TECHNICAL NOTE: NOISE DISCUSSION

PURPOSE: To determine the limitation to sensor resolution with regard to electrical noise present in the sensor. This test was done on an experimental 10 INCH TE device but is representative of other sensors manufactured by All Sensors.

APPLICATION: Breathing monitor where resolution of 1 in 60,000 is desired.

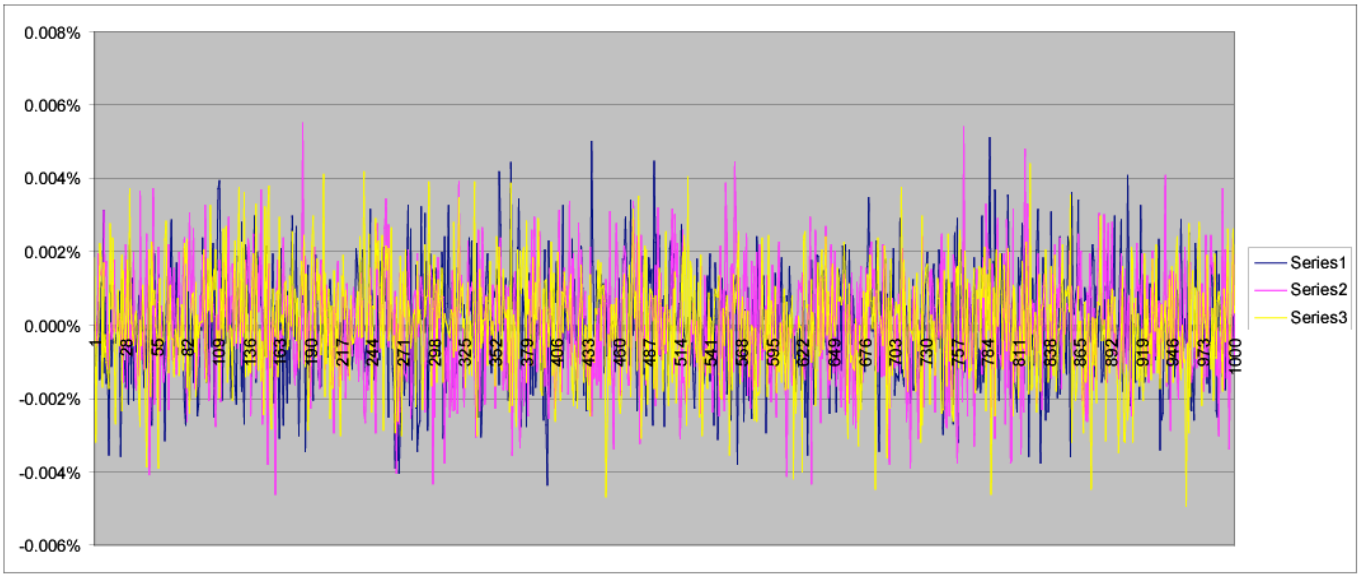
DISCUSSION AS REPORTED:
I decided to go back in the production area and take a look at a basic device with our manufacturing Kiethley DMM (and Kiethley software). It turns out we can get data with that program over an IEEE bus at a rate of 41Hz (24mS per sample)....not the data rate of your target system but faster than the over-sampled digital device...

I used coax lead clips (coax cable with about 2" and 4" lead clips (not really so good but available) for measuring.

