EmoConnect - PPG&Motion Manual

NEWERT

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1. EmoConnect PPG&Motion Introduction

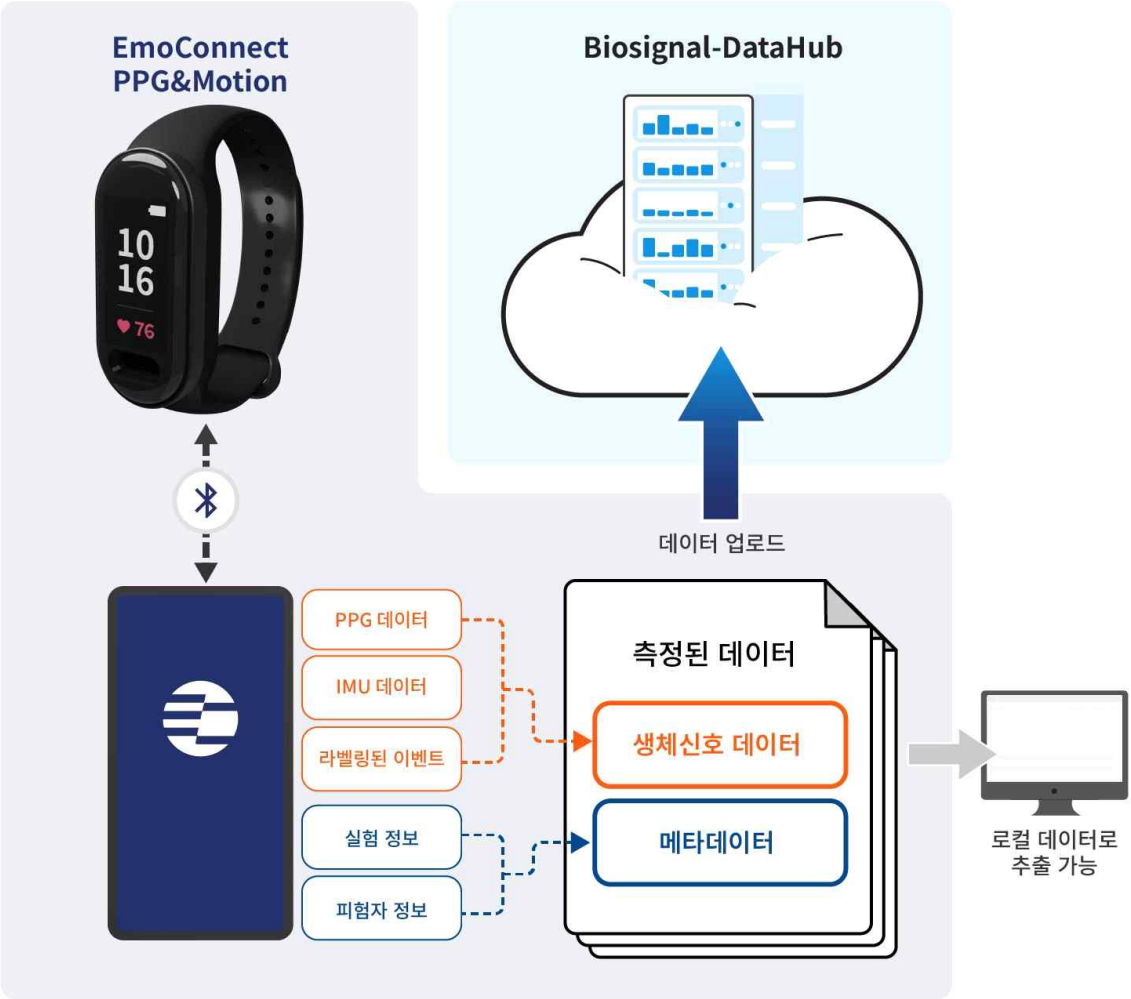
EmoConnect – PPG & Motion is a band-type device that wirelessly collects biosignals and motion data in real-time. It features smart noise filtering technology powered by On-Device AI, effectively eliminating noise to deliver clear and reliable biosignal data.

▪ 1.1 Product Overview

EmoConnect – PPG & Motion, along with its dedicated application, collects integrated data from PPG (Photoplethysmography) and IMU (Inertial Measurement Unit) sensors. This enables real-time wireless monitoring and simultaneous collection of the user's biosignals and motion data, which can be stored as files.

If needed, the stored biosignal data files can be uploaded to Newert's web service, DataHub, for secure storage and easy management.

The primary purpose of EmoConnect – PPG & Motion is to provide raw data for researchers and developers.
The PPG sensor measures heart rate and signal variations through blood flow changes, while the IMU sensor collects the acceleration and rotational data of the user.
By using the dedicated application, researchers can generate files with real-time event labeling during data collection.



