope

B : intercept

If the input and engineering high and low pairs are not integers, then integer pairs will need to be calculated since they can only be entered as integers.

For example, an application has an input register range of 1487 to 1953 which corresponds to a display range of -0.015 to 0.050, respectfully. Since the display range low and high values are non-integers, perform the following steps to arrive at the integer values needed for the Numeric Data Object's conversion entry:

1) Calculate the fixed slope (M):

$$\begin{aligned} M &= (\text{EngHi} - \text{EngLo}) / (\text{InputHi} - \text{InputLo}) \\ &= (0.050 - (-0.015)) / (1953 - 1487) = 0.000139485 \end{aligned}$$

2) Calculate the fixed intercept (B):

$$\begin{aligned} B &= \text{EngHi} - (M * \text{InputHi}) \\ &= 0.050 - (0.000139485 * 1953) = -0.222414 \end{aligned}$$

3) Select the Engineering integer values based on the desired display range:

Display low = -0.015; the next lowest integer value = -1 = EngLo.

Display high = 0.050; the next highest integer value = 1 = EngHi.

4) Calculate the input low integer value for the engineering low and high integer values:

$$\begin{aligned} \text{InputLo} &= (\text{EngLo} - B) / M \\ &= (-1 - (-0.222414)) / 0.000139485 = -5575 \end{aligned}$$

$$\begin{aligned} \text{InputHi} &= (\text{EngHi} - B) / M \\ &= (1 - (-0.222414)) / 0.000139485 = 8764 \end{aligned}$$

In summary, enter the following integer values:

InputLo = -5575 InputHi = 8764

EngLo = -1 EngHi = 1

More Information

When non-integer input low and/or high values are given, then the same method may be used by changing step 3) to determine InputLo and InputHi integer values, and changing step 4) to calculate EngLo and Eng Hi using the equations $EngLo = (M \times InputLo) + B$ and $EngHi = (M \times InputHi) + B$.

When only integer low and high values are used, no calculations are needed. For example, if your PLC is providing you a range of values from 1 to 1960 and you want to scale this input to a 1-10 range, you just need to enter the following data:

Input Low = 1 Input High = 1960
Eng Low = 1 Eng High = 10

Additional query words: linear scaling, conversion, engineering high, engineering low, non-integer scaling

Keywords: linear scaling, conversion, engineering high, engineering low, non-integer scaling

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