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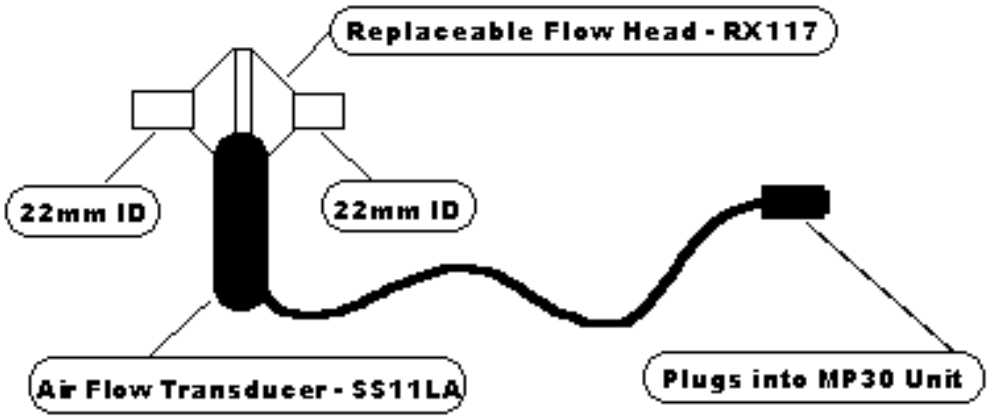
SS11LA Pneumotach Transducer

The SS11LA can be used to measure respiratory flow over a wide range of subjects and conditions. The SS11LA includes an optically clear detachable flow head (RX117) for easy cleaning and inspection. As the detachable flow head is snapped into the SS11LA handle the flow head plugs directly into an integral precision low differential pressure transducer. Accordingly, the SS11LA will output an electrical signal proportional to respiratory flow. The SS11LA plugs directly into the MP30.

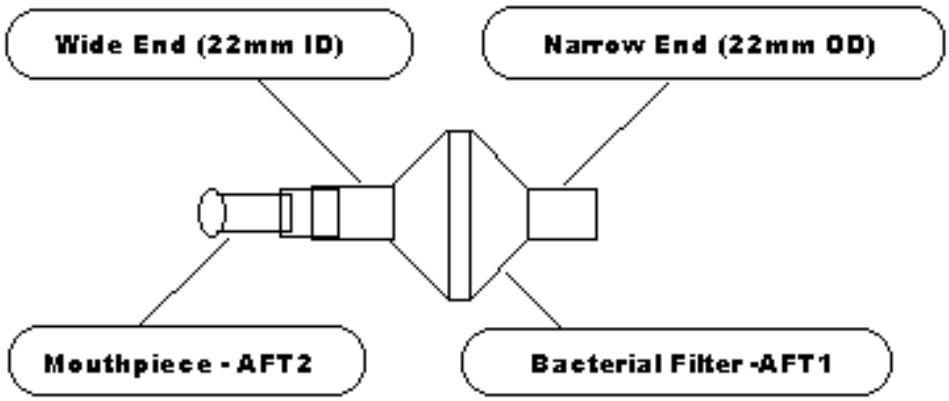
The SS11LA connects to industry standard bacterial filters (AFT1) and disposable mouthpieces (AFT2). The RX117 detachable flow head can be cold sterilized in Cidex®.

The following piece parts are used when performing air flow (and volume) measurements using the SS11LA pneumotach (air flow) transducer.

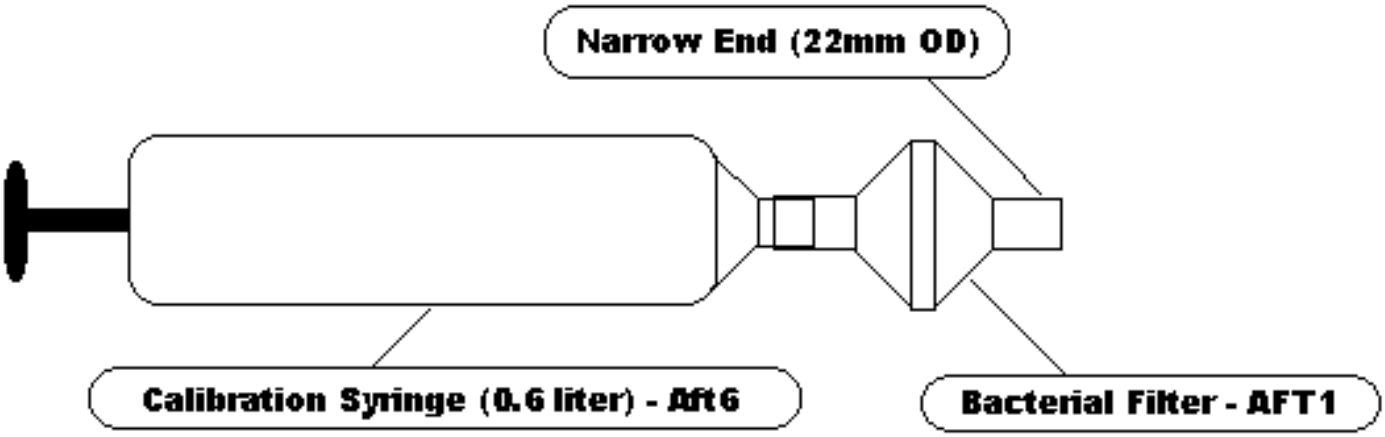
Air Flow Transducer (SS11LA)



