Industrial Automation
Tech Note 20 Crimson Scaling

Abstract

This document describes and provides examples for, the scaling parameters found in the Crimson® 3.0 software.

Product Families

G3 Series HMI / G3 Kadet HMI / Graphite® HMI / Modular Controller / Data Station Plus / ProducTVity Station

Use Case: Scaling Tags and Modules

Scaling tags within Crimson enables users to change the engineering units or resolution of a tag's data source. Scaling the input and output of modules converts an analog signal to engineering units, and vice versa.

Required Software

Crimson 2.0 or 3.0

Scaling Tags

Tag scaling has five (5) parameters; the first determines the data type of the scaling output. The other four (4) are used as X/Y coordinates to calculate the internal scaling equation.

Scaling: Type of scaling to use

- Scale to Integer: the result of the scaling will be a (signed 32-bit) integer number
- Scale to Floating Point: the result of the scaling will be a (32-bit) floating point number

Data From: lesser of the two known input values

Data To: greater of the two known input values

Display From: lesser of the two display values, the engineering unit value to be associated with the Data From value

Display To: lesser of the two display values, the engineering unit value to be associated with the Data To value

- Make sure to use the lowest common denominator when keying in scaling values to avoid data overflow when calculating the output value.

EX1: Analog input from a PLC is sent as a raw signed 16-bit integer with a value from -32768 and +32767, which represents a pressure from 0-150 PSI. In order to display this number as an integer with no decimal precision (whole numbers only) the scaling points would be:

Data From: -32768

Data To: 32767

Display From: 0

Display To: 150

EX2: Analog input from a module is sent in tenths of degrees, which when not scaled shows 10 times higher than the actual temperature. In order to display this number as a floating point value in degrees the scaling points would be

Data From: 0

Data To: 10

Display From: 0

Display To: 1

Scaling Modules

- The analog values in the Modular Controller and Graphite modules are all signed 16-bit integers.
- The limits of the values are -30000 to 30000.
- The DP setting in many of the scaling sections are strictly implied decimal precision. For example; the default scaling of a PID module with its Input Type set to *Process 4-20mA* is 0.00 to 100.00%, this will result in a value of 0-10000, because the decimal precision is only implied and 16-bit integers are only whole numbers.
- The Process Units settings are purely cosmetic.
- There are only two (2) reasons to scale both the module and the tag:
  1. To get the most resolution from the input,
  2. To change the data type to Floating Point.

Process Inputs: 0-10V, +/-10V, 0-50mV, 0-20mA, 4-20mA

Decimal Places (Decimals): digits of implied precision
Process (PV) at 0%: engineering units associated with analog input low signal
Process (PV) at 100%: engineering units associated with analog input high signal
Square Root: enable/check if the input requires square root extraction to generate a proper process value.

EX: A 4-20mA analog input which represents a pressure from 0-150 PSI. In order to display this number with two (2) digits of decimal precision (0-15000) the scaling points would be:

Decimal Places (Decimals): 2
Process (PV) at 0%: 0
Process (PV) at 100%: 150.00

Temperature Inputs: Thermocouple, RTD

The TC/RTD selection will load a scaling curve for the type of TC/RTD selected. The scaling parameters only need to be adjusted in special cases.

Offset: fixed temperature offset applied to the temperature reading
Slope: changes the ratio of the PV in relation to the sensor reading, useful if sensor is non-linear.

Strain Gauge Inputs

Range (mV): full scale input range
Excitation: voltage used to power sensor
Display Low: known low engineering unit value
Display High: known high engineering unit value
Signal Low: voltage signal associated with Display Low value
Signal High: voltage signal associated with Display High value

EX: Sensor specifications:
0-250 lb "Top Hat" load cell
Excitation: 5 Vdc
Output: 1.5 mV/V nominal

Range (mV): +/-20.000
Excitation: +5V
Display Low: 0
Display High: 250.00
Signal Low: 0
Signal High: 7.500 (5V * 1.5mV/V)

Analog outputs: 0-5V, 0-10V, +/-10V, 0-20mA, 4-20mA

Single Loop PID and SG modules with Analog Output Option

Output Type: analog output type (0-10V, 0-20mA, 4-20mA) *the CSPID1 has a hardware jumper that also needs to be set in the correct position
Mapping: module parameter that the analog output will be associated with
Drive Min At: value of Mapping parameter that will result in the low end output being transmitted
Drive Max At: value of Mapping parameter that will result in the high end output being transmitted

EX: 4-20mA output to control a heater, 4mA is off, 20mA is fully on.

Output Type: Process 4-20mA
Mapping: Heat Power
Drive Min At: 0.00%
Drive Max At: 100.00%

Analog Output Modules (CSOUT4 and GMOUT4)

Output Type: analog output type (0-5V, 0-10V, +/-10V, 0-20mA, 4-20mA)
Decimal Places: implied decimal precision of 'Data' value
Data Low: data value which corresponds to Output Low
Data High: data value which corresponds to Output High
Output Low: analog output value associated with Data Low
Output High: analog output value associated with Data High

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