



Diadem 12ch EEG

USER GUIDE

Model: E12



V-E12-DI-01-040326-EN

English

This is the user guide for the Diadem 12ch EEG device from Bitbrain.

This document will provide information for the proper setup and usage of the system.

Contents

05	What is included?
07	Safety information
09	Conventions and symbols
10	Conditions for use
11	Disclaimer
12	Diadem 12ch EEG
14	Technical specifications
15	Preparing to record data
18	Placing the equipment

21 Obtaining a signal

23 Removing the Diadem device

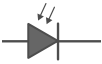
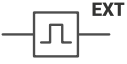
24 Maintenance

What is included?

The pack includes all the elements necessary for the operation of the 12-sensor Diadem EEG system.

Item	Name / description	Amount
	Amplifier with 12 channels Powered by an internal battery.	1
	EEG headband with 12 channels - Based on 10/10 international system. - Includes 12 dry sensors + GND + REF	1
	Headband stand Holds the headband securely when not in use.	1
	8GB Class-10 MicroSD Card with SD Adaptor	1
	Charger + adapters Charges the internal amplifier battery.	1
	REF Sensor Elastic O-Ring Replacements (Clip) Used to replace the elastic o-ring located on the REF sensor clip in case of breakage, wear, or loss.	4
	Elastic adjustable band (optional) Enables placement of the amplifier on the arm or waist.	

What is included?

Item	Name /description
	Photodiode EEG (optional) Connected to the auxiliary input, it measures changes in light intensity to synchronize data recording with on-screen stimuli.
	1 Button Box - 1-bit input trigger (optional) Connected to the auxiliary input, allows the user to record events.
	Pedal - 1-bit input trigger (optional) Connected to the auxiliary input, allows the user to record events.
	TTL Trigger BBT (optional) Connected to the auxiliary input, allows synchronization with Versatile BIO.
	TTL Trigger EXT (optional) Connected to the auxiliary input, allows synchronization with external devices.
	Duplexer (optional) Connected to the auxiliary input, enables the connection of one photodiode and one digital trigger (TTL, button, pedal or pulse generator) at the same time.

Safety information

Please read the safety information, conditions for use and instructions carefully before using the device. Failure to follow the instructions set out in these documents will lead to the nullification of the product warranty.

Careful usage and handling of the equipment

- Do not handle the device with damp hands, as this could cause a short-circuit.
- Do not use the device for other applications than its intended purpose.
- Do not hit, throw, bite, open or burn the device.
- Avoid falls or collision with other objects.
- Keep the device in a dry place, and do not expose to extreme temperatures.
- This equipment is not suitable for use where children are likely to be present.

Warnings about the equipment

- DO NOT use the device while it is charging.
- DO NOT open the device. If your device does not work properly, contact support@bitbrain.com.
- DO NOT place this device close to life support electronic and electrical equipment.
- The handling and supervision of the equipment shall mandatorily

be performed by an adult when the equipment is used to measure biometric data in children.

- If you notice that the device emits strange smells or noises, or that its temperature is excessive, leave it in a safe place and contact support@bitbrain.com.

Warnings about the battery

- Disconnect the charging cable once the battery is fully charged. Otherwise, the battery's life cycle could be reduced.
- If you are going to store the device for a long period (more than one week), it is recommended that the battery should not be 100% charged. This could cause battery degradation and loss of some of its capacity.
- Keep the device in a dry place, between the temperatures of 5°C and 40°C. Prolonged exposure to high temperatures can affect the stability of the battery.
- To charge the battery of the device, ONLY use the battery charger provided. Limit of 1A. Using a higher amperage charger may seriously damage the equipment.

Safety information

Disposal of the device

- Do not throw electrical and electronic devices in the trash! In accordance with European Directive 2012/19/UE on Waste Electrical and Electronic Equipment, they should be disposed of at suitable collection points for environmentally responsible recycling.
- Before disposing of appliances at collection points, batteries should be removed and disposed of separately from the electronics to be treated appropriately.
- In order to separate the battery from the electronics in preparation for disposal, open the amplifier using a Torx 6 screwdriver and carefully detach it.



Conformity and CE marking

This device is a radioelectrical IT equipment.

The CE marking indicates compliance with the essential requirements of the RED Directive (2014/53/EU).

The Bluetooth module it incorporates complies with this Directive. It is used according to the requirements and instructions specified by its manufacturer.



Important

- Diadem is a device designed by Bitbrain to measure biometric data for research purposes.

