

About the product



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

Note: This is not a medical device. It is designed for educational use only and should not be used in any medical process such as life support or patient diagnosis. It is not intended for use in graduate research or industry including industrial control or any type of industrial testing.

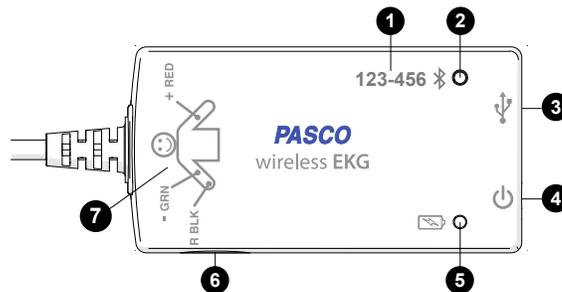
What's Included

- Wireless EKG Sensor
- 100× Electrode Patches (not pictured)
- USB Cable

Required Items

- **Data Collection Software**
This product requires either SPARKvue or PASCO Capstone for data collection and analysis.

Part names and descriptions



1 Device ID
Use to identify the sensor when connecting using Bluetooth.

2 Bluetooth Status Light
Indicates the status of the Bluetooth connection.

LIGHT	STATUS
Red, blink	Ready to pair
Green, blink	Paired
Yellow, blink	Remotely logging data

3 USB Port
Use with the USB cable to connect to a USB wall charger to charge the battery. Also use to send measurement data to software when connected to a USB port of a computer or mobile device (iOS devices not supported).

4 Power Button
Press and hold for one second to turn the sensor on or off.

5 Battery Status Light
Indicates the battery level and charging status.

LIGHT	STATUS
Red, blink	Low battery level
Green, solid	Fully charged
Yellow, solid	Charging

6 Threaded Hole
Use for mounting the sensor, such as to a mounting rod. Accepts 1/4-in-20 screws.

7 Connection Diagram
This diagram provides a reminder on how to correctly attach the EKG leads to a person. Connect the red (+) lead to the left forearm, the green (-) lead to the right forearm, and the black (R) lead to the right wrist. See the **Connect the sensor to a person** section for detailed instructions.

8 EKG Leads (not pictured)
Three alligator-clip leads are attached to the sensor box by a wire. The leads attach to the electrode patches that are applied to the skin.

Getting started

Perform the tasks in this section before using this device in the classroom.

Charge the battery

The Wireless EKG Sensor contains a rechargeable battery that lasts an entire school day when fully charged. Charge the battery before using the Wireless EKG Sensor for the first time since it is not shipped with a full charge.

To charge the battery, connect the sensor to a USB wall charger or powered USB port using the USB cable. The battery status light is solid yellow while the battery is charging and changes to solid green when fully charged.

Install or update data collection software

The latest update of PASCO Capstone or SPARKvue is required to use the Wireless EKG Sensor. Download and install the software from the PASCO website. Check if an update is available if the software is already installed.

SPARKvue

Windows and Mac Computers

Download: Go to [pasco.com/sparkvue](https://www.pasco.com/sparkvue) then click **Downloads**.

Update: Click  then select **Check for Updates**.

Mobile Devices and Chromebooks

Search for SPARKvue in your device's app store. SPARKvue automatically installs updates.



PASCO Capstone

Windows and Mac Computers

Download: Go to [pasco.com/capstone](https://www.pasco.com/capstone) then click **Downloads**.

Update: Click **Help** then select **Check for updates**.

Check for a firmware update

Update the sensor firmware to access the latest features and bug fixes. Sensor firmware is installed using SPARKvue or PASCO Capstone. Connect the sensor to SPARKvue or PASCO Capstone to check for a firmware update.

SPARKvue

1. Turn on the Wireless EKG Sensor.
2. Open SPARKvue then click **Sensor Data**.
3. Select the sensor that matches the device ID.
4. If a notification appears, click **Yes** to update the firmware. If a notification doesn't appear, the firmware is up to date.

PASCO Capstone

1. Turn on the Wireless EKG Sensor.
2. Open Capstone then click **Hardware Setup**.
3. Select the sensor that matches the device ID.
4. If a notification appears, click **Yes** to update the firmware. If a notification doesn't appear, the firmware is up to date.