▪ 1.2 Product Components

EmoConnect PPG&Motion Components:

After receiving the product, please ensure that all the following components are included.

EmoConnect PPG&Motion
1EA

Charging Cable
1EA

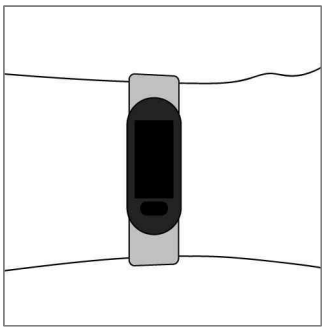
Pin for Reset Button
1EA

▪ 1.3 Wearing Guide

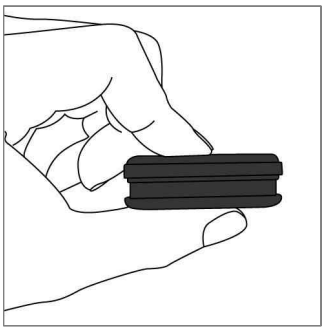
EmoConnect PPG & Motion Wearing Guide:

The biosignal sensor of this product is recommended to be worn on the wrist. However, depending on the usage purpose and environment, the sensor can also be placed at the fingertip or held directly in the hand to measure biosignal data.

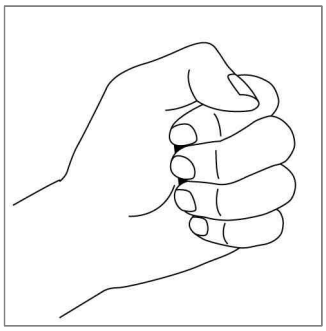
For accuracy and stability of data collection, please choose the appropriate sensor placement according to the situation.
(Select the suitable position based on the usage environment and purpose.)



1. Wrist (recommended location)



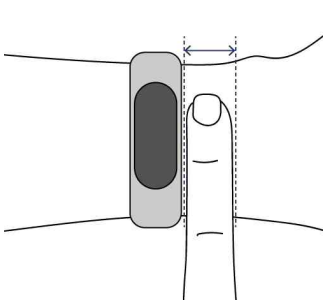
2. Fingertips

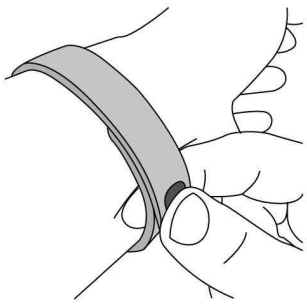


3. Grasp (Sensor – palm direction)

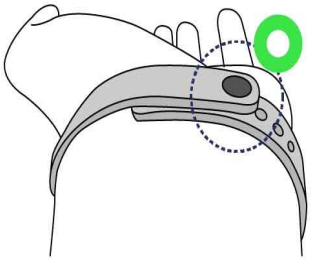
How to Wear EmoConnect PPG & Motion: Wrist Position

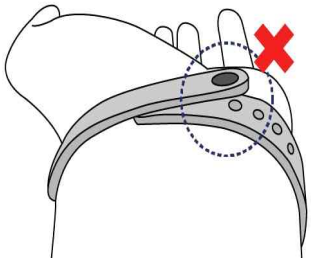
1. Wear the band of the EmoConnect PPG & Motion so that it is positioned about one finger-width away from the wrist bone.





2. Adjust the band to the most comfortable position on your wrist, then press the band until you hear a clicking sound.
(Once the fastening clip is fully inserted, the band of the EmoConnect PPG & Motion will be securely fixed.)





