# Instrument Validation Report
**For**
# Vernier BAR-BTA Barometer


**Abstract**

In our experiment we tested a Vernier BAR-BTA Barometer, made by Vernier Software and Technology, for validation as a sensor in the overall project. We measured air pressure in our classroom trying to calibrate one barometer with another, and ended with good results. Resolution was +/- .05kPa, Accuracy +/- .25kPa, and Precision +/- .15kPa.



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# Vernier Barometer

## Purpose

The intent of the project started and completed by our group was to calibrate a barometer to make sure that it is accurate over many trials and measures out measurements very precisely. Words that define our goals are accuracy, precision, and resolution tests.

## Method

Resolution can be found just in the first trial by looking at the calculations, and precision just by completing numerous trials and measuring the difference in each trial. However, to get accuracy one has to get the real value for pressure in your location. Our first thought was to find a mercury barometer and compare results with that using a remote terminal with the computer. Our plan was foiled though when we found that all the mercury barometers had been taken off campus a year earlier. The next idea was to go to an airport or weather station and check there mercury barometer, but we didn't have enough time to travel to their locations. The only option left was to just use another electronic barometer and compare the results.

The experiment procedure was we set the whole collection to go on for 600 seconds and take a measurement each 5 seconds. Placing both barometers nest to each other facing the same direction they would measure the same air pressure.

## Prediction

One could predict that the precision and resolution would be perfect already, but since the barometer had been calibrated originally somewhere else it should be calibrated here in order to get accurate results. Prior use of the equipment has led us to believe that resolution will be +/- .05kPa and precision will be +/- .08kPa also. Accuracy could range tremendously depending on the altitude of the producer of the barometer, and in order to calculate a prediction we would need to know this information along with the average air pressure here in Paso.

## Actual Data

**Precision** - 99.5kPa, 99.4kPa, 99.4kPa, 99.3kPa, 99.6kPa- average of each trial.

**Accuracy**- 99.4kPa, 99.6kPa- numbers taken from graph after 1 minute taken to settle.

## Analysis

**Precision** - 99.5kPa, 99.4kPa, 99.4kPa, 99.3kPa, 99.6kPa- average of each trial.
Average = 99.44kPa, average, - 99.6kPa, greatest value, = -.16kPa, 99.44kPa, average, - 99.3kPa, least value, = +.14kPa
+/- .20kPa, a greater value that .14kPa and .16kPa

**Accuracy**- 99.4, 99.6- average of both barometers going at same time.
+/- .25kPa, difference in the two, give or take

**Resolution**-the barometers take the decimal out 2 places.
+/- .05kPa, read out of program

During the testing, we realized that the data that we were receiving from one of the barometers was slightly different from the other barometer. Even though they were measuring at the same time, they didn't agree. We didn't expect them to read the same. We assumed that they weren't calibrated the same which would result in different data. We assumed one of them to be correct. The correct barometer was used to calibrate the wrong one. As a result we have two barometers that may be calibrated to the wrong pressure, but at least they are the same.

## Conclusion

In conclusion, we believe that we have achieved our goal to get acquainted with the barometer and to calibrate it to a common number. Sources of error could include: calibration to the wrong number, positioning problems, and changes in pressure in the room such as doors opening, air conditioners, and fingers in front of the sensor.