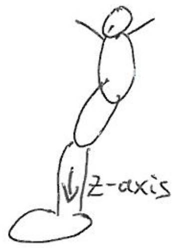
Thoughts about acceleration trace z-axis: 9.02.15

- According to the GaitWatch manual the positive z-axis is pointing towards the ground



- So, the acceleration signal should attain +1g if the patient stands still, because the shank is nearly parallel to the Earth's gravity vector

- Typical trace of z-axis of acceleration

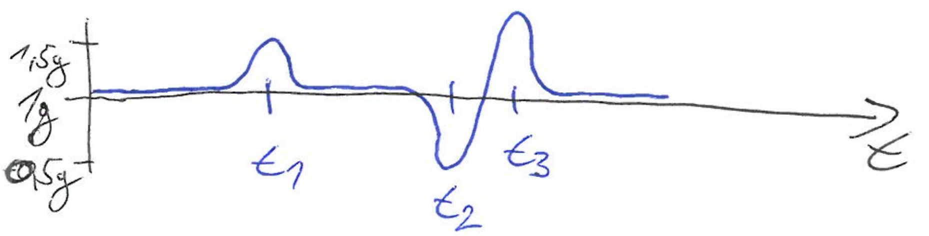


Fig. 1

Initial interpretation:

t_1: Patient lifts his shank to initiate the step

t_1 to t_2: Patient moves his shank parallel to the ground (relative acc. = 0)

t_2: Patient lowers his leg and accelerates it towards the ground

t_3: Patient touches the FP and strongly decelerates the shank

- assuming that the orientation of the axis is incorrect the entire signal would have to be multiplied with -1.
  -> also confer page 12 of 16 in the ADXL335 datasheet

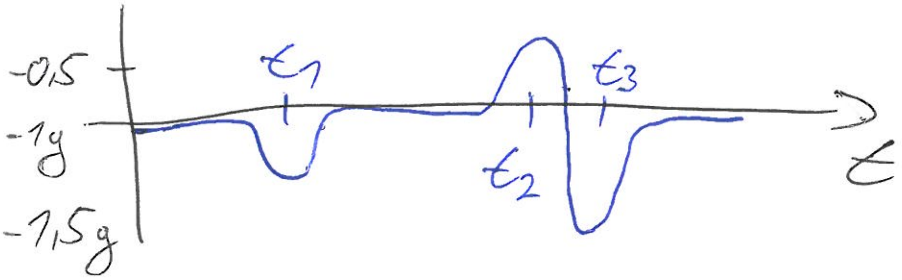


Fig. 2

- still the ~~amp~~ direction of the amplitude is not consistent with the direction of the acceleration at rest.

=> That means this cannot be the mistake!

- Having a look at figure 1 the value of 1g at rest suggests that the positive z-axis points towards the ground, but when you then start lifting up your leg against the ~~positive~~ z-axis the peak should be negative (that is, pointing downwards in the graph)

USE WITH OPERATING VOLTAGES OTHER THAN 3 V

The ADXL335 is tested and specified at $V_S = 3$ V; however, it can be powered with V_S as low as 1.8 V or as high as 3.6 V. Note that some performance parameters change as the supply voltage is varied.

The ADXL335 output is ratiometric, therefore, the output sensitivity (or scale factor) varies proportionally to the supply voltage. At $V_S = 3.6$ V, the output sensitivity is typically 360 mV/*g*. At $V_S = 2$ V, the output sensitivity is typically 195 mV/*g*.

The zero *g* bias output is also ratiometric, thus the zero *g* output is nominally equal to $V_S/2$ at all supply voltages.

The output noise is not ratiometric but is absolute in volts; therefore, the noise density decreases as the supply voltage increases. This is because the scale factor (mV/*g*) increases while the noise voltage remains constant. At $V_S = 3.6$ V, the X-axis and Y-axis noise density is typically 120 μ*g*/√Hz, whereas at $V_S = 2$ V, the X-axis and Y-axis noise density is typically 270 μ*g*/√Hz.