Conventions and symbols

The Following Conventions and Symbols are Used in this Manual:

Conventions:

- **Note:** used to highlight relevant information.
- **Caution:** used to point out aspects that if not observed, may cause damage to the equipment, injury to persons or deviations in the operation of the equipment with respect to its specifications.
- **Warning:** used to inform of a specific action which, if not observed, may cause damage to the equipment, injury to persons or deviations in the operation of the equipment from its specifications

Symbols:

The following symbols are to be found both in this manual and on the labelling of the equipment or its packaging:



This product contains electrical and electronic components and must not be disposed of using the standard waste collection system. Please refer to your local regulations for the disposal of electrical and electronic equipment.



Product complies with CE Marking regulations. See instructions for use.



Direct current.



Power button.

Conditions for use

- Read the device safety information carefully and keep this manual for future reference.
- Read the “General Terms and Conditions of Sale and Use for Bitbrain Products” carefully. You can find the document at <https://downloads.bitbrain.com/documents/terms-and-conditions-eu>

Disclaimer

The Hardware equipment included in the Products (EEG, biosensors, indoor positioning systems, eye tracking) are not medical devices, have not been designed or manufactured to offer healthcare services, and are not sold for the purposes of diagnosis, treatment, palliation, medical advice or illness prevention, but for research purposes.

Read the “General Terms and Conditions of Sale and Use for Bitbrain products” before buying a product, in order to understand it fully. You can find the document at <https://downloads.bitbrain.com/documents/terms-and-conditions-eu>

Bitbrain reserves the right to revise this user guide and make any changes to its content that it considers relevant, at any moment and without obligation to notify any person or entity of the changes made. Despite the best efforts made to ensure the accuracy of the information contained within, this should not be interpreted as a commitment from Bitbrain. To ensure that you have the latest version, please visit the Downloads section on the product page at www.bitbrain.com

Diadem 12ch EEG

Diadem is a 12-channel wearable and portable dry-EEG device designed for real-world applications that require easy set-up and high signal quality. The Diadem system uses active shielding for robust EEG monitoring and mobility, and it is designed to address the pre-frontal, frontal, parietal and occipital brain areas.

Sensor layout

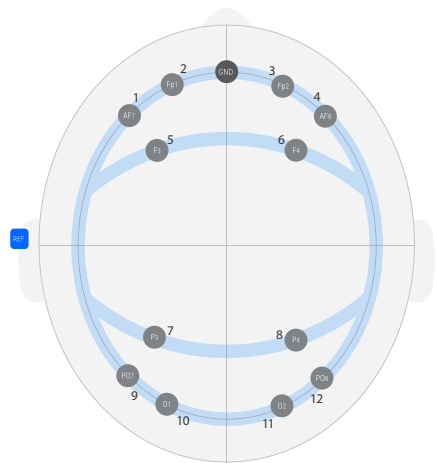
The headband includes 12 EEG sensors, plus ground (GND) and reference (REF).

The sensors are placed at positions AF7, Fp1, Fp2, AF8, F3, F4, P3, P4, P07, O1, O2 and P08, according to the EEG 10/10 international standard.

REF is located on the ear clip.

The correspondence between channel numbers and sensors is as follows:

Channel 1: AF7
Channel 2: Fp1
Channel 3: Fp2
Channel 4: AF8
Channel 5: F3
Channel 6: F4
Channel 7: P3
Channel 8: P4
Channel 9: P07
Channel 10: O1
Channel 11: O2
Channel 12: P08



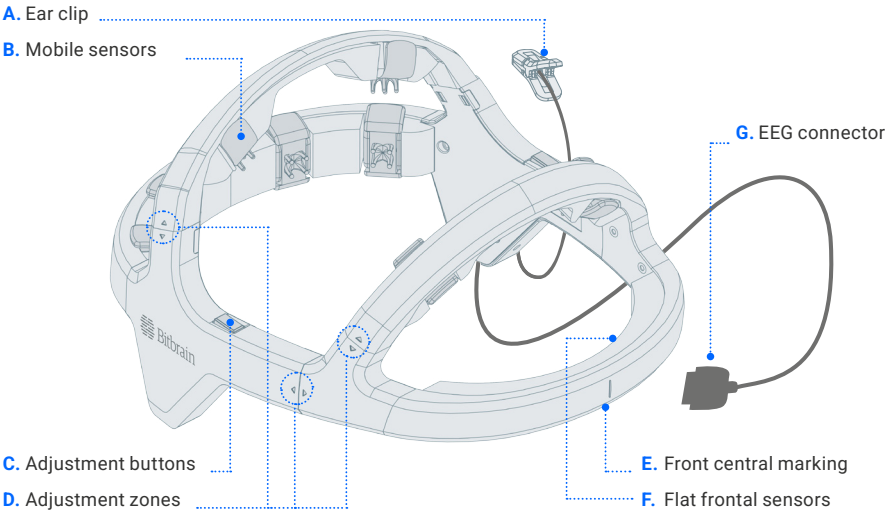
Manufacturer's Information

BIT&BRAIN TECHNOLOGIES, S.L.