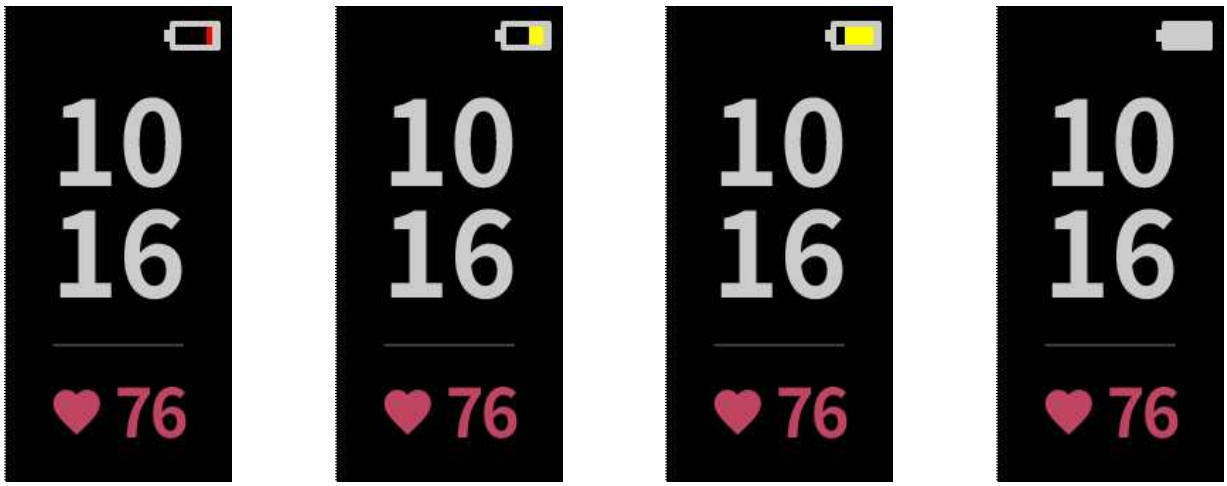
▪ 1.4 Charging the Device

The battery life of a fully charged EmoConnect PPG & Motion can last up to approximately 9 hours under continuous use. Battery life may vary significantly depending on the light intensity setting and can be influenced by usage patterns, environmental conditions, and other factors.

Usage Precautions:
If the device's screen flickers, it may indicate a low battery. In this case, please charge the device.
When using the product for the first time or after long-term storage, it is recommended to fully charge the battery before use to ensure optimal performance.

To charge the EmoConnect PPG & Motion, please follow these steps:

1. Plug the charging cable into a charger that guarantees charging performance, another low-power charging device, or a USB port on a computer.
2. Connect the C-Type end of the charging cable to the charging contact area on the front of the EmoConnect PPG & Motion.
   (※ It is recommended to charge the device while the main screen is off.)



10% 30% 70% 100%

The charging specifications for the EmoConnect PPG & Motion are as follows:

Power Supply IC	: USB-C Type
Battery Type	: Lithium-Polymer Battery
Charging Voltage	: 3.7V
Charging Capacity	: 140mAh
Charging Time (Recommended)	: Approximately 2 hours
Operating Time (Data Measurement Mode)	: Approximately 9 hours
Operating Time (Standby Mode)	: Approximately 50 hours

※ Battery usage time may vary depending on environmental and usage conditions.

Things to Keep in Mind When Charging the Product:

· It is recommended to use a charger that guarantees charging performance.

· If there is any foreign matter between the product and the charging cable, it may not charge properly. Before charging, make sure there is no sweat, liquid, dust, or other debris.

· If the battery is completely drained, the device may not turn on immediately even when connected to the charger. Charge the battery for at least a few minutes before turning the device on.

· The product can be used while charging, but it may take longer to fully charge.

· Be careful not to bend the charging cable. The cable may wear out or break. If the charging cable is damaged, discontinue use.

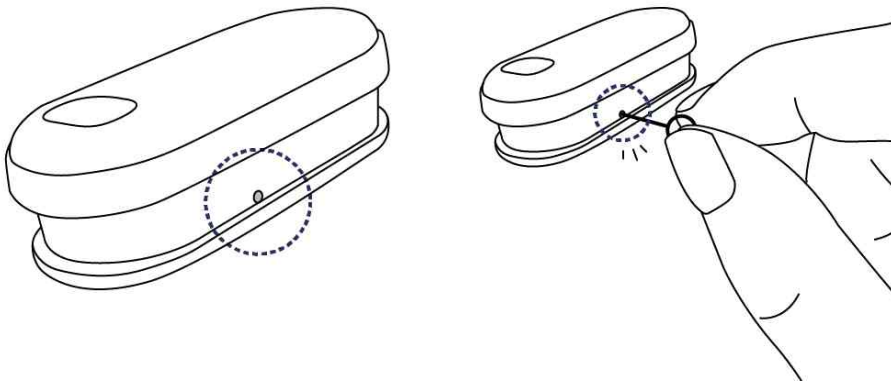
▪ 1.5 Reset Button Usage

If a temporary issue occurs during product use and a reset is required, please follow the instructions below:

· Prepare the reset button pin included with the product.

· Locate the reset button on the device and use the pin to press it until you hear a click sound. (Note: If the reset pin is unavailable, you can use a small pin, paperclip, or similar object.)

· Once the reset is complete, the device will reboot, and initialization will proceed.



2. EmoConnect - PPG&Motion Features

▪ 2.1 PPG and IMU Data Collection

You can collect PPG and IMU data using the EmoConnect – PPG & Motion.
Data collection requires the dedicated EmoConnect – PPG & Motion application.

[EmoConnect App
Google Playstore]

* The EmoConnect – PPG & Motion device can be purchased on the official Newert website.

Purchase page: Newert Official Website
Inquiries and consultations: Additional information can be requested or purchase consultations can be made through the inquiry form on the website.
For more details, please contact Newert Customer Support.

▪ 2.2 Real-Time Event Labeling

When using the EmoConnect – PPG & Motion dedicated application, you can input real-time event labeling during the data collection process.
Three methods for event recording are available: ‘Not Used,’ ‘Preset,’ and ‘Manual Entry.’
Event labeling data is stored along with the biosignal data.

