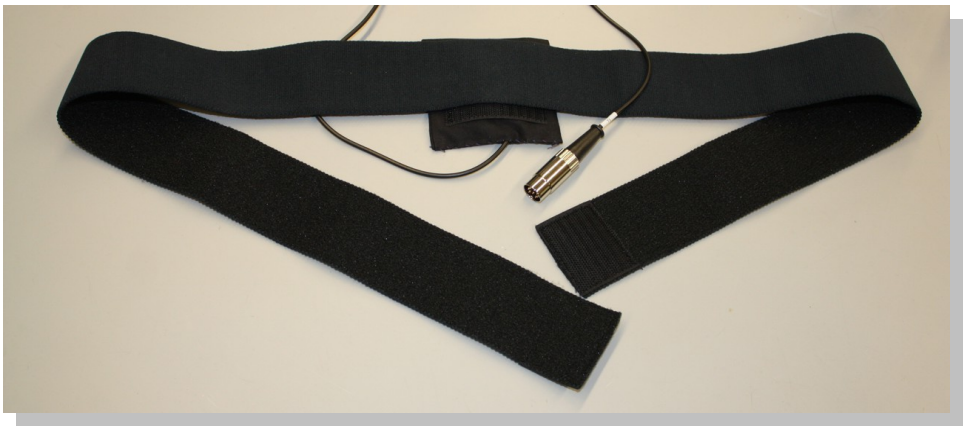
RM-204 Respiration Monitor

Technical Note



RM-204

Overview

The RM-204 Respiration Monitor is a transducer used to measure the relative depth and frequency of breathing in a human subject during experiments where it is impractical to monitor breathing with a spirometer. For example, the use of a spirometer to monitor breathing during a psychological test could be a distraction that affects the results of the test. If the subject is not familiar or comfortable with breathing through a spirometer, the subject cannot focus on completing the test. The RM-204 permits breathing rates and relative amplitudes to be measured easily, accurately, and unobtrusively while the subject performs another task.

How It Works

The RM-204 Respiration Monitor has two components: a piezo-electric sensor that produces a voltage in response to movement; and an elastic belt that is placed around the chest to hold the sensor in place.

The primary driving force for pulmonary ventilation is the diaphragm, the large muscle between the thoracic and abdominal cavities. During inhalation, the diaphragm contracts, moves downward, and forces the abdominal wall to move outward. The process is reversed during exhalation. The piezo-electric sensor in the RM-204 detects the cyclic movement of the ventral body wall and generates a voltage that is proportional to the amount of movement.

Piezo-electric sensors are devices that generate a voltage in response to motion. When a piezo-electric sensor stops moving or is moving slowly, the voltage output of the sensor returns to its baseline level within milliseconds. To make this motion detector suitable for breath monitoring, the sensor of the RM-204 is fitted with a filter that slows the return of the voltage to its baseline level. Because of the filter, the RM-204 is able to record breath rates from 4 to 100 breaths per minute. However, when the subject is holding his or her breath, the voltage output of the sensor decreases very slowly. This decrease occurs because the filter cannot hold its voltage level indefinitely and still respond to subtle changes in breathing.

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How to Use the RM-204

Caution: Do not bend the sensor element in the cloth pouch! Bending will permanently damage the sensor.

Equipment Setup

1) Plug the DIN8 connector of the RM-204 into a DIN8 transducer input of an iWorx data acquisition unit or amplifier.
2) Wrap the elastic belt of the respiration monitor around the subject's chest at a level that is below the sternum.
3) Place the sensor inside the belt so that the sensor is in the center of the chest at a level that is even with the subject's elbows. The cloth pouch should be placed inside the belt so the Velcro strip on the pouch is facing the inside of the belt.

Start the Software

When using an iWorx data acquisition system with DIN8 transducer inputs or an iWorx amplifier:

1) Open LabScribe by double-clicking on the LabScribe icon.
2) When the program opens, select **Preferences** from the **Edit** menu (or from the **LabScribe** menu on a Macintosh computer).
3) Select the **Channel** preferences dialog window. Name the channel to which the RM-204 is connected. Set the **Mode/Function** for this channel to **DIN8**. Also, set the sampling rate and display time. Click **OK**.

Experiments

Preconfigured LabScribe experiments using the RM-204 Respiration Monitor include:

- **Experiment HS-5: Breathing Techniques and Heart Rate** (found in the **Human Spirometry** category of the LabScribe **Settings** menu as **BreathingTechniques-HeartRate**)

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