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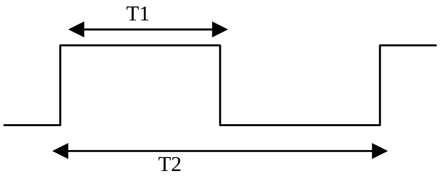
The output of an ADXL202 looks like this



The value of acceleration for a perfect ADXL202 is defined as

(the ratio of Tl/T2now) - 50% divided by the range of Tl/T2 from 0 to 1g

The 50% value is modified to be the true mean between T1 max and T1 min

i.e. (T1 max +T1 min)/2 divided by T2

The range is (T1max – T1min)/2 divided by T2

$$Acceleration = \frac{\frac{T1now}{T2now} - \left(\frac{T1\max now + T1\min now}{2*T2now}\right)}{\frac{T1\max now - T1\min now}{2*T2now}} -$$

$$= \left(\frac{T1now}{T2now} - \left(\frac{T1\max now + T1\min now}{2*T2now}\right)\right) * \left(\frac{2*T2now}{T1\max now - T1\min now}\right)$$

by calling $(T1\max + T1\min)$ a constant, ie K2

and $(T1\max - T1\min)$ a constant, ie K3

the formula becomes

$$\left(\frac{T1now}{T2now} - \frac{K2}{2*T2now}\right) * \left(\frac{2*T2now}{K3}\right)$$

Multiplying through by

$$\left(\frac{2*T2now}{K3}\right)$$

gives

$$\frac{2*T2now*T1now}{K3*T2now} - \frac{K2*2*T2now}{K3*2*T2now}$$

cancelling gives

$$\frac{2*T1now}{K3} - \frac{K2}{K3}$$

which equals -

$$\frac{(2*T1now - K2)}{K3}$$

This is only true at all temperatures if there are no temperature effects, but is always true if the constants are changed to reflect their true values at the appropriate temperature.

To take the changes into account, the values of T2, T1max and T1min were measured at two temperatures, as far apart as possible:
The values of K2 (T1max+T1min) and K3 (T1max-T1min) and T2 for both the X and Y channels, for each of the two temperatures(*cold* and *hot*) are stored in the PIC eeprom.

From these the corrected values of K2 and K3 at the current value of T2 are calculated as follows.

K2 at current measured value of $T2_{now}$

$$K2 = K2_{cold} + \frac{(K2_{hot} - K2_{cold}) * (T2_{now} - T2_{cold})}{(T2_{hot} - T2_{cold})}$$

K3 at current measured value of $T2_{now}$

$$K3 = K3_{cold} + \frac{(K3_{hot} - K3_{cold}) * (T2_{now} - T2_{cold})}{(T2_{hot} - T2_{cold})}$$