

Equation 1: Calculation of CO<sub>2</sub> concentration (ppm<sub>v</sub>) from raw signal voltage, temperature, barometric pressure, and relative humidity.

$$C = \frac{[1 + 0.5w] a_1 \frac{V_s P_o}{[1 + 0.5w]P} + a_2 \frac{V_s P_o}{[1 + 0.5w]P}^2 + a_3 \frac{V_s P_o}{[1 + 0.5w]P}^3 * \frac{T + 273}{T_o + 273}}{1 - w} \quad \text{Where:}$$

C = CO<sub>2</sub> concentration (ppm<sub>v</sub>), V<sub>s</sub> = raw signal voltage (millivolts), T = temperature (degrees celcius), P = barometric pressure (kilo pascals, kPa), and standard pressure (P<sub>o</sub>) is 101.3 kPa. For this IRGA Serial Number IRG2 - 226, T<sub>o</sub> = 35.4 and coefficients for the third order polynomial are a<sub>1</sub> = 0.1424, a<sub>2</sub> = 1.606\*10<sup>-5</sup>, a<sub>3</sub> = 2.695\*10<sup>-9</sup>. w is the mole fraction of water (moles), or the partial pressure of water vapor in air, which is computed from the relative humidity. In LICOR manuals for the 6252 and 6251 w is defined as w=e/p where e = vapor pressure. Vapor pressure is calculated as e=[RH%\*e(T)]/100, where e(T) is the saturation vapor pressure where:

Equation 2: Expression for saturation vapor pressure

$$e(T) = 0.61083 * 10^{\frac{7.6448T}{242.62 + T}}$$

Equation 3:

$$w = \frac{RH\% * 0.61083 * 10^{\frac{7.6448T}{242.62 + T}}}{100}$$

Equation 4:

$$CO_2 Flux Density \frac{mgC}{m^2 hr} = CO_2 \frac{\mu mole}{mole - min} \times 1.5176 \frac{kg}{\mu mole} \times 1.293 \frac{kg}{m^3} \times ChamberVolume(m^3) \times \frac{1}{ChamberArea(m^2)} \times 60 \frac{min}{hr} \times 0.2727 \frac{gC}{gCO_2}$$

Figure 8. Equations used to calculate CO<sub>2</sub> concentration and make corrections for temperature, vapor pressure and boarometric pressure.