BrainBit DragonEEG

USER GUIDE

Contents

About this guide

The user manual describes in detail the functionality, features, and operation of the BrainBit DragonEEG device. For your safety, please read this manual before using the device.

Symbols and abbreviations used in this guide

This guide contains the following symbols:

Warning – situations that could cause injury to you or someone else.

Attention – situations that could damage the device or other equipment.

Note – recommendations or additional information.

Precaution

This information will help to avoid injury and damage to your device during operation.

- *Do not use the system for purposes other than its intended use.*
- *Do not apply disposable electrodes to damaged skin.*
- *Do not conduct the study while the recording module is charging.*
- *Do not use a damaged USB cable to connect the amplifier to the PC.*
- *Do not connect the recording module to the main power without protective grounding. Electric shock may occur.*
- *Do not use multi-socket power strips to charge the recording module.*
- *Do not touch the PC and the client simultaneously during the study, as the safety level of household computer equipment is insufficient for use in the environment surrounding the client.*
- *Do not allow moisture or gel to enter the connectors, as this may lead to clogging or oxidation of the connector contacts and system failure. The warranty does not cover such malfunctions.*
- *It is prohibited to use electrical networks that combine neutral and protective ground.*

- *Do not disassemble or repair the system yourself. If the system malfunctions, contact the manufacturer's technical support service.*
- *Do not use cables that are not included in the kit. This may lead to increase electromagnetic emissions or reduce system immunity.*
- *Excessively high or low temperatures may damage the recording module and negatively affect the battery capacity and service life.*
- *The influence of other equipment on normal system operation can disrupt it, even if it meets electromagnetic emission requirements.*
- *The system requires the application of special measures to ensure electromagnetic compatibility and must be installed and put into operation in accordance with the EMC information provided in Appendix A.*
- *The use of mobile radio frequency communication devices may affect the system.*
- *The system is not sterile. Do not use sterilization methods to clean and disinfect the device.*
- *The system does not intend to operate in environments with elevated oxygen levels.*
- *Modification of the product is not permitted! Modification of the product requires appropriate control and testing to ensure the long-term safe operation of the product.*

Device information

Technical specifications

Communication between the recording module and the PC is established via Bluetooth interface. The maximum communication range between the recording module and the PC in line-of-sight conditions is 5 meters. The maximum allowable time to establish operating mode is no more than 1 minute.

Memory device	microSD card
Number of recording channels	up to 24
Sampling frequency	500 Hz
ADC resolution	24 bits
Amplifier input impedance	1000 MΩ
Common-mode rejection ratio	110 dB at 50 Hz
DC current in the client circuit during signal measurement for each electrode	no more than ±1nA
Measurable voltages	0 to 400 mV with a permissible relative deviation of ± 10%
Noise level on shorted inputs	no more than 2 μV peak-to-peak
Range of inter-electrode resistance assesstment	1 kOhm – 100 kOhm
Permissible relative deviation of the inter-electrode resistance assesstment	+-20%
DC current in the client circuit during inter-electrode resistance assessment	no more than ±10 μA
Maximum battery life	8 hours
Full battery charging time	should not exceed 4 hours

Product designation

The BrainBit DragonEEG system is designed for recording brain biopotentials, with the capability of simultaneously recording signals from polygraphic channels. The system records electroencephalograms (EEG) with up to 21 channels, according to the generally accepted «10-20%» or «10-10%» EEG electrode placement systems.

However, it does not provide report generation for diagnostic purposes. The system is not intended for clinical research.

The BrainBit DragonEEG system is intended for use in:

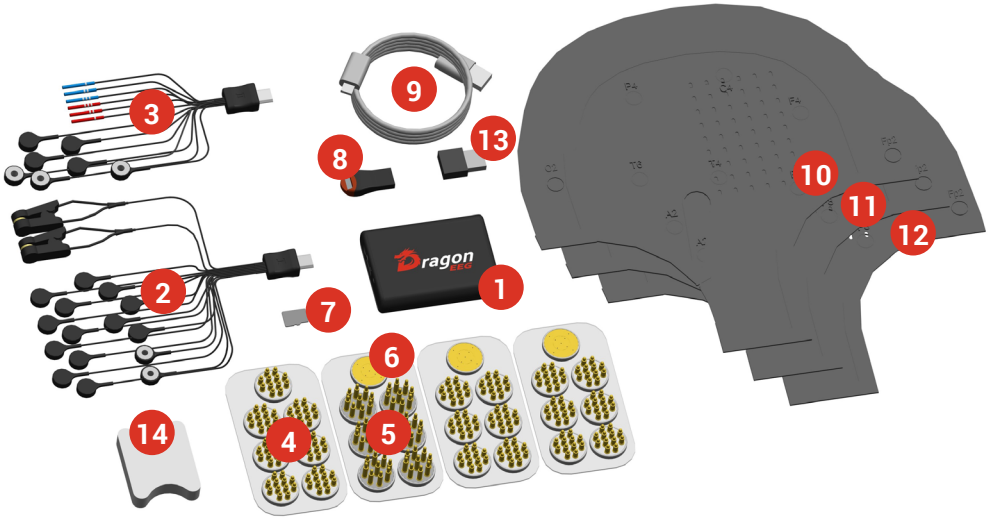
- psychologists' offices;
- research laboratories;
- universities;
- rehabilitation centers;
- other organizations involved in brain research and neurotechnology development.

