Principle Behind the CO_2 Correction Factor

The BreathTrackers SC and H2+ utilize a CO_2 correction factor technique to minimize error caused by improper sampling techniques. The CO_2 correction factor is based on the concept that carbon dioxide is present in alveolar (lung) air at a virtually constant concentration; while CO_2 in room air is virtually zero (in fact it is present, but in extremely trace concentrations). Therefore, if an alveolar air sample is accidentally contaminated (mixed) with room air, the CO_2 concentration in the sample will be reduced, as will any other trace gases in the sample (in our case H_2 and/or CH_4). By knowing the degree to which the CO_2 is diluted, it is possible to apply a correction to the analysis of each trace gas of interest (again in our case H_2 and/or CH_4), and be able to estimate the "true alveolar" concentration of these trace gases. The sample concentrations of H_2 and/or CH_4 are multiplied by the factor calculated from:

FACTOR = Alveolar CO_2 concentration/Sample CO_2 concentration

CO_2 is the physiological regulator of breathing, and the whole breathing system is dedicated to keeping the alveolar CO_2-pressure ($PACO_2$) constant at 40 mm Hg (torr). Therefore CO_2 is the most reliable "normalizing" component in the sample, because it ordinarily has the most constant alveolar composition of any gas in the sample.

Alveolar PCO_2 remains constant at 40 torr among normal individuals if ventilation is normal. The percent of CO_2 in an alveolar sample is affected by the barometric pressure (altitude) at which the sample is collected. Alveolar air with a PCO_2 of 40 torr in Miami (at sea level) will have a CO_2 concentration of about 5.5% in dry air (40/(760-37)), while alveolar air in Denver (where barometric pressure is closer to 625 torr) will be near 6.8% (40/(625-37)). Significant differences in barometric pressure exist at different altitudes, as demonstrated by Miami and Denver. However, using a single correction factor, alveolar concentration will simplify the process without introducing significant error, because all the samples will be normalized to the same (constant) CO_2 level.

Research studies, using an alveolar concentration of 5.5% will be adequate for calculating the correction factor for CO_2. However when the absolute alveolar pressure for the trace gases is important, you may adjust the instrument to your specification.

CO2 (Correction Feature) for Methane (CH4) is only available on the BreathTracker SC.