Bacterial filter (AFT1) and Mouthpiece (AFT2)



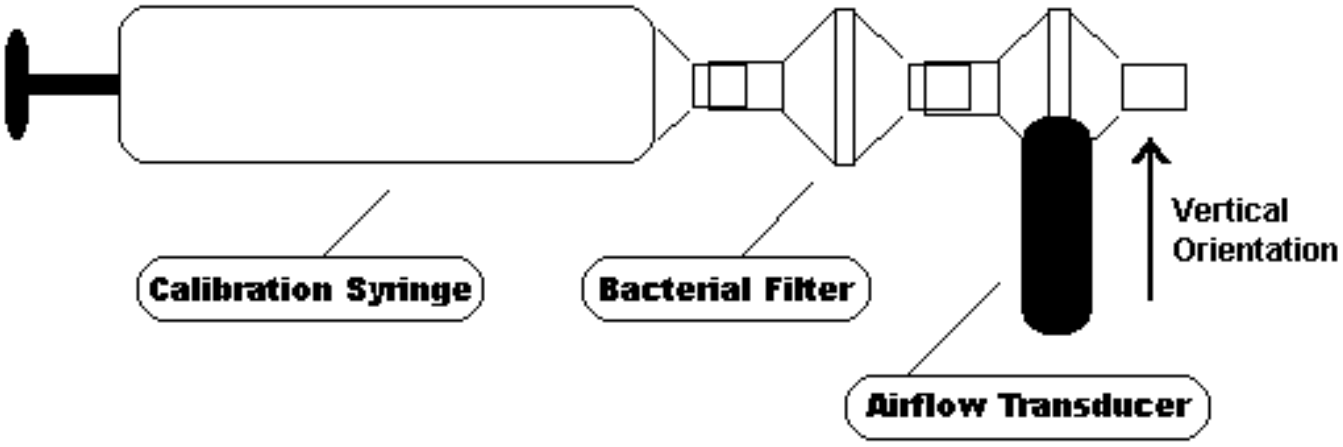
Calibration Syringe (AFT6) with Bacterial Filter (AFT1)



Please note the following:

- The SS11LA must remain upright for best results.
- The bacterial filter and mouthpiece are disposable and are **"one per person"** items. Please use a new disposable filter and mouthpiece each time a different person is to be breathing through the air flow transducer.
- For more effective calibration, use a bacterial filter between the calibration syringe and the air flow transducer.
- Either the bacterial filter and mouthpiece are inserted into the air flow transducer or the calibration syringe (with attached filter) is inserted into the air flow transducer.

Calibration connections:



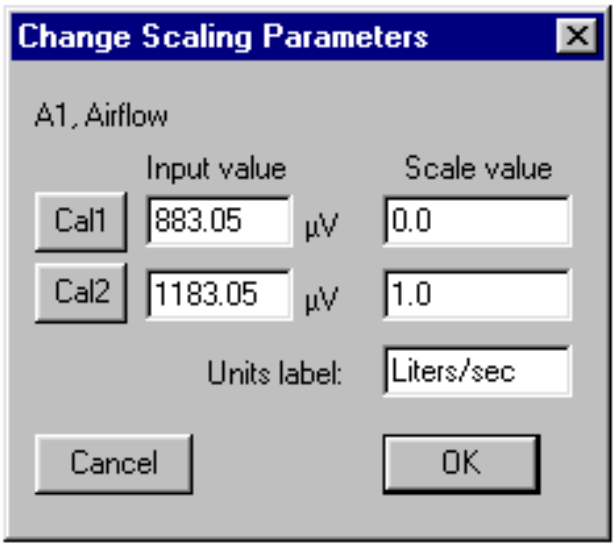
Calibration Procedure Options

The SS11LA can be roughly calibrated without using the calibration

syringe. The airflow transducer has a nominal output of 60 microV/[liter/sec], this is then scaled to account for the amplifier excitation. For the MP30, this is factory set to 5 Volts. Therefore,