Using the sensor

Connect the sensor to a person

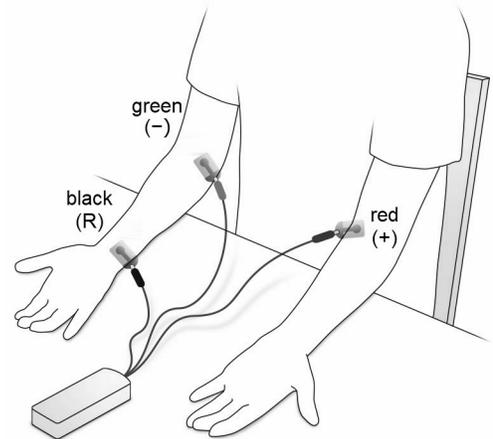


Figure 1. EKG leads attached to the electrodes.

1. Rub the skin at the locations shown in (Figure 1) with a paper towel to remove dead skin and oil. Shaving excess hair at these locations may provide better results.

 **Tip:** To help boost the EKG signal, apply a gel made from 100 mL of aloe gel mixed with 1 teaspoon of table salt.

2. Apply the adhesive electrode patches to the right wrist, right forearm just below the elbow, and left forearm just below the elbow. Press the patches firmly for best adhesion and signal quality.

 **CAUTION:** Placement of the electrode patches on the body provides an excellent path for current flow. Don't connect anything to the electrode patches other than the Wireless EKG Sensor.

3. Clip the EKG leads to the electrode patches as follows:

EKG LEAD	LOCATION
Green (-)	Right forearm
Black (R)	Right wrist
Red (+)	Left forearm

4. Arrange the leads so that they hang loosely without straining the patches.

Collect data

Connect the sensor to SPARKvue or Capstone to collect data.

SPARKvue

1. Turn on the sensor.
2. Open SPARKvue then click Sensor Data.



3. Select the that matches its device ID.
4. Under Quick Start Experiments, select **EKG and Heart Rate**.
5. Click Start ● to begin data collection.

PASCO Capstone

1. Turn on the sensor.
2. Open Capstone then click Hardware Setup .
3. Select the that matches its device ID. Click Hardware Setup  to close the panel.
4. Select the **EKG and Heart Rate** Quick Start Experiment.
5. Click Record ● to begin data collection.

Analyzing the electrocardiogram

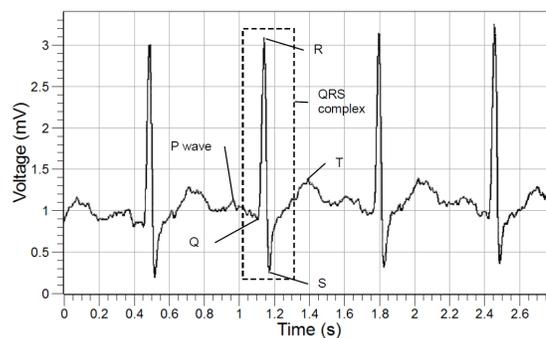


Figure 2. Example electrocardiogram.

The voltage versus time graph displays an electrocardiogram (Figure 2). One part of the electrocardiogram is a trace indicating no detectable electrical activity (flat line). 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 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 to the Purkinje fibers. The Purkinje fibers 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**. This is 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 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.

Additional resources

Product information

Visit the product web page at pasco.com/product/PS-3236 for additional information including:

- Specifications
- Buying Guide
- Experiments
- Documents



Software help

The SPARKvue and PASCO Capstone Help provide additional information on how to use the Wireless EKG Sensor with the software. Access the help within the software or online.

SPARKvue

Software: Click  then select Help.

Online: pasco.com/help/sparkvue

PASCO Capstone

Software: In the menu bar, click Help then select PASCO Capstone Help.

Online: pasco.com/help/capstone

Technical Support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to provide assistance with this or any other PASCO product.

Phone (USA)	1-800-772-8700 (Option 4)
Phone (International)	+1 916 462 8384
Online	pasco.com/support

Regulatory information

Warranty, Copyright, and Trademarks

Limited Warranty

For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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Product end of life disposal instructions



This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle or disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

Battery disposal instructions



Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative. The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.

CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

FCC statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.