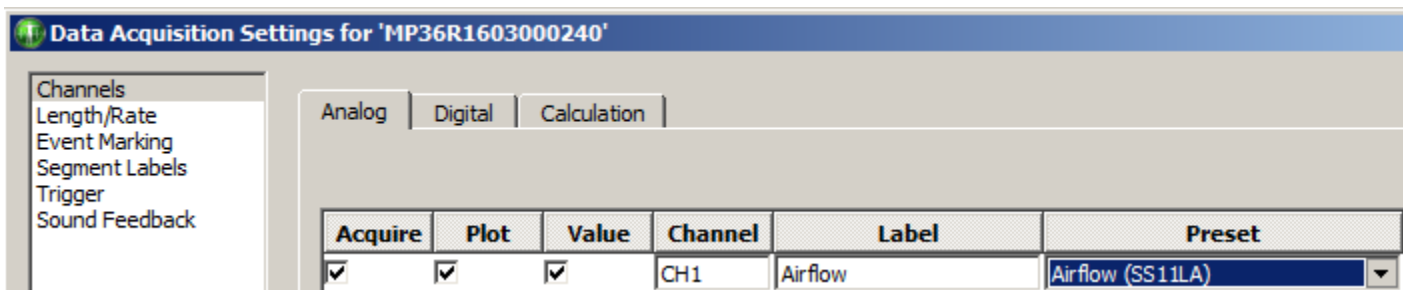
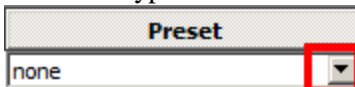


Application Note 181 Producing and Integrated Airflow Signal

Overview

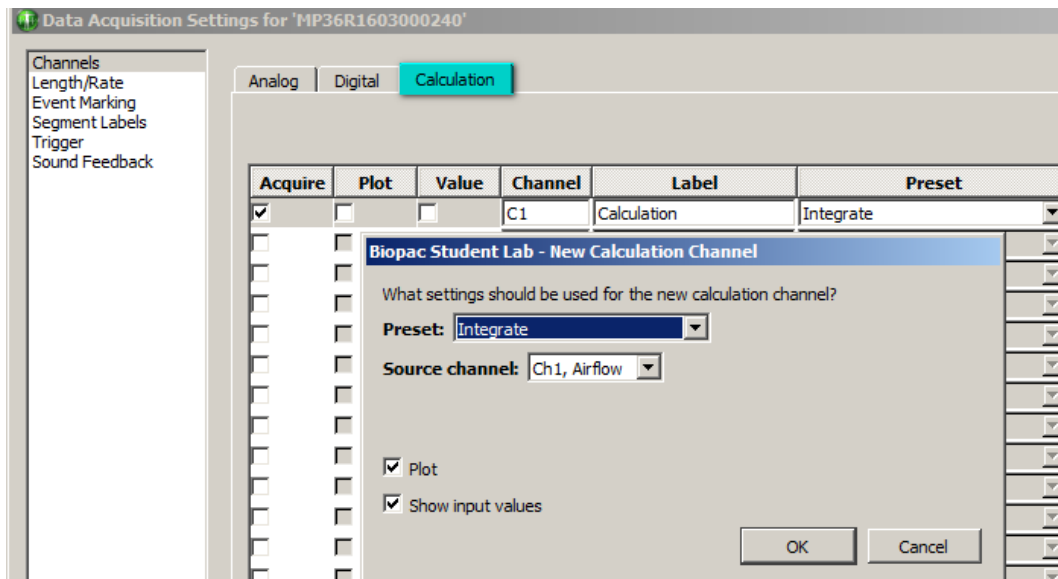
Biopac Student Lab software with MP36/35/45 (or AcqKnowledge software with MP36R) includes a very useful integration tool within the Calculation Channel menu. Using the Integrate function, you will be able to calculate airflow volume. It's necessary to calibrate the airflow transducer before proceeding with this application. If unsure of the calibration procedure, please see Application Note 135.

After completing the calibration procedure, choose the MP36/35/45 menu and select Set Up Data Acquisition > Channels. Select the type of airflow transducer being used (SS11LA or SS11LB) from the **Preset** pop-up menu (click the arrow).



To add the Integration Calculation channel:

1. Click the Calculation tab and check the **Acquire** box.
2. Choose **Integrate** from the New Calculation Channel pop-up menu and click OK.