▪ 2.3 DataHub Link-up

When using the EmoConnect – PPG & Motion dedicated application, you can upload data files to DataHub.
By uploading data files to DataHub, you can securely store and easily manage your files.

▪ 2.4 Check and Delete data information

When using the EmoConnect – PPG & Motion dedicated application, you can view the information of the measured data or delete the data files.

3. Step-by-Step Usage Guide

▪ 3.1 Starting the App and Logging In

Search for EmoConnect – PPG & Motion in the store that corresponds to your platform (Google Play Store / Apple App Store) and install the dedicated application.
Launch the app and proceed with the login.

· **DataHub Account Login**
Since the account is shared with DataHub, if you already have a DataHub account, you can log in using the same credentials.

· **Sign Up**
If you don't have an account, select Sign Up to create a new account. Once the account is created, you can log in.

· **Skip (Guest)**
If you prefer to use the app without logging in, you can select the Skip button.
In this case, the app will not be linked to DataHub, and the collected data will only be stored on the local device.
(※ In Skip mode, data upload and integration with DataHub will be restricted.)

▪ 3.2 Linking with DataHub Platform

EmoConnect – PPG & Motion shares an account with DataHub.
You can easily upload the data collected from EmoConnect – PPG & Motion to DataHub for storage and management.

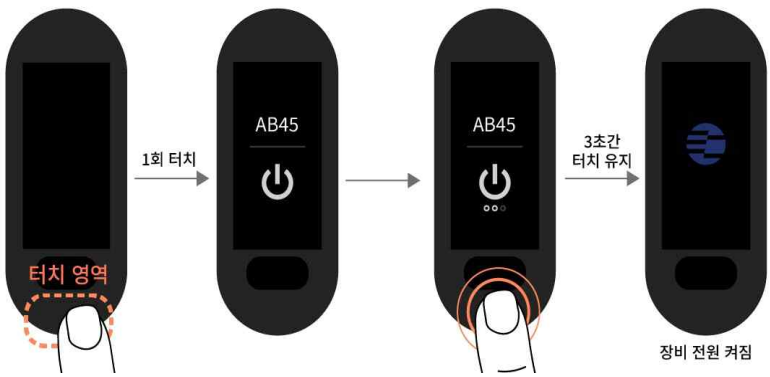
▪ 3.3 Connecting the Device to the Application

· 3.3.1 Power Control of the Device

Turning On the Device:
1. While the device is off, tap the touch area once.

2. When the power icon and model number (e.g., AB45) appear on the screen, press the touch area again for 3 seconds.

3. After 3 seconds, the EmoConnect logo will appear, and the device will power on.



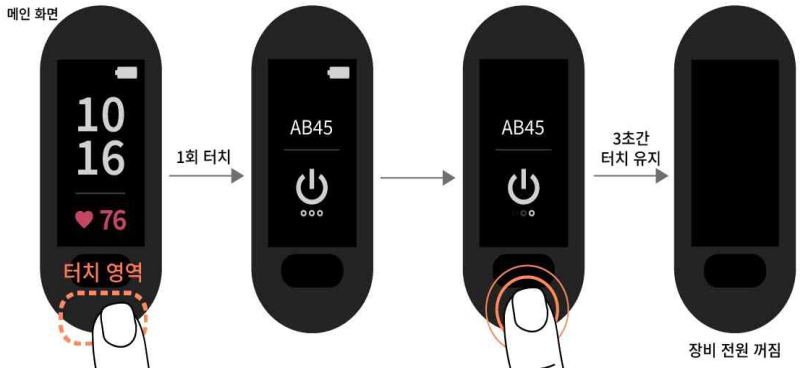
Turning On the Device

Turning Off the Device:

