ScienceCube

Wireless EKG/ECG(Electrocardiogram) (WL121E)

User Guide

Rev. WL121E-12-2023

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

KOREADIGITAL

The Science Cube wireless EKG/ECG sensor can measure the rhythm signals produced by the heart.

The wireless EKG sensor measures the rhythm signals produced by the heart. When depolarization and repolarization of the heart muscle occur, the electrocardiogram sensor measures the heart rate and displays it on a graph. The sensor also comes with a conductive adhesive patch that can be easily removed. Measurements can be made by remotely connecting to a smart device or PC wirelessly or wired without a separate interface.

Suggested experiments

- Monitor resting EKG
- Study the P, Q, R, S and T wave forms
- Monitor EKG after mild exercise
- Investigating EKG with different body position.
- Investigating EKG changes after mild stimulants.

Composition

The ScienceCube wireless OO sensor *consists of the following.*

- Wireless EKG sensor(WL121E)
- Conductive adhesive patch
- USB-A/C cable
- Booklet

Feature

- Up to four Science Cube wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the **Science#** application.
- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.

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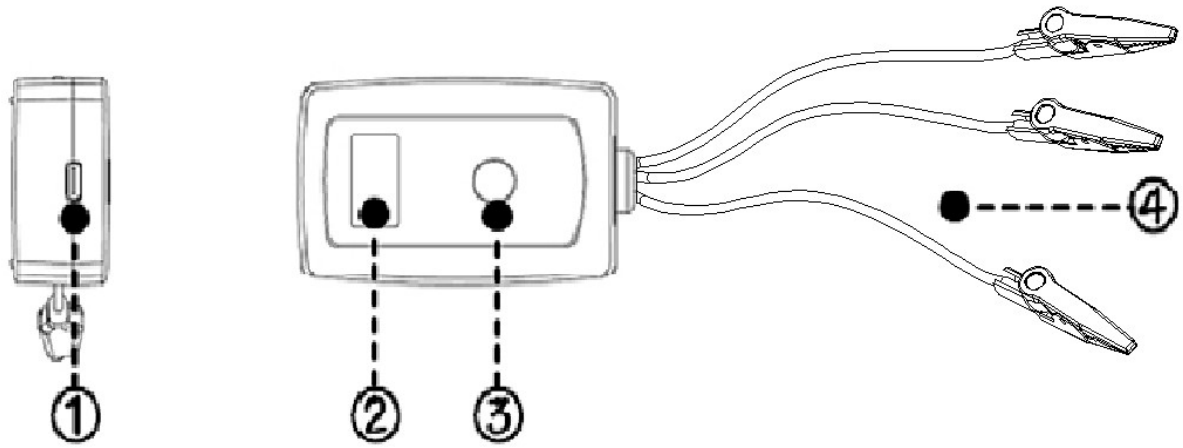
Function of wireless sensor

Structure



① USB port : Connect the sensor to a PC and use it for experiments or charging.

② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.

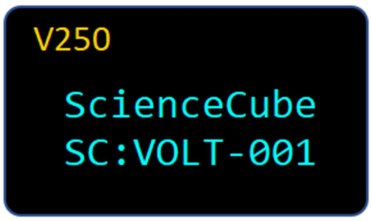
③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.

④ Sensing part : Three signal wires connected by clips that secure the conductive patch.

Power/Function Button

Status	Turn	Action	Description
When the power is off	Click once	■	A short press turns the sensor on.
	Long click	■■■■■	A long press changes the mode and turns on the sensor.
When it's on	Long click	■■■■■	Turns off.

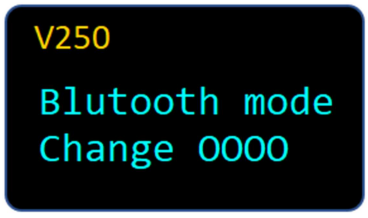
Start screen



V250 : Displays the sensor's firmware version.

SC:OOOO-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

Mode change



When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

①Connection mode	**Mobile** : Connecting Androidor iOS. **PC** : Connecting to Windows PC ※ A long press changes the mode and turns on the sensor.

Measurement screen

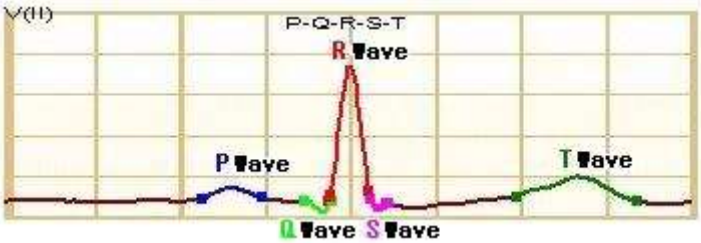
②**Sensor-ID**	This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.
③**Battery**	Check the battery status, and when charging via USB, the display will change to charging.
④**Value**	1) Displays sensor measurement values and units in real time. 2) If **user calibration** is used, **U0** or **UC** will be displayed above the units. 3) For sensors with **multiple ranges**, the current range is displayed. 4) For **multiple sensors**, the values for each sensor type are displayed.

NOTE : EKG/ECG waveforms can be viewed through the Science# application after connecting to a smart device.

How it Works

Electrocardiogram waveform

Electrocardiogram wave form is influenced by electrical activation step which is consist of P, Q, R, S, T.



P-WAVE

The P wave is the electrical signature or the current that causes atrial contraction. Both the left and right contract simultaneous may indicate arrhythmia. Its relationship to QRS complexes determines the presence of a heart block.

