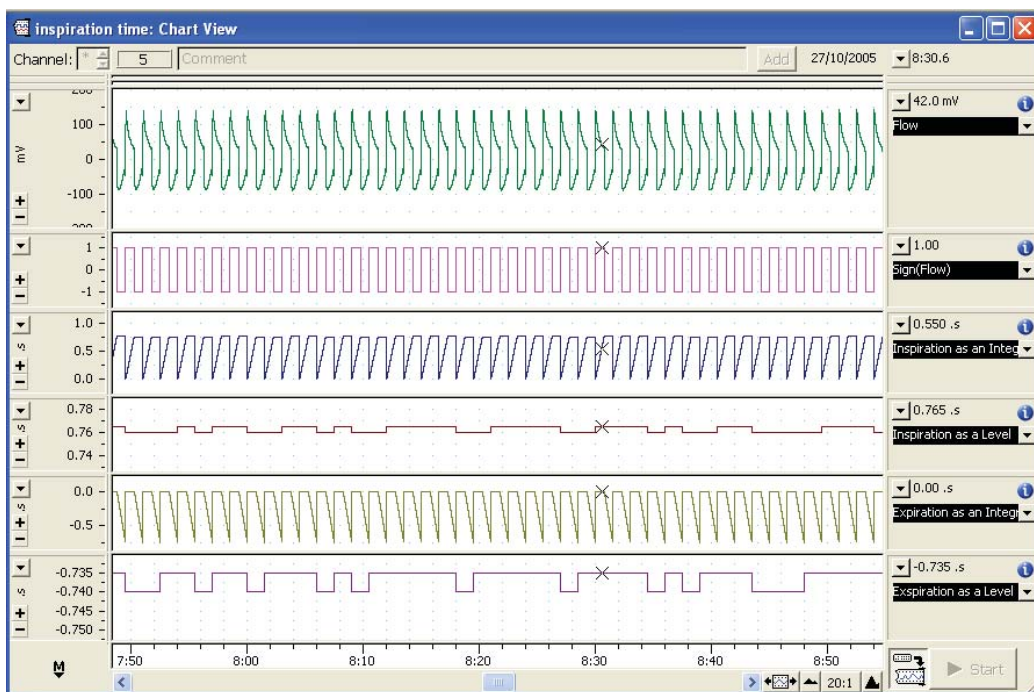


Cyclic signals can be separated into two parts above and below a threshold level using the Sign (“operand”) function available in the Arithmetic window in Chart. The Sign function displays unity whenever the operand is zero or positive and minus one whenever the operand is negative. For example, to discriminate a signal Channel 1 to parts above and below 1 V, the Arithmetic function in a second channel can be setup like $Ch2=Sign(Ch1-1)$. Whenever the signal in Ch1 is below 1 V, Ch2 is -1 and whenever Ch1 is above 1 V then Ch2 is +1. To make Ch2 a step function between 0 and 1, then set up the Arithmetic function as $Ch2=(Sign(Ch1-1) +1)/2$

By separating signals into parts above and below a threshold it becomes easier to determine the length of time that a signal remains above or below the threshold. This may be cyclic signals such as respiration airflow where the duration of inspiration and expiration can be a parameter of interest, or even the duration of pulse.



The above example shows the airflow recorded from a pneumotach. The top channel is a respiratory airflow signal that has been filtered to remove any jitter in the signal. A low pass filter in Chart’s Digital Filters has been used to smooth the signal.

The second channel discriminates the airflow signal by using $Ch2=Sign(Ch1)$ function. For an airflow signal convention usually has inspiration as a positive signal and expiration as a negative signal. Ch2 shows breathing split into a step function where inspiration is unity and expiration is negative one.

Integrating the positive and negative parts of the Ch2 give the inspiration and expiration time of each breath. Ch3 uses Chart’s Integral function Integrate Positive Ch2 and reset each cycle to display the inspiration time as a series of plateaus.

Ch4 uses Cyclic Measurements to show the peaks as level using the cyclic maximum command.

In a similar manner Ch4 uses Chart’s Integral function Integrate Negative Ch2 and reset each cycle to display the expiration time as a series of negative peaks. Ch5 uses Cyclic Measurements to show the negative peaks as levels using the cyclic minimum command.