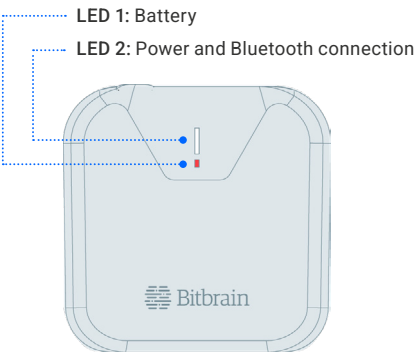
C/Sta Teresa de Jesús 32, 50006 Zaragoza, España.

Diadem

EEG Device



Amplifier

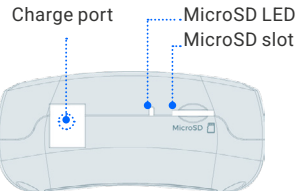
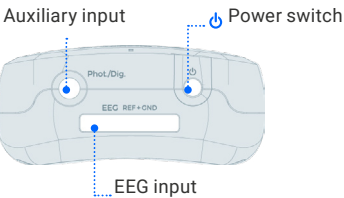


LED 1 STATUS

- Charging battery
- Low battery
- Battery loaded

LED 2 STATUS

- Bluetooth connected
- Connecting bluetooth



LED MicroSD status

- MicroSD card inserted

Technical specifications

Nominal voltage	3.7V
Nominal power	750mW
Battery life	>8h
Charging time	≤3h
Sampling rate	256 SPS at 24 bits
Data transmission and range	Bluetooth 2.1 + EDR with 10 meters in direct sight
Data backup	Yes (removable μSD card. Max 8 GB, class ≥10)
Dimensions	Amplifier: 71x71x34mm
Weight	Amplifier: 120g.
Charging connection	Barrel plug connector (Charger provided)
Certifications	CE (Directive 2014/53)
Head perimeter	530 - 610mm

Preparing to record data

1

Turn on the amplifier by pressing the power button (🔌). The white wireless connection LED will flash until a connection is established with the software, at which point the light will be steady.

When the battery device is low, the battery indicator LED will turn on.

IMPORTANT:

Do not use the device while charging. A low battery can adversely affect the quality of the recorded signal and it is recommended to charge the system before starting a recording.



Preparing to record data

2

This equipment sends data using Bluetooth wireless technology.

The data can be saved on:

- **The computer with which the device is paired.** Note that if the device loses Bluetooth connection with the computer, this can lead to a loss of data.
- **MicroSD Card.** In this mode, the wireless signal will continue being sent, so data can still be seen and recorded in real time on the computer while simultaneously being saved on the memory card.

Pairing

Be sure the computer has a Bluetooth adapter version 2.1 or higher. The first time you use the device, you will need to pair it. This can be done from "Settings > Devices" on Windows.

The name of the device in the list of Bluetooth interfaces corresponds to the serial number (S/N), which you can find printed on the label on the amplifier.

Data backup with MicroSD

1. Insert the MicroSD card provided into the slot on the display.
2. Enable the "SD card record" option on the software to save data to the card.

The files saved are recorded in .sdf format. To convert them to .csv format, use the "Import record" function on the software.

IMPORTANT:

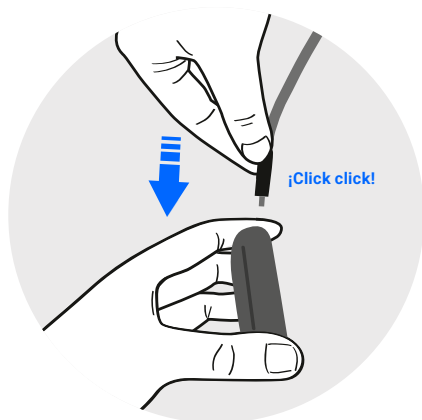
We recommend using a Class 10 or above MicroSD card with capacity of 8GB. Using another type of memory card that does not meet these specifications could cause loss of data.

Preparing to record data

3

Connect the EEG connector (G) to the amplifier with the side labeled 'This Side Up' facing upwards. To ensure good connection, you must hear a double "click".

⚠ Caution: Connecting the EEG connector upside down may damage the connector. Always ensure the side labeled 'This Side Up' is facing upwards before inserting.