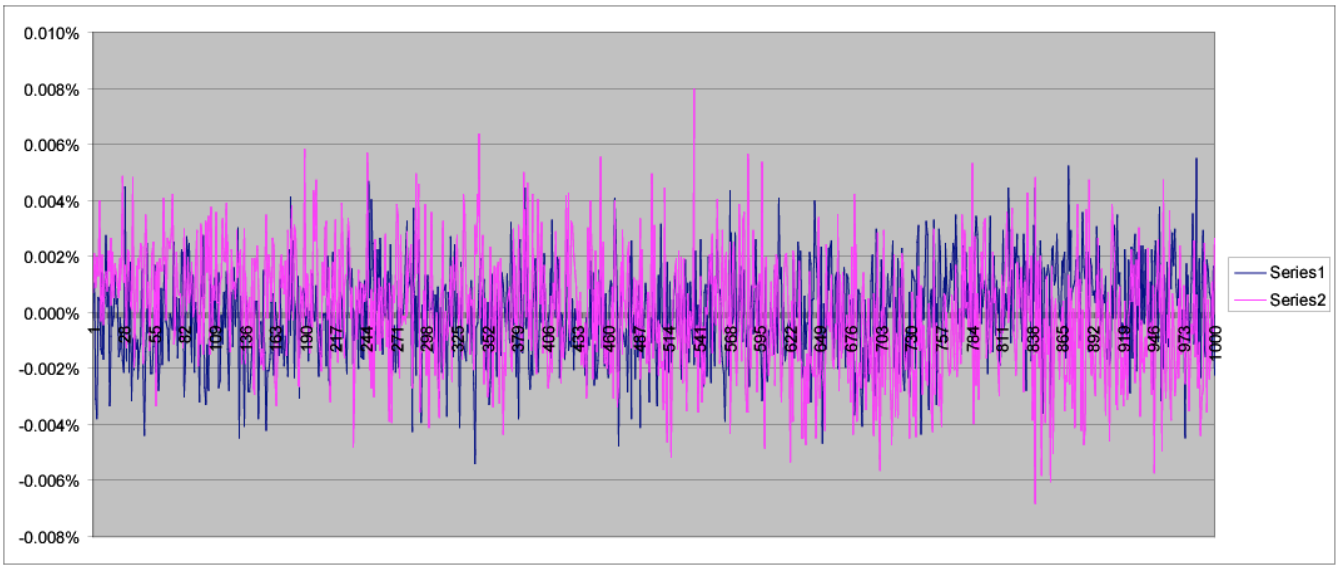
The background noise was measured with the clip leads connected together.

Here are some graphs...normalized to the sensor FS sensitivity...the sensor was a 10 INCH TE device, single die.

1) Background noise levels (three runs of 1000 data points)...

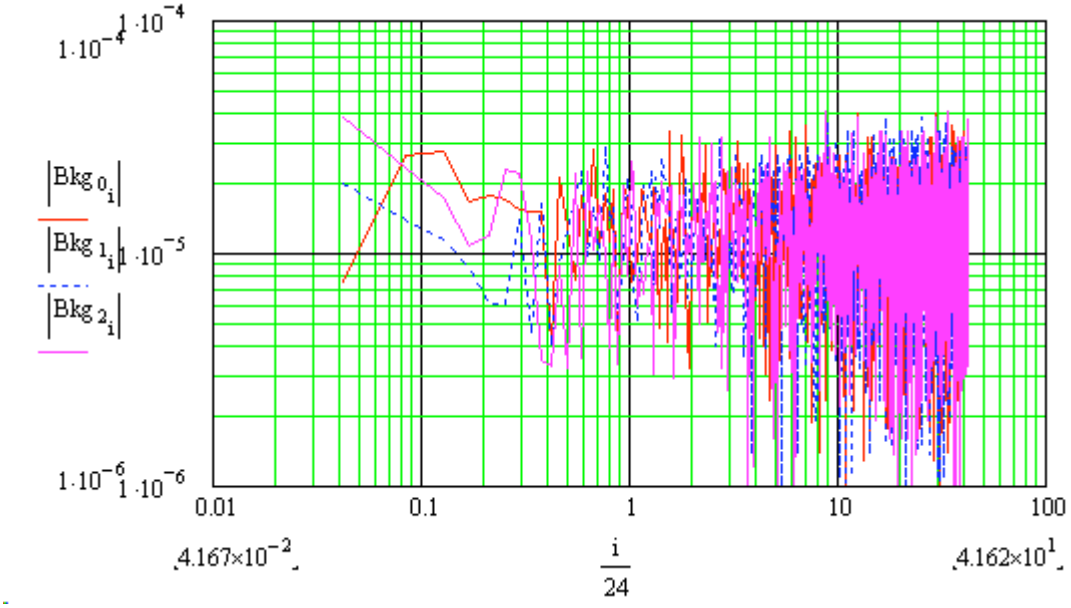


2) Sensor output (2 runs of 1000 points)...

