MENTALAB

# Explore

## Quick Start Guide

# Overview

## Thank you for purchasing a Mentalab Explore device.

Mentalab Explore is a versatile, high-end solution for biomedical recordings that provides research-grade precision in a mobile format†.

Enjoy a 12h battery life, 1kHz sampling rate, 24 bit resolution and 9-axis positional data.

Stream data to Bluetooth for real-time analysis at over 10 meters.

Record to internal memory and work offline using our extensive open-source software.

†Not for medical diagnosis.

# Getting started

This guide contains basic information to start streaming and recording data with your Mentalab Explore device.

For more extensive information regarding safety and usage, please refer to the user manual. Further guidelines and instructional videos can be found at www.mentalab.com.

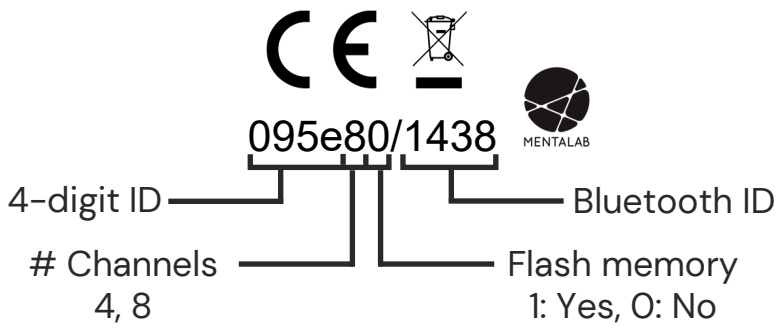
## Package contents

- Mentalab Explore device in shockproof case.
- USB 2.0A to micro-USB cable.
- Electrode sets and caps of your choice.
- Electrode gel and cleaning solution (optional).

## Device configuration

Your Explore device's configuration is encoded on the device label on the back of the device.

An 8-channel device without flash memory and Bluetooth name "Explore_1438" would appear as follows:



## Technical specifications

| | |
|---|---|
| **No. channels** | 4, 8 |
| **Sampling rates** | 250 (default), 500, 1000 Hz |
| **Dimensions** | 41 x 42 x 17 mm |
| **Battery life** | Up to 8 hr online, 12 hr offline |
| **Differential Input Range** | ± 400 mV |
| **Input Impedance** | 1 GΩ |
| **Resolution** | 24 bit resolution, < 1 µV noise (RMS) |
| **USB Output Interface** | USB 2.0 |
| **Additional Sensors** | Gyro-, Accelero- and Magnetometer: 20 Hz<br>Device Temperature, Battery: 1 Hz |
| **Flash Memory Size** | 512 MB |
| **Bluetooth Range** | Approx. 10 m |

## Collecting data

1) Charge the device via USB. A green LED indicates sufficient battery. Disconnect from the power source prior to use.
2) Connect the cable set to the device and place the electrodes on the body. Each channel (1-4 or 1-8) is recorded against a unipolar reference electrode. The order of the electrodes is shown below. Use the Velcro strap to secure the device to an EEG cap.
3) Push the power button to start the device. It will now record data to internal memory, if present.

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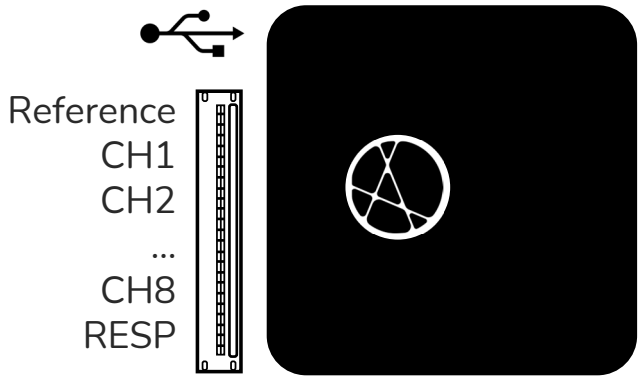
4) Two blue blinks per second indicate that the device is visible via Bluetooth. The device's Bluetooth name is Explore_xxxx. The last four digits on the device's label are its Bluetooth ID.

5) Once a Bluetooth connection to the host machine has been established (see Section: API), the Explore device will start transferring data via Bluetooth. Use Explore's open-source APIs to access impedance values, visualize the signal stream, change device settings, and more.

6) Press the device button once to set a mark during the recording. A pink LED signal indicates that a marker has been set.

7) Turn off the device after use. To do so, hold the power button for 3 seconds until the LED blinks red 3 times. Always shut down the device before connecting it to USB.



# Instructions

The following table describes Explore's LED light code:

| LED Color | Blinking pattern | Indicates |
|---|---|---|
| Red<br>Yellow<br>Green | At device startup, about 3 sec | Startup in progress. The color indicates the battery level (green > 60%, yellow 30 - 60%, red < 30%) |
| Blue | Blinking 2x / sec | Bluetooth visible and advertising |
| Blue | Blinking 1x / sec | Bluetooth visible and connected to the host machine. Online mode in progress. |
| Green | Blinking 1x / 3 sec | Bluetooth is inactive. Offline mode in progress. |
| Pink | Blinking 1x / sec | Not enough space in memory. Press the button twice to free up space (formats memory). |
| Light pink | One-time flash | Button has been pressed: a marker with the timestamp corresponding to the button event is stored and transmitted. |
| Red | Flash 3x | Device is shutting down. |

## Connection

To pair your Explore device with a mobile or computer, use the standard Bluetooth menu. Explore uses a Serial Profile Protocol (SPP) over Bluetooth to transfer raw data as soon as a Bluetooth connection is established.