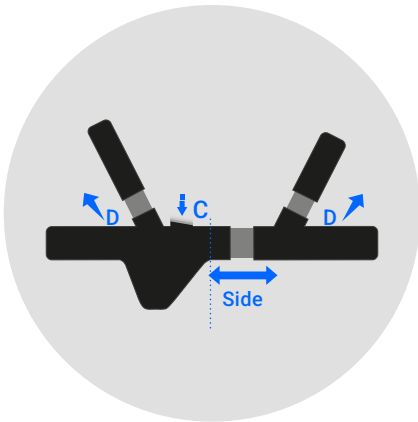


Placing the equipment

Follow the steps described below for correct placement of the headband.

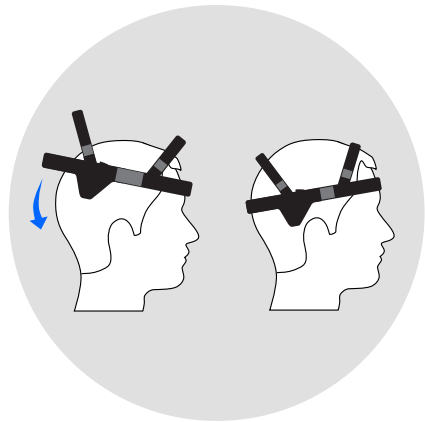
1

- Open the side adjustment strips completely by pressing the (C) buttons while extending the frame carefully.
- Open the top strip adjustment zones (D).



2

- Place the headband over the perimeter of the head. First, position the frontal section, making sure the central mark (E) is aligned with the nose, and then slide the back part of the headband downwards, until it is situated at the most prominent zone in the back of the head.



Placing the equipment

3

- Ensure that the frontal strip is horizontal and its central mark (E) is aligned with the nose.
- Position hair away from the forehead to ensure that the flat sensors (F) touch the skin directly.



4

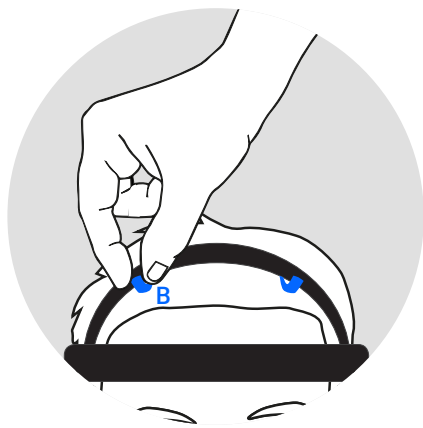
Place the clip (A) on the left earlobe, with the sensor in contact with the inner part of the earlobe



Placing the equipment

5

Move the sensors (B) by rocking them backward and forward so the sensor pads slide through the hair and make better contact with the scalp.



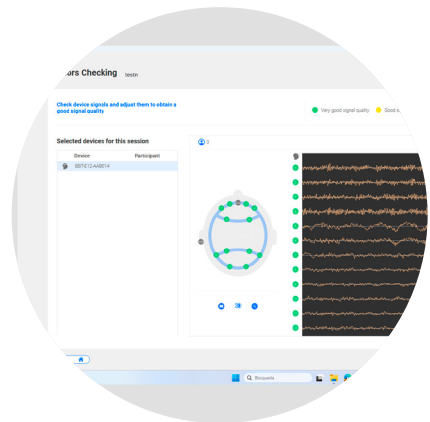
Wait for 10 seconds until the signal is stabilized.

Obtaining a signal

8

The acquisition software shows the EEG signal captured by the device in real time.

The color of the sensors indicates the impedance, or the quality of the contact with the skin. Quality depends directly on the placement.



Obtaining a signal

If some of the mobile sensors do not show a quality signal:

Repeat these steps until impedance improves:

- A.** If the sensors are not close enough to the head, slide the adjustment zones (D) carefully to bring the sensors closer to the scalp. Verify that the adjustment is uniform on both sides of the head.

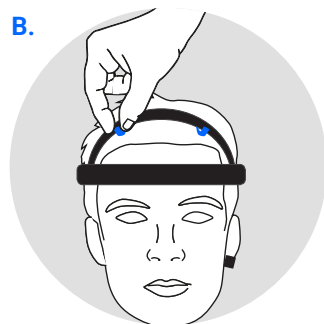
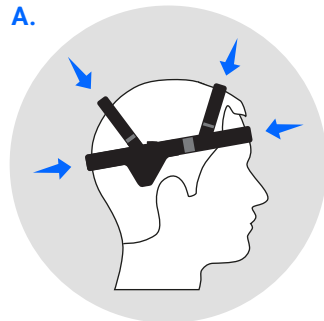


Wait for 10 seconds until the signal is stabilized.