If performing Airflow acquisition at a slow resting pace, the default Integrate preset should work fine. If the integrated data is mis-triggering or inaccurate, it may be necessary to adjust the Reset Thresholds.

With the Threshold set at 0 (as shown at top left of the following page), the Integration function will automatically reset itself every time data crosses the Threshold in either the Positive or Negative direction. This can occur due to excessive EMG artifact, or an array of noises often encountered when acquiring respiratory data. By setting the Reset Thresholds above and below the artifact, it's possible to control the triggering process and acquire an accurate integrated signal.

Biopac Student Lab - Online Transformation - Integrate

Destination: C1, Integrate setup Volts

Label: C1 - Integrate

Source channel: Ch1, Airflow liters/sec Scaling...

Preset: none

Option

Average over samples Reset via channel Timed reset

Control Channel: Ch1, Airflow

Reset thresholds

LOW 0.000000 liters/sec

HIGH 0.000000 liters/sec

Reset trigger

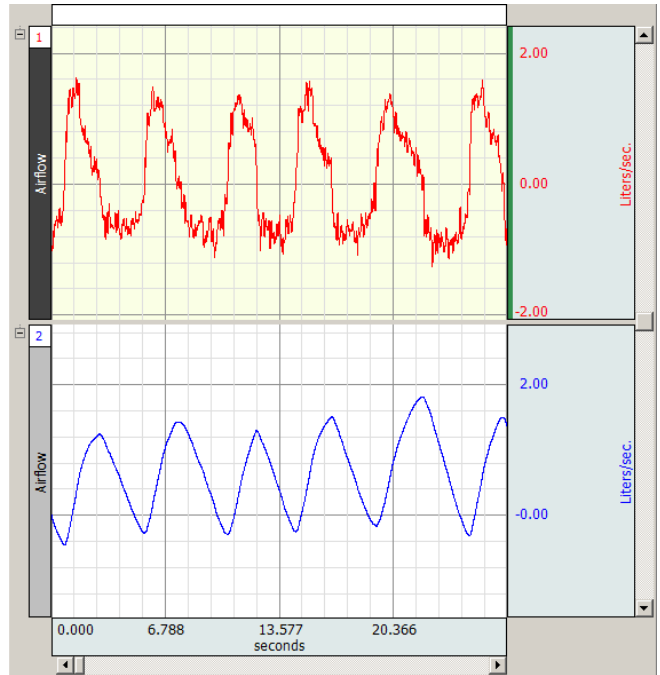
Positive Mean subtraction

Negative Output reset events

Max cycle period 1.000000 sec

New Preset OK Cancel

Default Integrate Settings



The above diagram shows a screenshot of the raw airflow data and the integrated flow (volume).

If you encounter a wandering baseline, use the Mean subtraction function to alleviate the problem.

Biopac Student Lab - Online Transformation - Integrate

Destination: C1, Integrate setup Volts

Label: C1 - Integrate

Source channel: Ch1, Airflow liters/sec Scaling...

