Application Corner

Pulse Oximetry is a state-of-the-art, non-invasive method of determining the percentage of hemoglobin (Hb) saturated with oxygen. Hemoglobin is the oxygen-carrying constituent of blood. Knowing what percentage of the hemoglobin is saturated with oxygen is important when providing anesthesia or for determining the effectiveness of the respiratory system as well as helping in diagnosing various illnesses. A pulse oximeter measures the absorption of red and infrared light passed through a patient's finger or ear lobe by utilizing light sensors. Hemoglobin that is carrying oxygen (oxy-hemoglobin) absorbs Infrared wavelength of light and hemoglobin not carrying oxygen (deoxy-hemoglobin) absorbs visible RED wavelength. Backgrounds such as fluid, tissue and bone are factored out of the measurement by monitoring the steady state absorption from bone, tissue, venous blood and arterial blood. LEDs are used as the light source and are sequentially pulsed at a rapid rate. During an arterial pulse there is an increase blood volume and this AC component is used to calculate the absorption of oxy and deoxy hemoglobin. From this data the pulse oximeter does the mathematical calculations based on the Beer-Lambert Law to determine the percent oxygen saturation of the blood. See Figure 1.

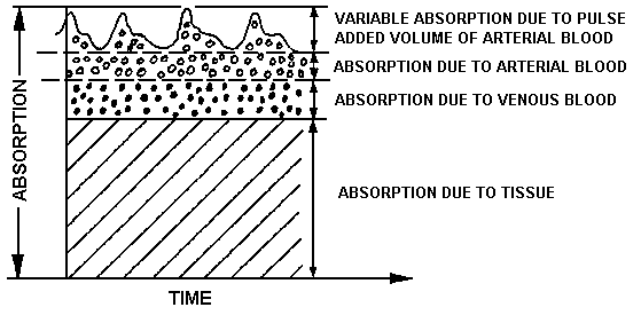

Figure 1

Pulse Oximetry is performed by placing a clip that contains the 2 LEDs and the light sensor either on the patient's finger or earlobe. The clip is connected by cable to a microprocessor unit. One of the LEDs emits red light (600-700 nm) and the other near infrared (800-940 nm). A photodiode has been the light sensor of choice in the past but we are now seeing a growing interest in using either a **TAOS** Light-to-Voltage Converter or Light-to-Frequency Converter. Both devices offer benefits over the photodiode including less susceptibility to noise. When using a photodiode a good deal of effort is placed in shielding the photodiode typically using wire mesh this adds to the cost. The light to frequency converter is particularly attractive in this regard because the output is not analog but digital in nature. Additionally the light to frequency converter has a very large input dynamic range and provides the capability of making high-resolution measurements.