- B.** If the problem is coming from the sensors in the hair, carefully move the mobile sensors (B) back and forth so that their pads slide through the hair and make better contact with the scalp.

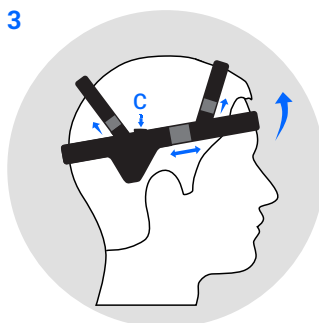
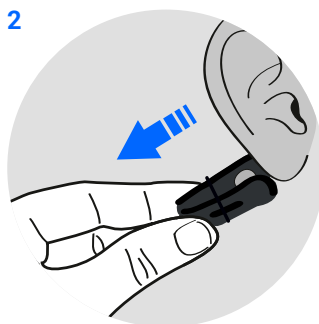
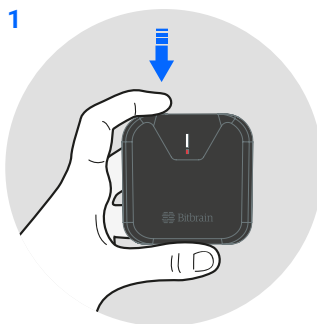


Wait for 10 seconds until the signal is stabilized.



Removing the Diadem 12ch EEG device

1. Turn the amplifier off.
2. Subsequently, **remove the clip** from the participant's ear.
3. To remove the headband, **press the adjustment buttons (C) while sliding the side strips fully open.** Also open the upper adjustment strips. Remove the headband by **lifting the front part first.**



Maintenance

Remember to clean the headband after each use.

Disinfecting and cleaning the headband

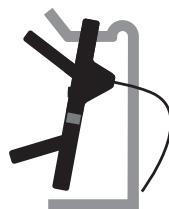
- To disinfect the headband, we recommend using Clinell Universal Wipes.
 1. Use the wipes in such a way that all surfaces of the equipment stay damp for 1 minute. Wipe gently without applying excessive pressure – this could release liquid that could cause internal damage to the device.
 2. In the area of the forehead sensors, always wipe with them face-down.
- Clean and dry the device frequently, especially the sensors. We recommend to slightly dampen a cloth with water.

Disinfectant product clarification

- Use ONLY Clinell© Universal Wipes
- DO NOT USE! Any other cleaning product or disinfectant not validated by Bitbrain. The use of any other cleaning product not validated by Bitbrain could deteriorate the equipment and affect the signal obtained.

Storage

- Keep the product in its original packaging while not in use.
- If you are storing the device for long period of time (more than one week), it is recommended that the battery not be at 100% charge. This can degrade the battery and result in permanent capacity loss.
- Between uses, place the headband on the provided stand to prevent damage to the cable. Rest the occipital strip on the stand, as shown below.

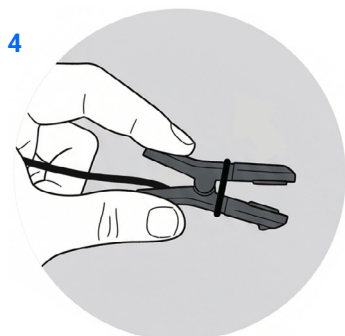
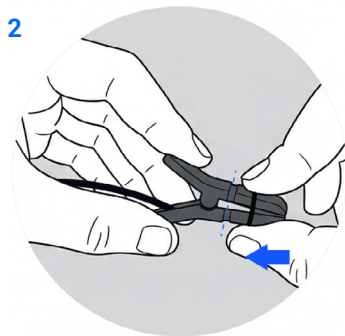
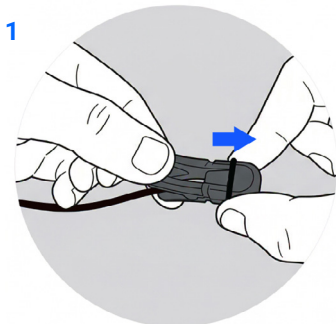


Replacing the REF Sensor Elastic O-Ring

In the event of loss, breakage, or visible signs of wear of the elastic O-ring that secures the REF sensor clip, it can be easily replaced using one of the spare bands included with the device.

To do so, remove the old O-ring by sliding it outward and insert a new one (with the clip in the closed position) until it is properly seated in the corresponding groove, as shown in the image.

Ensure that the clip opens and closes normally.





Europe

Zaragoza, España

C. Sta Teresa de Jesús, 32, 50006

Zaragoza

+34 931 444 823



Más información en:

Email

info@bitbrain.com

Help Center

help.bitbrain.com