Preset: none

Option

Average over samples Reset via channel Timed reset

Control Channel: Ch1, Airflow

Reset thresholds

LOW 2.000 liters/sec

HIGH 5.000 liters/sec

Reset trigger

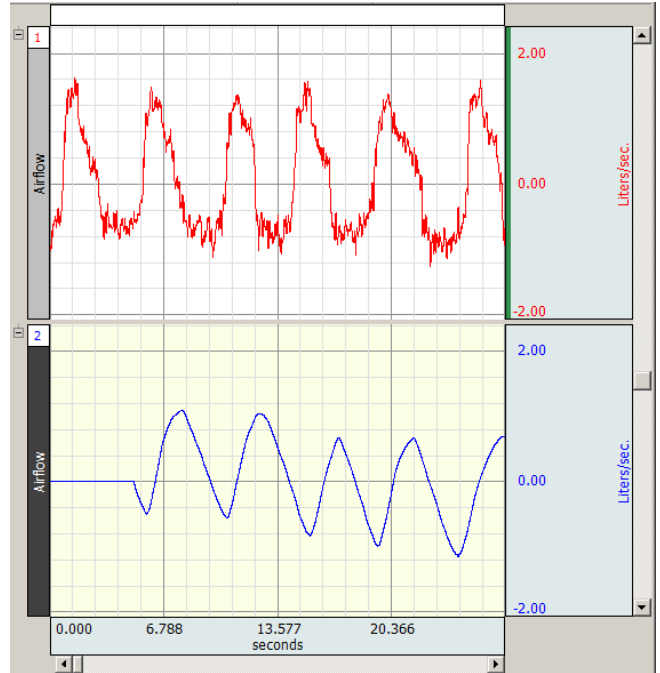
Positive Mean subtraction

Negative Output reset events

Max cycle period 5.000000 sec

New Preset OK Cancel

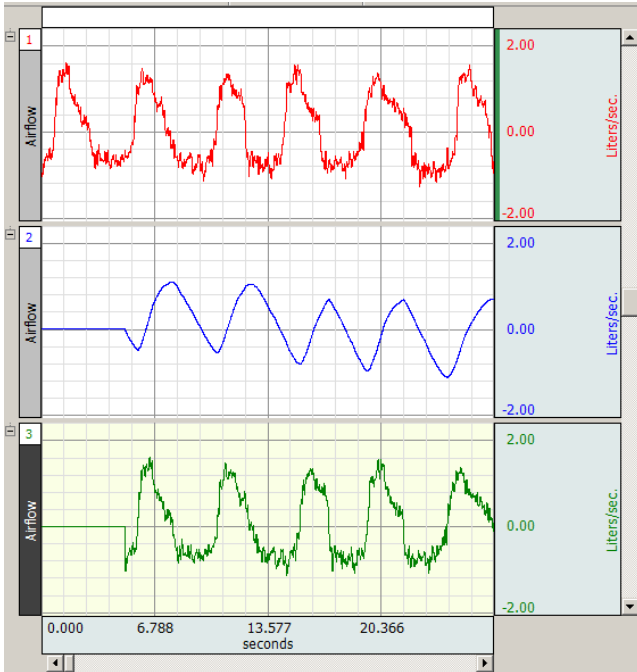
Integrate Settings with modified Reset Thresholds, Mean Subtraction and Max Cycle Period



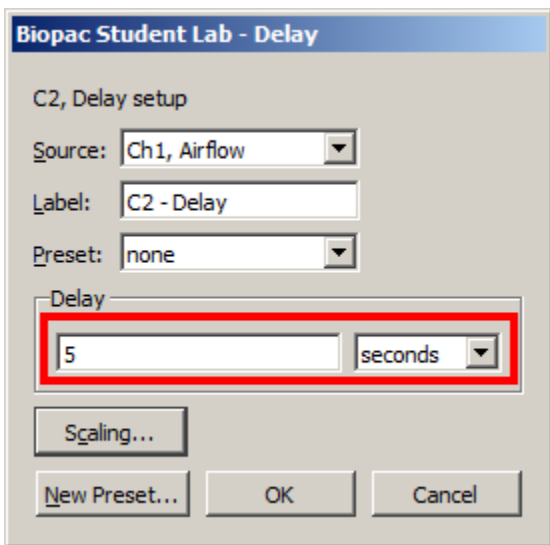
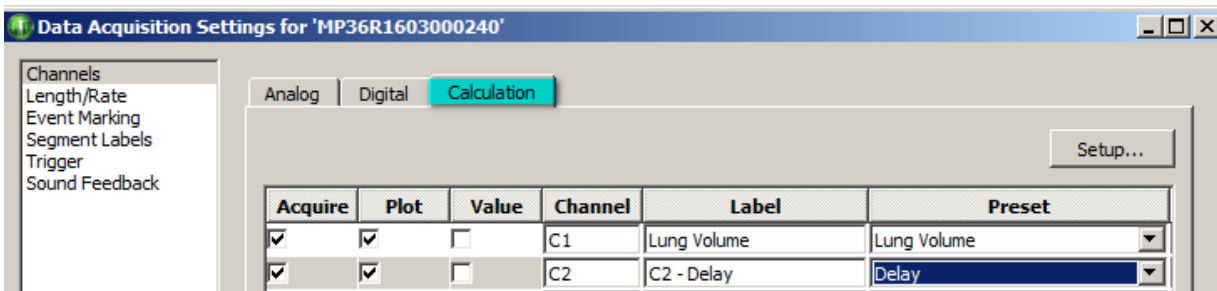
The above diagram shows the airflow data with the integrated flow using the Mean Subtraction function. Notice the random delay in the integrated channel created by the Mean Subtraction.