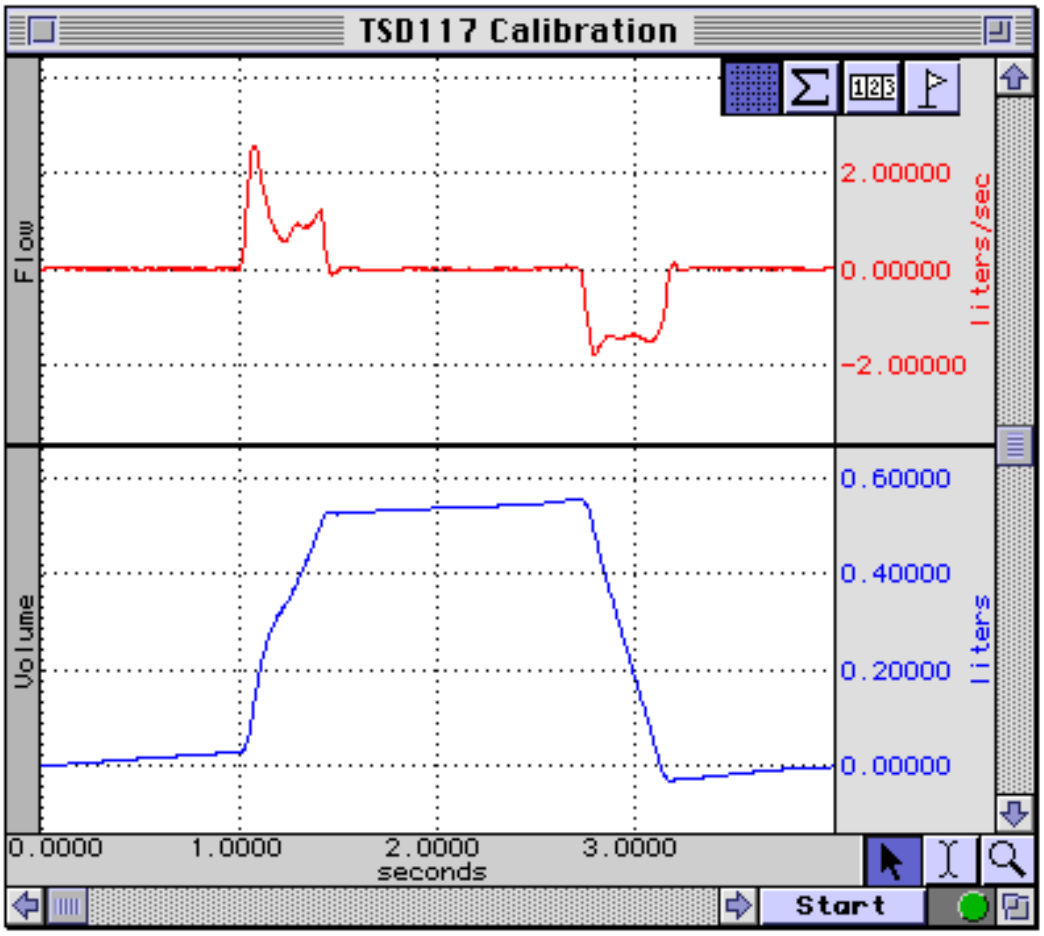
$$60 \text{ microV/[liter/sec]} \cdot 5 = 300 \text{ microV / [liter/sec]}.$$

1. Setup the Airflow transducer, so that the calibration syringe is attached to the transducer via a bacterial filter, and such that when looking down the barrel of the syringe toward the Airflow transducer the cord of the transducer is exiting the left hand side of the transducer.
2. Launch the Biopac Student Lab.
3. From the **MP30** menu, Choose **Setup Channels.**
4. Check the **Acquire** and **Plot** Analog Channel 1. Type in Airflow for the channel name.
5. Click on the **Setup** button to take you to the Channel 1 Setup window. Click on the **Preset** button and choose Airflow from the pull down menu.
6. Next click on the **Scaling** button. Hold the Airflow transducer upright with the plunger of the calibration syringe pulled out. Inside the Scaling window, click on the **Cal 1** button. This will give you an approximate 0 liters/second flow value. Enter 0.0 in the adjacent **Map Values** box.
7. In the **Cal 2 Input Value** box add 300microV (or 300 mV, depending on the units displayed in the window) to the value you obtained for the Cal 1 Input Value. Type in 1.0 for the **Cal 2 Map Value**. Type "liters/sec" in the Units window.



