

Understanding Specifications, Part II...The Sequel:

A customer recently came to us with a question on an *Agilent* 34401A multimeter.

With the unit measuring a known AC signal (sine wave at 1 kHz) of approximately 180 mV and the meter set to the millivolts position, the unit reading was fine: 00.178,6 VAC (interpreted as **178.6 mV**).



As soon as the range of the multimeter was changed to the higher (ACV) position, the display went to 000.040 VAC (interpreted as **40.0 mV**). The input signal had not changed.



Was there something wrong with the meter?

The banner (1-year) specification for the unit is $\pm (0.06 \% \text{ of reading} + 0.03\% \text{ of range})$, which seems very accurate!

Reading further, we found a footnote stating that, "inputs from 1% to 5% of range and < 50 kHz, add 0.1% of range additional error."

However, our measurement was lower than 1% of the full-scale value of the unit (in the higher ACV range).

So, we investigated further and found the statement in the operator's manual that read, "For ac voltage and ac current measurements, note that the smallest value that can be measured is different from the sensitivity. For the *Agilent 34401A*, these functions are specified to measure down to 1% of the selected range. For example, the multimeter can measure down to 1 mV on the 100 mV range."

Using that example, the lowest value that should be read on the 750 VAC range would be 7.5 VAC.

The lessons and warnings from this example are:

- 1) Generally speaking, for the highest accuracy, you should use the lowest range possible for the measurement.
- 2) There's more to interpretation of the specifications than the "banner" numbers. The manual(s) must be read completely.

It was ultimately determined there was nothing wrong with the meter.

Submitted by Tim Cooke
October 2017

Page 2 of 2

HQ/East Coast: 20 Republic Road, N. Billerica, MA 01862
Midwest: 9224 Grand Ave., Franklin Park, IL 60131
www.repaircalibration.com
Phone: 800-447-4020 Fax: 978-667-8901