QRS-COMPLEX

The QRS complex corresponds to the current that causes contraction of the left and right ventricles, which is much more forceful than that of the atria and involves more muscle mass, thus resulting in a greater EKG deflection.

The Q wave, when present, represents the small horizontal(left to right) current as the action potential travels through the interventricular septum. Very wide and deep Q waves do not have a septal origin, but indicate myocardial infarction.

The R and S waves indicate contraction of the myocardium. Abnormalities in the QRS complex may indicate bundle branch block(when wide), ventricular origin of tachycardia, ventricular hypertrophy or other ventricular abnormalities. The complexes are often small in pericarditis.

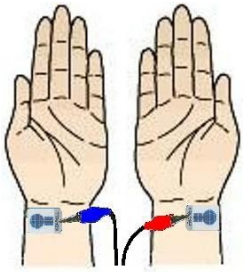
T-WAVE

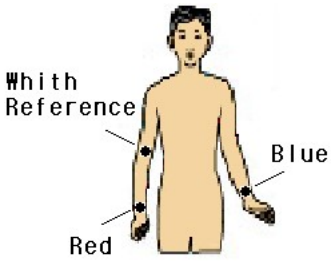
The T wave represents the repolarization of the ventricles. The QRS complex usually obscures the atrial repolarization wave so that it is not usually seen. Electrically, the cardiac muscle cells are like loaded springs. A small impulse sets them off, they depolarize and contract. Setting the spring up again is repolarization.

Using the Sensor

Connecting the wireless EKG sensor to a person

Use three electrode patches per subject. The electrodes can be reused, but they tend to absorb moisture so, reuse is not recommended. Once opened, the electrodes should be kept in refrigerator with air-tight container. But, you can't preserve more than 1 year if you keep the electrodes as above.





① Because the electrical signal produced by the heart and detected at the body's surface is so small, it is very important that the electrode patch makes good contact with the skin.

② Peel first electrode from the backing paper. Place it on the inside of the right elbow.

③ Place a second electrode on the right wrist.

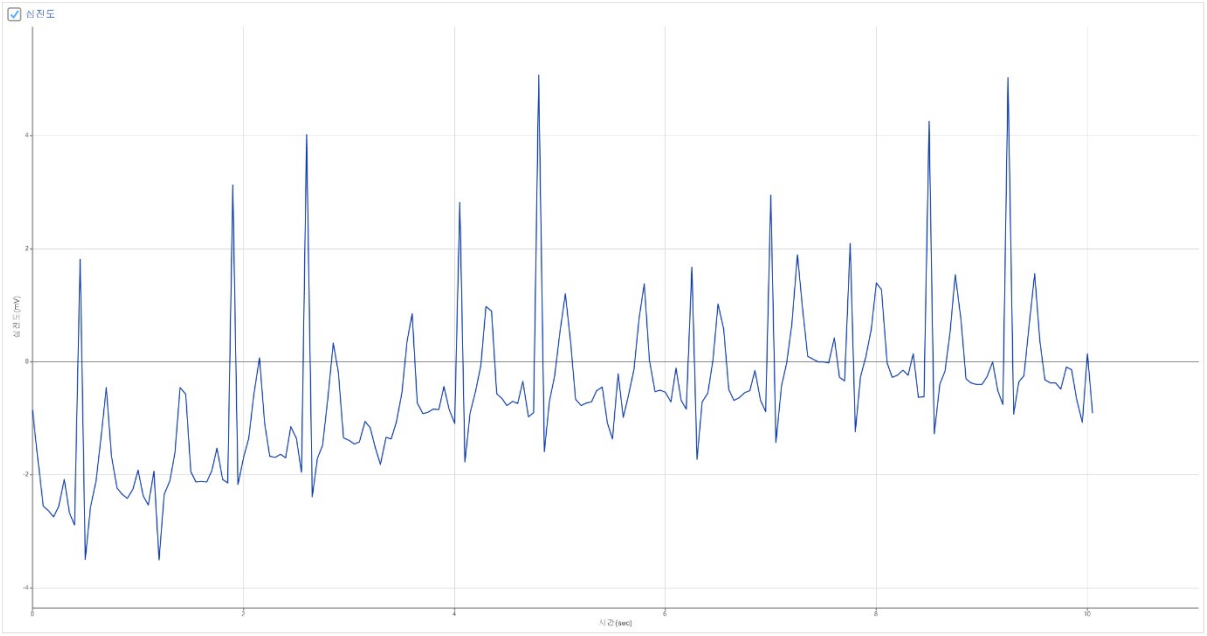
④ Place a third electrode on the left wrist.

⑤ Connect the clips from sensor to the tabs on the edges of the electrode patches.

⑥ Connect white clip to the right elbow electrode patch.

⑦ Connect red clip to the right wrist electrode patch.

⑧ Connect blue clip to the left wrist electrode patch.



Specifications

Item	Description
Range	0 ~5 mV
Resolution	5 uV
Sampling Time	Max. 100Hz (0.01 sec.), (Typical 1Hz)
Condition	0 ~ 40℃, ~85%RH
Wireless Connection	Bluetooth 5.0 or Classic 2.1
Wired Connection	USB-C
Battery	700mAh Li-Polymer rechargeable
Charging Time	within 2 hours
Operating Time	Approximately 8 hours after full charge (depending on usage conditions)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301

CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

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- The contents of this manual are provided for informational purposes only, and product specifications and functions may be changed without prior notice to improve performance.
- This product is designed for science education. No warranty is provided and no liability is assumed for errors in industrial testing or manufacturing process controls, medical analysis or controls, or commercial design applications.

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