Scaling Factors for Rough Calibration of the SS11LA

Data can now be collected directly, or you may choose to use a calibration syringe to help calibrate the transducer more exactly. Calibrate further by introducing a known volume of air through the transducer via a calibration syringe. To remove residual offset after the flow data has been collected, select a portion of the baseline (zero flow reading) and calculate the mean value using the popup measurements. Using Waveform math, from the Transform menu, subtract this mean value from the entire waveform to obtain a mean corrected flow signal. Now, the integral of the mean can be calculated, by selecting Integral from the Transform menu. An example is shown.



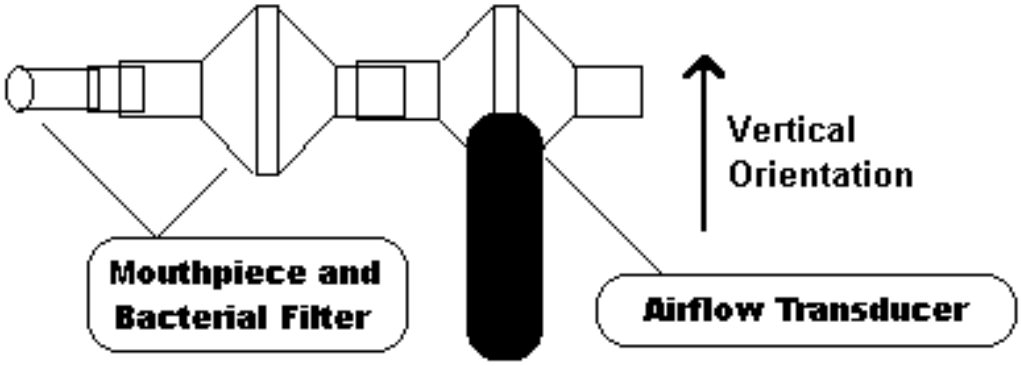
Flow Measurement and Volume Calculation

In this particular case, a 600ml calibration syringe was used to check the rough calibration of the SS11LA air flow transducer. The rough calibration indicates a syringe volume of about 550ml, so this method may only be expected to be accurate within 10% of the real reading.

To achieve a more exact calibration, start with the above scaling factors and then boost or drop them slightly as indicated by the rough calibration. In this case, if the Scale value (from the Scaling Parameters window) correlating to 1 liter/sec (from Step 7 of our example above) was boosted about 10% or to 330mV above the zero flow reading (from 300mV/ liters/sec), the resulting calibration would be fairly accurate.

After the calibration process, remove the calibration syringe and attach a new bacterial filter and mouthpiece to the air flow transducer. It's very important that each individual use their own mouthpiece and bacterial filter. Place the narrow end of the bacterial filter and mouthpiece assembly into the same side of the air flow transducer that the calibration syringe was connected to. You are now ready to begin recording air flow data. Hold the air flow transducer vertically, for best results.

Normal measurement connections:



For the most accurate lung volume recording, be sure to use a noseclip to prevent air flow through the nose. Also, be sure not to remove the air flow transducer assembly from your mouth during the recording. All air leaving or entering your lungs must pass through the air flow transducer during the lung volume measurement. Use the following measurement procedure for determining lung volume:

- Breathe normally for 3 cycles (start on inspire)
- Inspire as deeply as possible
- Return to normal breathing for 3 cycles
- Expire as deeply as possible
- Return to normal breathing (end on expire)

Data Processing

When integrating the collected data to determine breath by breath lung volume, you must integrate each inspiration and expiration separately. Before integration, you will need to determine the mean of an equal number of expirations and inspirations and then subtract the mean from the entire waveform. This process insures that the integral will have the same starting and ending value.

Technical Specifications

- Flow Bore: 22mm (ID), 29mm (OD)
- Flow Rate: 0-10 Liter/sec (highest linearity $\leq$ 5 Liters/sec)
- Dead Space: 93ml
- Nominal Output: 60 µV / [Liters/sec] (Normalized to 1 volt excitation)
- Flow Head Construction: Clear Acrylic
- Handle Construction: Black ABS
- Detachable Flow Head Dimensions: 82.5mm dia x 101.5mm long
- Flow Head Weight: 80 grams
- Handle Dimensions:127mm long x 23mm thick x 35mm wide
- Handle Weight: 85 grams
- 1/4" 25 TPI mounting nut (standard camera mount)
- Includes shielded 2 meter cable

Return To Application Note Menu