The Mean Subtraction function is particularly useful for removing the offset from certain transducers. Unfortunately, this function creates a delay before the integration calculation is performed. The software will read a complete respiratory cycle and perform a mean subtraction calculation; thus forcing the data to stay cycling on the 0 baseline where it was first initiated.

To synchronize the two signals, enter a Maximum cycle period. The Maximum cycle period will allow the setting of delay length. By controlling the delay, you can add an additional calculation channel that delays the flow signal by the same time period. The following diagram shows the original raw data plus the two aligned calculation channels.

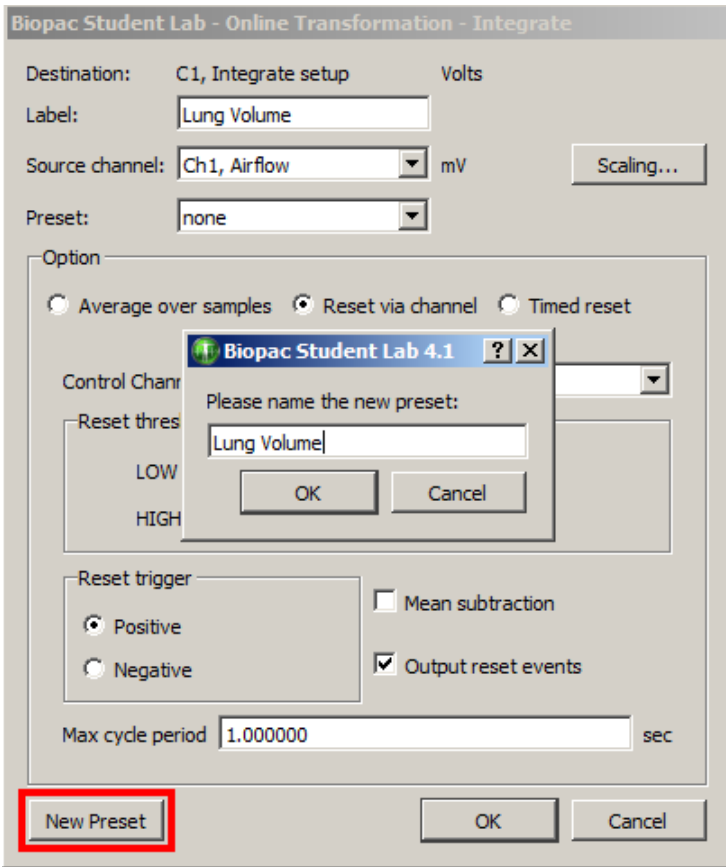


To create a delay channel, select Delay from the Calculation Channel Preset menu (see below).

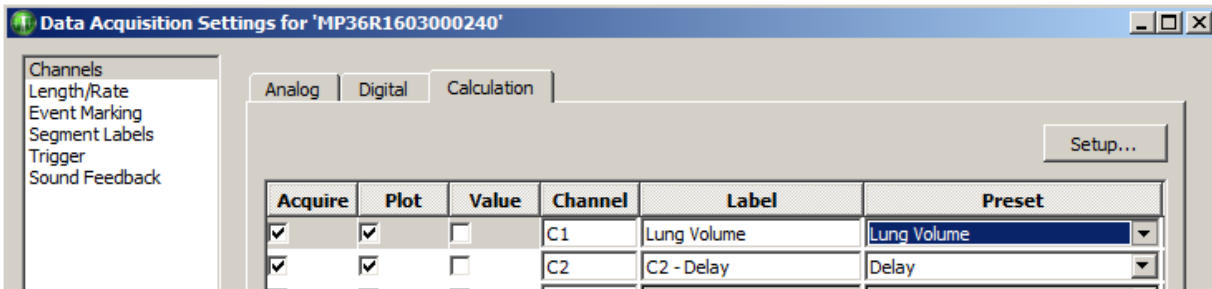


By adding the exact time delay as used in the Maximum cycle, both your delayed airflow channel and your integrate channel will run simultaneously.

Another powerful feature is the ability to save modified settings as a new preset. Simply by labeling the Channel Preset, (Lung Volume or a pertinent definition) and clicking New Channel Preset, the custom calculation channel setup can be saved for future use (see below).



To recall and re-use this calculation channel preset, select MP3x menu > Set Up Data Acquisition > Channels, and choose the desired Preset (see below).



To save your new settings as a template, select File, Save as, Graph Template, and label it accordingly (see below).

