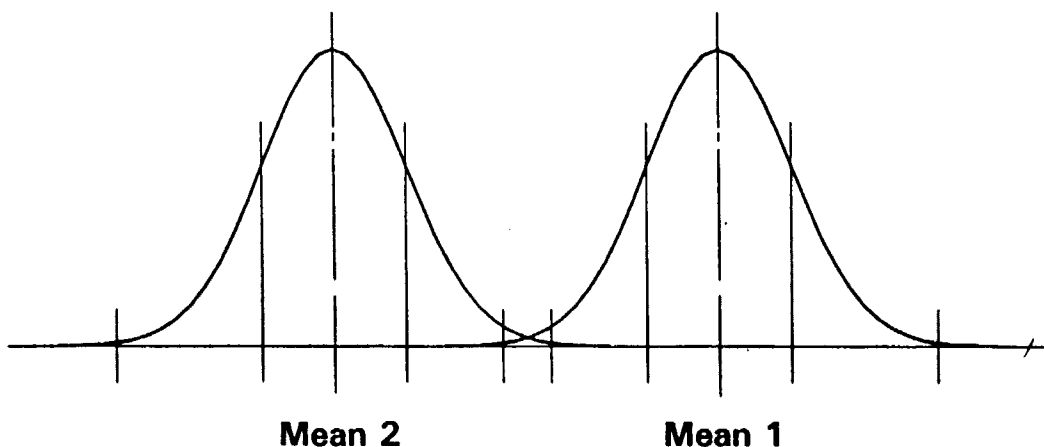


BIAS - PRESENCE OF SYSTEMATIC ERROR

Sometimes small systematic errors are ignored. That implies:

- Systematic error is lumped in with random error. That can be inconsequential if the systematic error is small compared to the random error. (The aggregate behavior of multiple systematic errors acquires random error characteristics.)
- The mean of a group of measurements is really not where it should be. The difference has been called a bias and is illustrated below. Statistical evaluation of a bias is part of Hypothesis Testing (beyond the scope of this seminar).



Say, for example, an EDM1 was used to measure a distance repeatedly. The first group of measurements was made with an incorrect setting for atmospheric correction dialed into the instrument and yielded a mean of 687.32 m with a standard deviation of 0.032 m. The second group of measurements was made with the correct ppm setting and yielded a mean of 687.12 m for the distance. The standard deviation for the second measurement is the same as for the first one because the measurement environment was identical.

Separately, the same distance was measured with GPS. Draw a curve on the diagram above to show a GPS distance of 687.16 m with a standard deviation of 0.008 m. What inferences can be made from the diagram?