1. While the device is on, tap the touch area once on the main screen.

2. When the power icon and model number (e.g., AB45) appear on the screen, press the touch area again for 3 seconds.

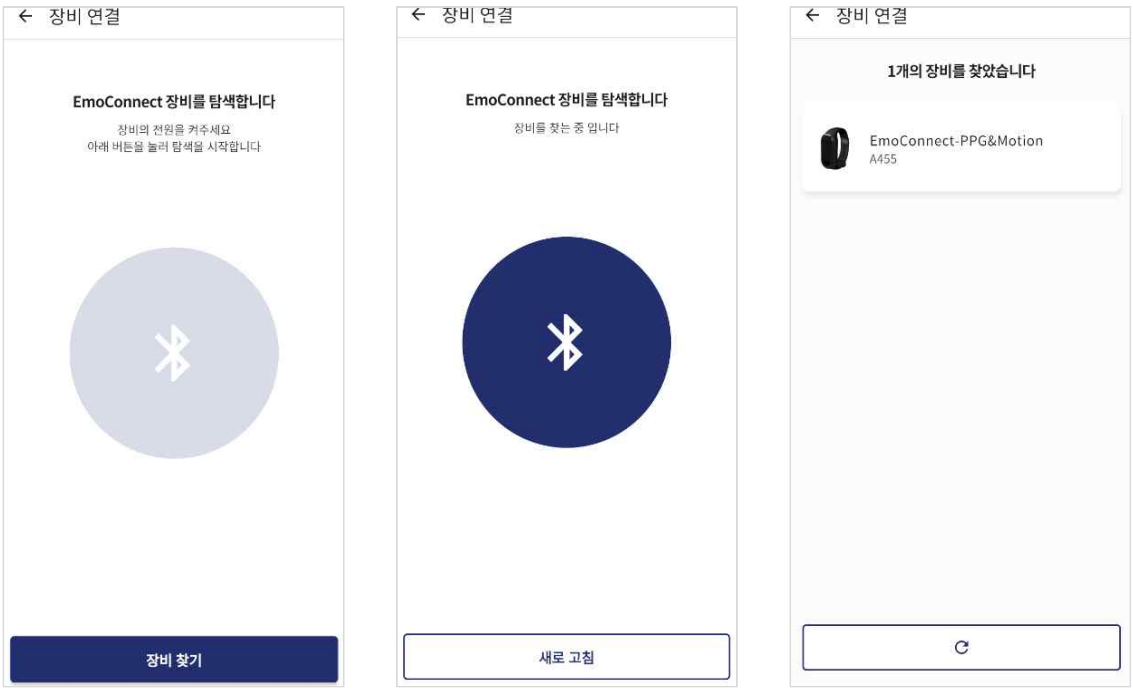
3. After 3 seconds, the screen will turn off, and the power will be off.



Turning Off the Device

· 3.3.2 Bluetooth Connection

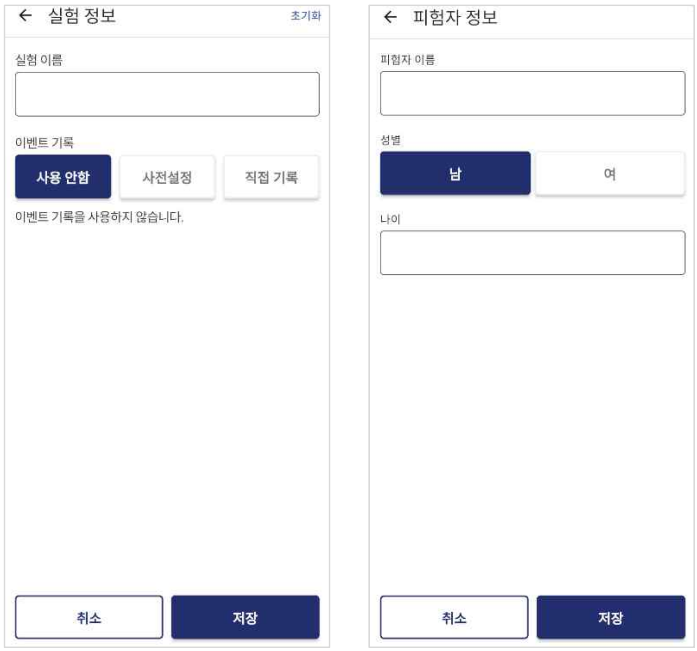
After logging in, the device connection screen will appear. Tap the "Find Device" button at the bottom of the screen to search for available devices. Once the device is found, a list of devices will be displayed. Select the device you want to connect to, and upon clicking it, the app will connect to the device and take you to the measurement screen.



Device connection screen and list of discovered devices

▪ 3.4 Setting Experiment and Participant Information

Before starting the biosignal measurement, you need to set the experiment and subject information at the top of the main screen. In the experiment information, you can set the experiment name and event details. In the subject information, you can set the subject's name, age, and gender.



The Information Screen of Experiment and Participant

· 3.4.1 Experiment Information

In the experiment information, you can set the experiment name and event details. The experiment name serves as a classification criterion for the storage location of the file when uploading to DataHub. There are two methods for creating experiment information: creating a new experiment or loading an existing one.

Loading an Experiment:
A list of experiments stored on the current device will be displayed. Selecting an item will load the information for that experiment. If the experiment information is loaded, the experiment name and existing event details cannot be edited, but new information can be added.

Creating an Experiment:
You can create new experiment information by setting the experiment title and event details for the current measurement.

Event information is provided in three methods: Not Used, Preset, and Manual Entry. Event labeling data is stored in the last column of the saved file, called the ‘event’ column.

Not Used: Events will not be recorded. The event column in the resulting data will contain the default value of 0.

No Event Data

No Event Data Display

PreSet : Event recording times are pre-set based on the measurement duration. You can specify event numbers to be recorded according to the set times. During the measurement, when the pre-set time is reached, the value in the event column of the resulting data will change to the designated event number. If the time does not match the pre-set time, the event column value will remain the default value of 0.

