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**MicroMet/AMBCS**
**Using 4-20ma Pressure Transducers with the CR1000 and CR10X**
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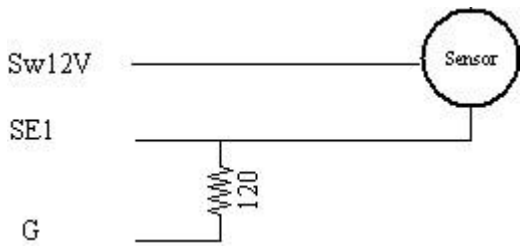
Many fine sensors are available configured to output an electrical current which is proportional to the parameter measured. Often this current output is specified to have a range of four to twenty milliamperes (4-20ma).

One advantage to using current sensors is that they are pretty much immune to signal cable length. The sensor can be located a thousand or more feet distant from the data logger. Another minor advantage is that only two conductors are required for connection to the sensor. This is the case because it is a current loop. The sensor drive current, and its output current are the same.

Since the data logger can only measure voltage (millivolts), and the current transmitting sensor produces proportional current rather than a proportional voltage, we must convert the current to voltage. This is easily accomplished with a simple termination resistor. The output lead (return) of the sensor, terminates through the resistor R, at the CR10X input channel. We have chosen 120 ohms as the termination resistance. This resistor must be a high precision resistor, or it must be selected to be exactly 120 ohms.




For best results, the termination resistor should be placed directly on the input terminals of the CR10X, not in the met tower box.

We now must calculate the sensor slope m, and the voltage offset b from the slope formula:

$m = y_1 – y / x_1 – x$

Where:

m is the voltage slope required for the CR10X
$y_1$ is the head in inches at the sensors maximum (20ma output)

y is no head
$x_1$ is the voltage produced across the termination resistor at 20ma (e=ir = 20 * 120 = 2400)
x is the voltage on the resistor with no head, which is 4ma * 120ohms = 480 millivolts

So, for the 1 psi sensor, terminated in 120 ohms:

m = 27.68 – 0 / 2400 – 480
= 0.01442

The offset b, is the x intercept of 4ma * 120ohms * m = 480 * 0.01442 = 6.920

## Common Pressure Sensor Values

**CR10X with 120 Ohm Resistor:**

| PSI | Feet | Inches | multiplier (m) | offset (b) |
|---|---|---|---|---|
| 1 | 2.307 | 27.68 | 0.01442 | 6.920 |
| 1.5 | 3.460 | 41.52 | 0.02163 | 10.382 |
| 2.5 | 5.768 | 69.20 | 0.0360 | 17.30 |
| 5 | 11.54 | 138.42 | 0.0721 | 34.605 |
| 10 | 23.07 | 276.84 | 0.1442 | 69.21 |
| 15 | 34.60 | 415.26 | 0.2163 | 103.815 |

**CR1000 with 240 Ohm Resistor:**

| PSI | Feet | Inches | multiplier (m) | offset (b) |
|---|---|---|---|---|
| 1.5 | 3.460 | 41.52 | 0.01081 | -10.38 |