Self-test response in *g* is roughly proportional to the square of the supply voltage. However, when ratiometricity of sensitivity is factored in with supply voltage, the self-test response in volts is roughly proportional to the cube of the supply voltage. For example, at $V_S = 3.6$ V, the self-test response for the ADXL335 is approximately −560 mV for the X-axis, +560 mV for the Y-axis, and +950 mV for the Z-axis.

At $V_S = 2$ V, the self-test response is approximately −96 mV for the X-axis, +96 mV for the Y-axis, and −163 mV for the Z-axis.

The supply current decreases as the supply voltage decreases. Typical current consumption at $V_S = 3.6$ V is 375 μA, and typical current consumption at $V_S = 2$ V is 200 μA.

AXES OF ACCELERATION SENSITIVITY

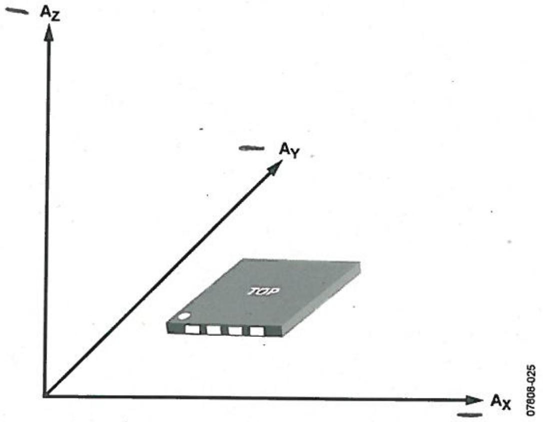


Figure 23. Axes of Acceleration Sensitivity; Corresponding Output Voltage Increases When Accelerated Along the Sensitive Axis.

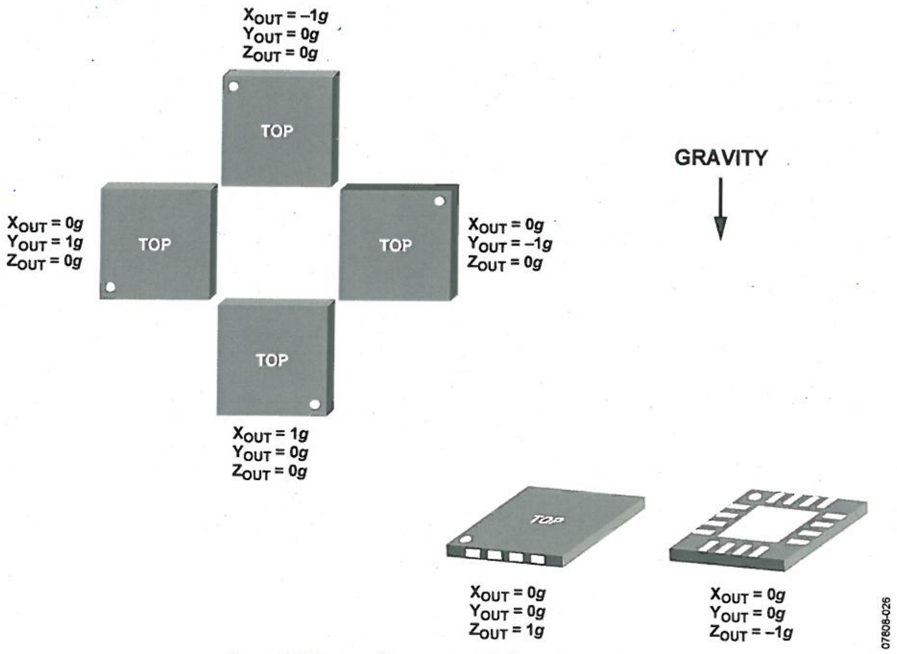


Figure 24. Output Response vs. Orientation to Gravity

Also on GitHub in Documents/Hardware Info/

... Datasheets