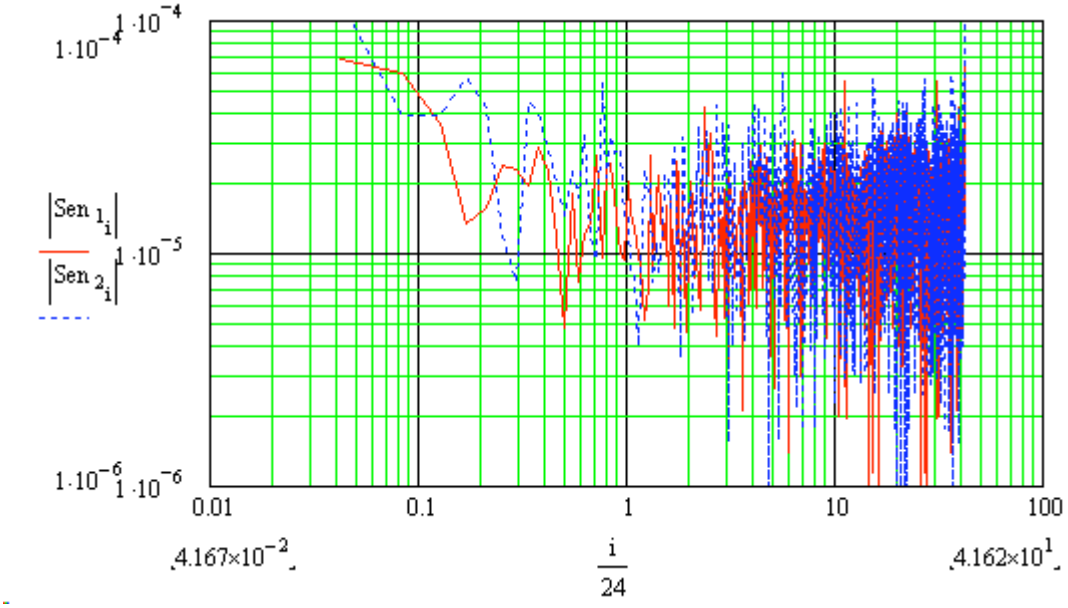


The background level is pretty close to the sensor noise level so here's some FFT info....X-axis is frequency (Hz), Y-axis is noise level relative to full scale (like percentage but MathCAD doesn't have axis format display options)...