If the connection is lost, the device will revert to BT-visible mode, and is ready to reconnect. Explore remains in this state for 4 minutes until moving to offline mode (flash memory) or shutting down (no flash memory).

## Data

Explore samples ExG data at 250 Hz (default value) with a 24-bit resolution. The device also records and transmits accelerometer, gyroscope and magnetometer data. This means you can derive the absolute orientation of your device at all times. Device temperature and battery voltage are also communicated continuously.

Data are stored in a binary file (.BIN suffix) in flash memory. To retrieve data from the device, connect Explore to a computer via USB. Files cannot be deleted via USB, instead they must be overwritten. To format the memory (and delete all previous data), use our open-source APIs. Please refer to the user manual or website for more details.

## Software

Capture and visualize data using Explore's APIs written in Python, C++, Java and MATLAB. Everything is open-source, feel free to contribute: https://github.com/Mentalab-hub.

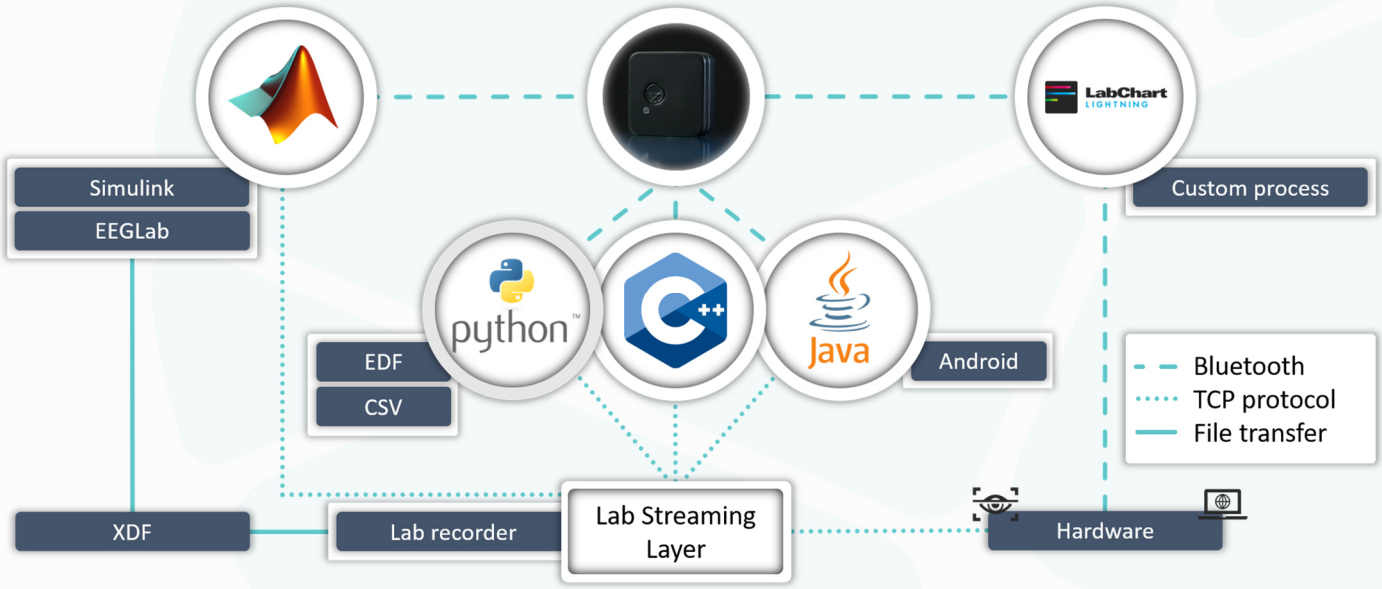
Explorepy, written in Python, is most mature. It provides an extensive set of tools that allow you to build customized biosignal applications. For detailed instructions on the installation and use of Explorepy, please visit the Explorepy Wiki page: https://explorepy.readthedocs.io.

## Software Features

Explorepy provides useful functionalities for all users, regardless of prior programming knowledge. Use the command line of your Python terminal to:

- Acquire data in CSV and EDF.
- Visualize data in a browser-based dashboard GUI.
- Visualize electrode impedance measurements.
- Set event markers.
- Configure the device.
- Integrate with MATLAB and LabStreamingLayer (LSL).
- Convert BIN-data in the device memory to other formats.

## Software Integrations



# Contact

Mentalab is a biomedical technology company from Munich, Germany. Mentalab Explore is a high-end, mobile measurement device for biosignal applications.

Mentalab Explore is used by researchers and scientists around the world in applications ranging from BCIs to sleep and neuropsychology research.

Our team is happy to support you in developing your own innovative solutions.


contact@mentalab.com
support@mentalab.com

http://mentalab.com

http://github.com/Mentalab-hub

http://explorepy.readthedocs.io

Mentalab GmbH
Weinstr. 4, Munich, D-80333, Germany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