Select event preset

Measurement screen with event preset selected

Time (seconds)	event
119.9	1
119.92	1
119.94	1
119.96	1
119.98	1
120	1
120.02	2
120.04	2
120.06	2
120.08	2
120.1	2

Event results in saved data

Manual Entry : Events are recorded based on the user's interactions during the measurement. With manual entry, you can specify the number and description of event numbers when setting up. During the measurement, you can press a button on the screen to designate the event column values that will be created in the resulting data. "No Event" is provided as a fixed option.

Select Manual Entry

Measurement screen with Manual Entry selected

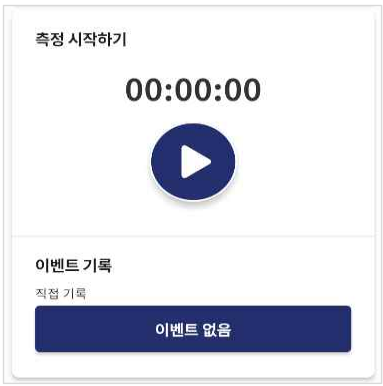
· 3.4.2 Participant Information

Participant information requires the entry of the participant's name, gender, and age. The entered participant information is automatically saved as "metadata" when uploading to DataHub, providing a summary of the experiment and making it easier to manage numerous data files.

▪ 3.5 Starting Data Collection and Real-Time Event Labeling

· 3.5.1 Data is collected

Data is collected and stored in real time through the connected device. By pressing the play button on the 'Measurement' tab, the measurement begins. Once the measurement starts, real-time PPG, HR, and IMU graphs will be acquired. During measurement, the event column values in the data file are saved based on the event recording method set when entering experimental information.

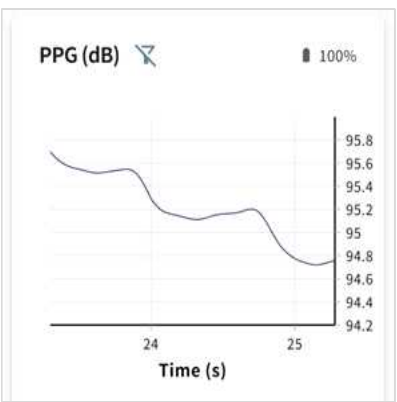


Start Measurement button and Event Record button on the Measurement screen

PPG Signal Graph

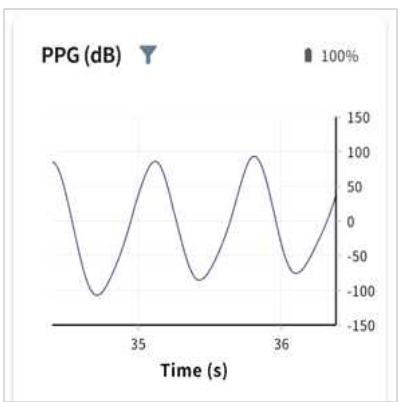
The two images below show the difference in graphs based on whether the PPG signal is filtered or not. Smart Filter Not Applied Graph: supports the collection of raw data measured in real-time through the PPG sensor.

Smart Filter Applied Graph: supports the collection of raw data with noise removed from signals that were unstable due to the user's movements.



Real-time PPG graph on the measurement screen

(Smart Filter not applied)



Real-time PPG graph on the measurement screen

(Smart Filter applied)

Advantages of the Filter Function

Smart Filter effectively removes complex noise components from raw signals, providing clearer biosignal information that is crucial for analysis and interpretation. This allows users to more easily identify key patterns in the data.

Note: In environments with strong electromagnetic interference, situations where noise increases due to vigorous physical movement, improper device wear, or if the skin has tattoos, stable signal collection may be difficult even with Smart Filter enabled.

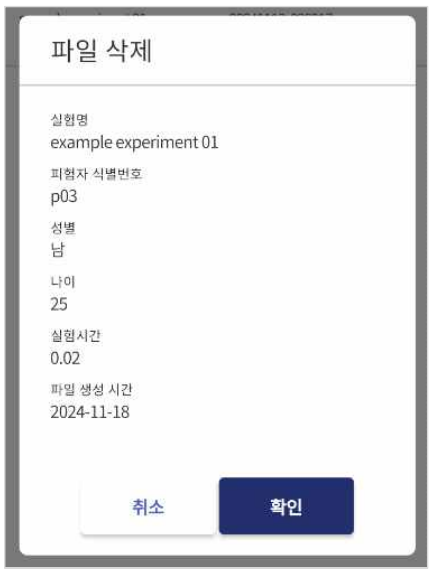
To stop the measurement during data collection, press the stop button. Once pressed, a file is generated based on the measured information and saved to the app's storage.

