

Problem Set 1

Due Thursday, Jan. 23

1. The data sheet for a bar graph meter can be found at the Web site <http://www.laurels.com/probarseries.htm>. Based on the information provided for this device, estimate the sensitivity, precision, and resolution of the instrument that has a range of 0- 10 V. Can you suggest some applications where the bar graph display would be preferred over a digital readout where numbers are presented, and can you suggest other applications where the digital readout is to be preferred?
2. There are many instruments that are used in science and engineering as well as medicine. Problem #1 gave an example of a component that is a readout from an instrument, but it did not consider an entire instrument. Using sources of information such as the World Wide Web, catalog sheets for instrumentation, or advertising in technical publications that give specifications, select an instrument such as a mercury and glass thermometer or something as simple as a tape measure and provide a one page copy of the data sheet for that instrument or some of the information provided on the Web page. Based upon that information identify several characteristics of the instrument such as its range of measurement, accuracy, precision, resolution, and a potential BME application of this where these variables can be taken to advantage.
3. Noise is a serious problem in biomedical measurements. Often this noise is interference from the 60 Hz ac power lines. An amplifier used to measure an electromyogram (EMG) with a maximum amplitude of $90 \mu\text{V}$ has a gain of 10^3 . Three mV of 60 Hz interference is seen at the amplifier's output whenever it is used. What is the voltage signal-to-noise ratio for this amplifier when it measures the EMG?