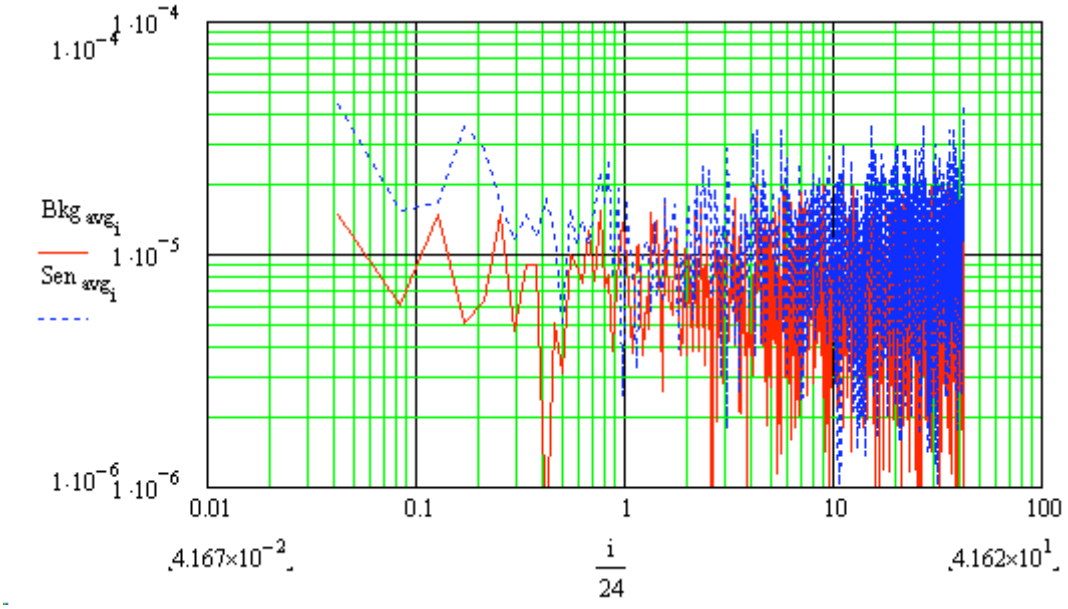
3) Background level (using CFFT function in MathCAD)



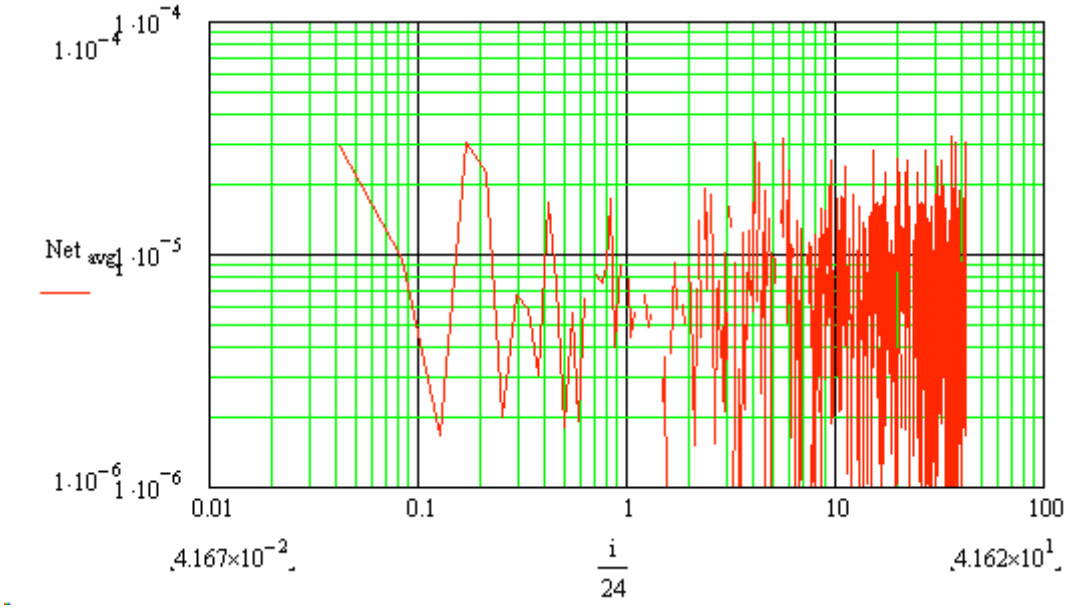
4) Sensor runs (CFFT)



5) Averages of the three background runs compared to average of both sensor runs...



6) Difference between average sensor and average background...



For the last graph above (#6), note the magnitude in the 0.1 Hz~0.02 Hz can be construed with noise where it may actually be small temperature shift or warm-up shift. I let the sensor stabilize for about 10 minutes before running the data but regardless, there is no temperature compensation done on the device.

The only conclusion that I can come up with is that the sensor noise is not significantly greater than the Kiethley background noise. I guess this is good news in itself.