▪ 3.6 Viewing and Managing Local Files

At the bottom of the screen, navigate to the "Saved Data" tab to view the list of local files stored in the app. You can click the additional menu button for the saved data to delete or view detailed information.

<List of saved data>

<Data details>



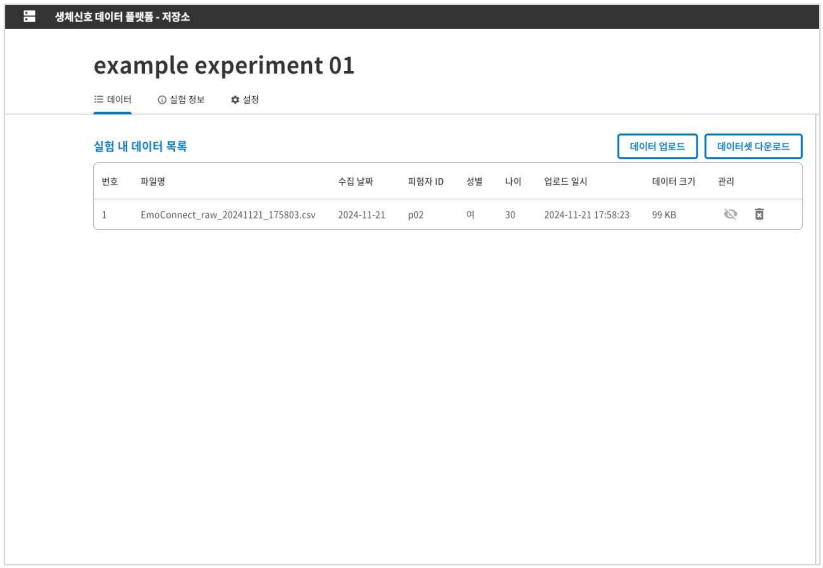
<File deletion instructions>

▪ 3.7 Uploading Data

You can upload the data created through real-time measurement to DataHub.
Go to the "Saved Data" tab and click the icon button of the desired item to upload the data to DataHub.

A new experiment with the same name as the current file will be created on DataHub, and each file will be uploaded under the corresponding experiment name. Only one file can be uploaded at a time. The uploaded data can be managed on DataHub (https://biosignal-datahub.com).

Data Upload



Data Uploaded to DataHub

▪ 3.8 Importing Local Data

Data measured with EmoConnect – PPG&Motion is by default created in the app's local storage.
If needed, the data can be directly extracted from the device without uploading it to DataHub.

Android: Connect the device to a PC and navigate to the following location in the file explorer:
'Android Device' > Internal Storage > Android > data > com.newert.emoconnect > files
iOS: Open the "Files" app on the iPhone and navigate to the following location:
Files App > EmoConnect App folder > files folder

The files generated after measurement will be stored in the specified location. You can copy or move the files to your personal drive to extract them.

4. SDK Usage Guide

▪ 4.1 SDK Overview

The EmoConnect SDK is designed to help researchers and developers easily integrate and customize biosignal and motion data collected through the EmoConnect device, enabling the development of various applications. This allows for the creation of applications that can be used in fields such as healthcare, fitness, and research.

▪ 4.2 SDK Installation and Setup

Android (Flutter): The EmoConnect SDK for Android supports integration within the Flutter environment and can be downloaded via GitHub. For detailed installation and setup instructions, please refer to the Android SDK page on the Newert official website.

iOS (Flutter): The EmoConnect SDK for iOS supports integration within the Flutter environment and can be downloaded via GitHub. For detailed installation and setup instructions, please refer to the iOS SDK page on the Newert official website.

Windows and Linux (Python): The EmoConnect SDK for Windows and Linux supports integration within the Python environment and can be downloaded via GitHub. For detailed installation and setup instructions, please refer to the Windows/Linux SDK page on the Newert official website.

▪ 4.3 SDK Key Features

Data Collection and Processing: Each platform's SDK supports real-time collection of biosignals (such as PPG) and movement data (IMU sensor data) from the EmoConnect device, and processes the data to be utilized within the application.

▪ 4.4 SDK Usage Examples

Basic Data Collection and Storage: Each SDK provides basic data collection and storage functionality, which can be utilized to develop applications. For example, the GitHub repository for the Windows/Linux SDK includes sample code for collecting data from the device via BLE connection.

▪ 4.5 SDK Support and Update Policy

Technical Support: If you encounter technical issues or require additional assistance during the use of the SDK, please contact Newert's official support email (Email: contact@newert.co.kr). All inquiries are handled promptly and accurately to ensure continuity in research and development environments.

Policy: The EmoConnect SDK is continuously optimized with performance improvements and new feature additions. Users are encouraged to regularly visit Newert's website to download the latest version and integrate it into their research environments to maintain optimal performance.

