1. INTRODUCTION
OMEGA® PLATINUM Series controllers offer Analog Voltage and Current Output with an accuracy of 0.1%. Voltage output requires no calibration but current output is influenced by the load resistance and requires an offset adjustment to reach stated accuracy when the output is operating in re-transmission mode.
This tech note describes two methods to adjust current scaling factors. Scaling can be easily calculated if the load resistance is known. If the load resistance is unknown it can be determined in a running system using a volt meter.

2. INITIAL SETUP
First set the desired output scaling range. In this example the Analog Output 1 is set to 4 to 20 mA mode and the desired scaling is set to 0°C = 4 mA and 100°C = 20 mA. Under the programing menu the ANG1 output is set to the following configuration:

3. CALCULATING THE OFFSET
If the load resistance is known the offset can be calculated by the following equations:

\[ I_A = I_D \times \left( \frac{R_L + 70000}{70000} \right) \]

Where:
\( I_A \) = Adjusted Current
\( I_D \) = Desired Current
\( R_L \) = Load Resistance

In the example if the load resistance is 400 Ω:
\( I_A \) (low) = 0.004 \times (400+70000)/70000 = 0.00402 = 4.02 mA
\( I_A \) (high) = 0.020 \times (400+70000)/70000 = 0.02011 = 20.11 mA

The PLATINUM can support up to 500 Ω of load resistance in current loop mode.

The PLATINUM Unit configuration is then updated with the adjusted currents:

4. DETERMINING THE RESISTANCE
In many systems the load resistance may not be precisely known. In this case, the required adjustments may be determined by using the measuring output voltage at a set current to calculate the load resistance using the following equation:

\[ R_L = \frac{V \times 70000}{70000 \times I_D - V} \]

Where:
\( V \) = Measured Voltage (In Volts*)
\( I_D \) = Expected Current (In Amps*)
\( R_L \) = Load Resistance

*Note that since the voltage measurement is taken in Volts, \( I_D \) must be expressed in Amps for this equation.

It is best to measure the system at the highest possible current to increase accuracy. An easy way to generate a fixed output current is to use Manual Output Mode:

- While running, press the ▶ arrow button until the display says MANL.
- Press the ➦ button. The display reads M.CNT.
- Press the ▶ button. The display reads M.INP.
- Press the ➦ button. The display now shows a simulated current process input.

The ▶ and ➦ buttons may be used to raise or lower the simulated process input. Raise the process input to 100°C and then take a Voltage Measurement, which in this example should represent a 20 mA output. For example, if the measured voltage across the output is 8V:

\[ R_L = \frac{(8 \times 70000)}{(70000 \times 0.020 - 8)} = 402.3 \, \Omega \]

This resistance may be used in the equation in Section 3 to determine the Adjusted Currents.