EKG Sensor

PS-2111

Included Parts

1. EKG Sensor
2. Electrode patches, 100 pieces

Additional Part Required

- PASPORT interface or datalogger

Quick Start

1. Connect the EKG Sensor to your PASPORT interface.
2. If you are using a computer, connect the PASPORT interface to it and start DataStudio.
3. Apply three electrode patches to the subject's arms and clip the leads to the electrodes patches as illustrated in Figure 1.
4. Press or click the start button to begin recording data.

Introduction

The EKG Sensor measures electrical signals produced by the heart. The EKG trace, displayed on a connected computer or datalogger, graphically illustrates the beating of the heart.

Set-up

Connecting the EKG Sensor to an Interface

1. Connect the sensor's plug to any port of a PASPORT interface or datalogger. Optionally, use a PASPORT extension cable (PS-2500) between the interface and the EKG Sensor.
2. If you are using a computer, connect the PASPORT interface to it and start DataStudio.

Connecting the EKG Sensor to a Person

1. Rub the skin where the electrode patches will be applied with a paper towel to remove dead skin and oil.
2. Apply adhesive electrode patches to the right wrist, right forearm just below the elbow, and left forearm just below the elbow (Figure 1). Press the patches firmly for best adhesion and signal quality.

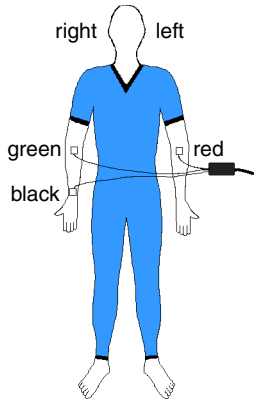

Figure 1

3. Clip the EKG leads to the electrode patches: black to the right wrist, green to the right forearm, and red to the left forearm.
4. Arrange the leads so that they hang loosely without straining the patches.

Collecting Data

1. Press or click the start button to begin recording data.
2. Have subject remain still during data collection.

About the Measurements

The sensor makes two measurements: Heart Rate (in beats per minute) and Voltage (in mV). These measurements are recorded and displayed by the computer or datalogger connected to the sensor.

Heart rate and voltage measurements are acquired at the default rate of 200 samples per second. You can lower the sample rate to 50 samples per second; however for best results, use the default rate.

About the Electrocardiogram

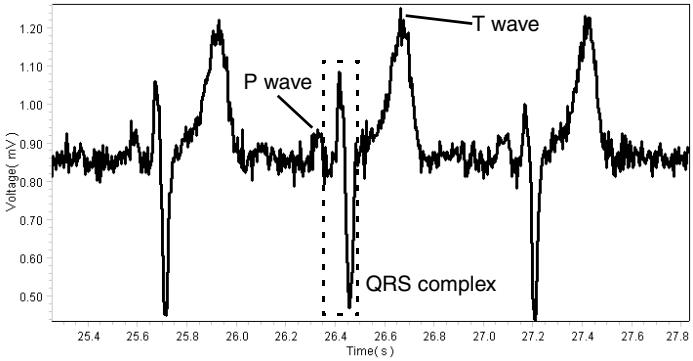

Figure 2

To see the electrocardiogram (Figure 2), display voltage versus time in a graph. One part of a typical electrocardiogram is a 'flat line' or trace indicating no detectable electrical activity. This line is called the isoelectric line. Deviation from the isoelectric line indicates electrical activity of the heart muscles. The sensor's Voltage measurement represents this deviation.

The first deviation from the isoelectric line in a typical EKG is an upward pulse followed by a return to the isoelectric line. This is called the **P wave**. This wave is caused by the depolarization of the atria and is associated with the contraction of the atria.

After a return to the isoelectric line there is a short delay while the heart's atrioventricular (AV) node depolarizes and sends a signal along the atrioventricular bundle of conducting fibers (the bundle of his) to the Purkinje fibers, which bring depolarization to all parts of the ventricles almost simultaneously.

After the AV node depolarizes there is a downward pulse called the Q wave. Shortly after the Q wave there is a rapid upswing of the line called the R wave followed by a strong downswing of the line called the S wave and then a return to the isoelectric line. These three waves together are called the **QRS complex**. This complex is caused by the depolarization of the ventricles and is associated the with the contraction of the ventricles.

After a short period the sodium and calcium ions that have been involved in the contraction migrate back to their original location in a process that involves potassium ions and the sodium-potassium pump. The movement of these ions generates an upward wave that then returns to the isoelectric line. This upward pulse is called the **T wave** and indicates repolarization of the ventricles.

The sequence from P wave to T wave represents one heart cycle. The number of such cycles in a minute is called the heart rate and is typically 70-80 cycles (or beats) per minute at rest.

Safety

- The EKG Sensor is for educational use only.
- Placement of the electrode patches on the body provides an excellent path for current flow. Do not connect anything to the electrode patches other than the EKG Sensor as described in this instruction sheet.

The sensor's circuitry protects the test subject in two ways: The sensor signal is transmitted through an optical-isolation circuit and power for the sensor is transferred through an isolation transformer. The circuitry protects against accidental overvoltages of up to 4,000 volts.

Specifications

Voltage range	0 mV to 4.5 mV
Voltage resolution	4.5 μV
Sample Rate	200 samples per second
Heart rate range	47 to 250 beats per minute
Heart rate resolution	1 beat per minute

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: 916-786-3800 (worldwide)
800-772-8700 (U.S.)

Fax: 916-786-7565

Web: www.pasco.com

Email: support@pasco.com

For more information about the EKG Sensor and the latest revision of this Instruction Sheet, visit:

www.pasco.com/go?PS-2111