5. Precautions for Use

▪ 5.1 Waterproofing Precautions

The EmoConnect device is research-grade equipment that does not offer waterproof functionality and is highly sensitive to moisture and contact with liquids. To maintain the device's reliability and performance, please adhere to the following guidelines.

Environmental Control:
Using the device in high-humidity environments (e.g., underwater laboratories, saunas) or areas where it may come into contact with liquids is prohibited.

Liquid Exposure Warning:
Exposure to external liquids such as water droplets, sweat, beverages, or chemicals may affect the accuracy and functionality of the internal sensors. Specifically, if the device gets wet, the reliability of the data may be compromised. Please ensure the device is thoroughly dry before and after experiments.

Structural Limitations:
As the device does not include waterproof functionality, exposure to liquids may cause irreparable damage, leading to distortion of experimental data and permanent damage to the device.

* Failure to follow the above precautions may result in physical damage to the device and data distortion, which could compromise the accuracy of research results. Additionally, such cases are excluded from the product warranty coverage.

▪ 5.2 Precautions Regarding Noise During Product Use

When using the EmoConnect device, please follow the noise-related precautions below to maintain signal quality and the reliability of the data:

Environmental Noise Management:
Strong electromagnetic interference (e.g., near MRI machines, and densely packed electronic devices) may distort signals.

Abnormal Activities:
The EmoConnect device is designed to collect stable and reliable signals during normal activities like walking, running, or light activities. However, sudden and intense movements, or continuous shaking, may affect signal quality. These activities could cause light interference on the sensors or loosen the attachment, disrupting signal collection. For optimal performance, please try to maintain an appropriate and stable posture during experiments.

Device Wear Status:
If the device is not securely attached to the skin, data quality may degrade. Ensure that the device is properly worn before use.

Skin Condition:
Tattoos on the skin or the presence of sweat and oils can degrade sensor contact quality. Therefore, clean and dry the skin before measurements.

Failure to follow these noise management guidelines may decrease data reliability and result in potential inaccuracies in experimental outcomes.

6. EmoConnect - PPG&Motion Legal Notices

EmoConnect - PPG&Motion is a bio-signal and motion data collection solution developed by Newert, provided exclusively for research and data analysis purposes. This product is not a medical device and is not intended for use in medical diagnosis or treatment. EmoConnect provides researchers and developers with precise tools for experimentation and data analysis, but it cannot be used to draw conclusions about health status or make medical decisions.

▪ 6.1 Legal Notices

Copyright and Trademark:

All intellectual property rights, copyrights, trademarks, and technological rights related to EmoConnect - PPG&Motion are owned by Newert Inc. The product and related materials are protected by copyright laws and international copyright treaties. Reproduction, distribution, modification, resale, or any other commercial use of the product without the explicit consent of Newert is strictly prohibited.

Disclaimer:

EmoConnect - PPG&Motion is not a certified medical device and is intended for research purposes only. While this product can support various analyses and research based on bio-signal and motion data, it cannot be used for clinical diagnosis, treatment, or prevention. Users should not make health-related decisions based on the results of this product, and all health-related concerns should be addressed through professional medical knowledge and consultation.

▪ 6.2 Additional Disclaimers

Limitations of Data Accuracy:

EmoConnect - PPG&Motion is designed for research purposes, and the accuracy and consistency of the collected data may be affected by various factors such as environmental conditions, user-wearing methods, and user activities. The provided data should only be used as a tool for research and analysis, and clinical, legal, or commercial decisions based on this data are not recommended.

Third-Party Data Usage Restrictions:

Users must obtain prior approval from Newert if they wish to provide or use the data collected via EmoConnect - PPG&Motion for third-party purposes or commercial use. Any legal issues arising without such approval are the sole responsibility of the user.

Regulatory Compliance:

Users must comply with the regulations and laws of their respective regions or countries when using the product. Since EmoConnect - PPG&Motion is not a certified medical device, its use in medical or regulated environments may be subject to restrictions based on relevant laws.

Safety Warnings:

EmoConnect - PPG&Motion is sensitive to physical damage (such as impact and water exposure). Newert is not responsible for any issues (such as device damage or data loss) caused by improper handling of the product. Users should be aware of all potential risks during use and manage them appropriately.

Product Software and Firmware Updates:
Newert periodically updates the product's software and firmware to improve performance and stability. Users must install the latest updates provided, and Newert is not responsible for issues arising from failure to install these updates.

Product Warranty Limitations:
The product warranty is valid only when users adhere to the official usage instructions provided by Newert. Any issues resulting from failure to follow the usage instructions will be excluded from the warranty coverage.

Other Contact Information:
Email: contact@newert.co.kr
Website: https://www.newert.co.kr

Users of EmoConnect - PPG&Motion must fully understand and comply with the above legal notice and use the product solely in a research environment. Newert is not responsible for any damage or data loss resulting from improper use of the product by the user.