Accuracy & Precision
Repeatability & Reproducibility
Stability

In Part I...

- Metrology is the science and study of measurement.
- Metrology is important to cohesiveness.
- NIST defines standard units.
- Traceability shows degrees of separation from NIST standards (traceability chain).
- Calibration is the comparison of measurement values from a unit under test and a NIST traceable standard with known accuracy.

In Part II...

- Accuracy & Precision
- Repeatability & Reproducibility
- Stability

Definition of Accuracy

How close a given set of measurements are to their true value.

In calibration, we define accuracy as…

Scenario:

Suppose you're testing a pump. What standard are you using?

The unit is set to 220 RPM. The standard reads 225.3. Is this accurate?

Definition of Precision

A description of random errors & a measure of statistical variability.

Scenario:

Suppose you are testing a 500kg floor scale. What standards did you bring?

Which part of the calibration tests the precision of the instrument?

Accuracy or Precision?

Assume that you work for a recording company that is recording the new Guns 'n Roses album. We can express each sound with a frequency, and frequency can be measured in Hertz or Hz. Suppose that you check your recording equipment. You know that the true frequency of a sound that comes from an instrument is 428 Hz. You measure this sound with your recording device 5 times, which shows the following measurements: 312, 311, 313, 311, 312 Hz. **Is this device accurate, precise, both, or neither?**

Accuracy or Precision?

Suppose that you decided to swap that equipment for some other recording equipment. Again, you know that the true frequency is 428 Hz. You measure this sound with your recording device 5 times, which shows the following measurements: 428, 311, 250, 507, 108 Hz. **Is the new equipment accurate, precise, both, or neither?**

In calibrations, do we use precision OR accuracy OR both?

Repeatability vs. Reproducibility

Which one is which?

- The variation in measurements when the same person measures the same thing under the same conditions.
- Internal Consistency

- Variations in measurements when someone else measures.
- External Consistency

Stability

Stability refers to the capacity of a measurement system to produce the same values over time when measuring the same sample. As with statistical process control charts, stability means the absence of "Special Cause Variation", leaving only "Common Cause Variation" (random variation).

Camera to Camera

Based on what you've learned, what concepts do we rely on for determining stability?