The BrainBit DragonEEG Wireless Brain Biopotential Monitoring System is safe and reliable. It complies with international and national standards and meets the requirements necessary for its intended use as defined by the manufacturer.

Device operation

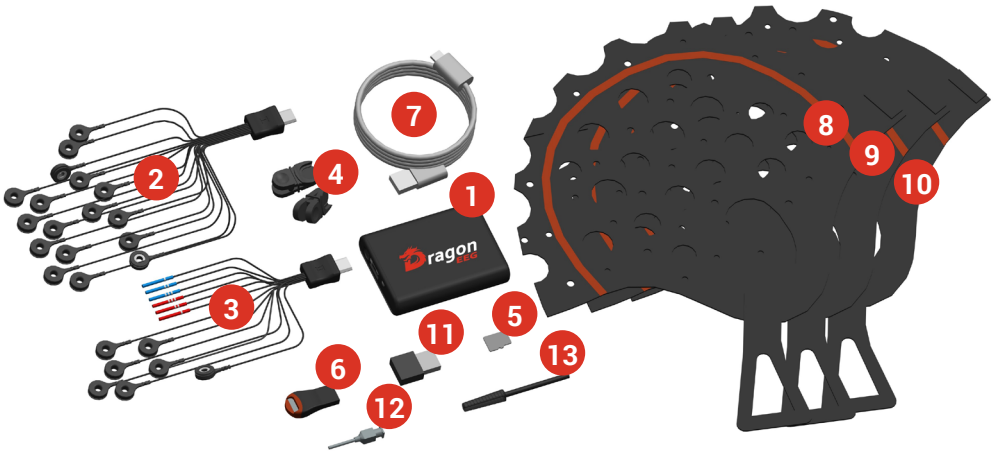
Appearance of the device and components

Basic system delivery set with dry electrodes.



1. BrainBit DragonEEG Amplifier – 1 pcs.
2. Cable system I with dry electrodes – 1 pcs.
3. Cable system II with dry electrodes – 1 pcs.
4. Dry electrode – 19 pcs.
5. Dry electrode with long pins – 6 pcs.
6. Flat dry electrode – 3 pcs.
7. SD card – 1 pcs.
8. SD card reader – 1 pcs.
9. USB charging cable – 1 pcs.
10. Cap size S – 1 pcs.
11. Cap size M – 1 pcs.
12. Cap size L – 1 pcs.
13. Bluetooth adapter – 1 pcs.
14. Device mounting – 1 pcs.

Basic system delivery set with wet electrodes.



1. BrainBit DragonEEG Amplifier – 1 pcs.
2. Cable system I with wet electrodes – 1 pcs.
3. Cable system II with wet electrodes – 1 pcs.
4. Ear clip for referential electrode – 2 pcs.
5. SD card – 1 pcs.
6. SD card reader – 1 pcs.
7. USB charging cable – 1 pcs.
8. Cap size S – 1 pcs.
9. Cap size M – 1 pcs.
10. Cap size L – 1 pcs.
11. Bluetooth adapter – 1 pcs.
12. Gel insertion needle – 1 pcs.
13. Electrode cleaning brush – 1 pcs.

Device indication and operating modes

- **LED off.** The amplifier is powered off.
- **LED flashes 3 times.** The recording module is powering on.
- **LED is on.** The recording module is powered on and in standby mode.
- **LED flashes continuously (0.1s on, 0.7s off).** Signal recording is in progress.
- **LED flashes (0.25s on, 0.25s off).** The recording module is charging or in pairing mode.
- **LED is on (when the power supply is connected).** The recording module is fully charged.

To turn the recording module on/off, press and hold the button for 2 seconds.
Before using the device, it must be paired with a computer.

To pair the device:

1. Power on the recording module.
2. Enter pairing mode: press and hold the power button for 5 seconds until the LED starts flashing (0.25s on, 0.25s off).
3. Pair the device with your computer/phone: use your computer's or phone's Bluetooth settings to search for and connect to the device. The device will be identified as DragonEEG in the Bluetooth settings list.

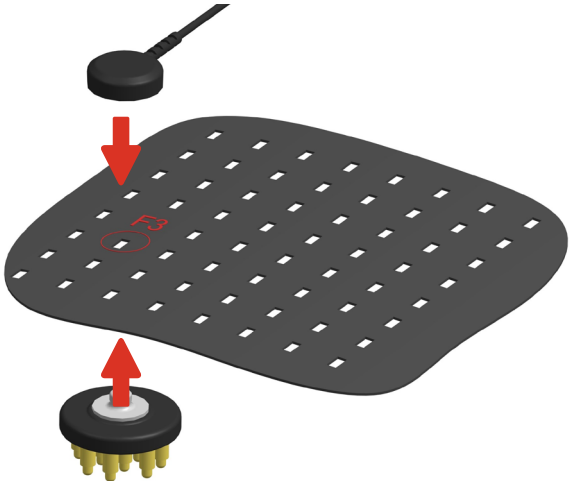
Electrode placement

You must select the correct size cap before attaching the electrodes (refer to the **«Recommendations for choosing the cap size»** section).

Dry electrode placement

Follow these steps to place and secure dry electrodes in the cap:

1. Insert the dry electrode into the designated mounting point inside the cap.
2. Connect the electrode connector to the dry electrode from outside the cap to secure it.
3. Repeat these steps for the remaining electrodes.
4. Attach the device to the cap to fix the electrodes.
5. Put on an EEG on a head.
6. Attach the reference and common electrode clips on the earlobes.



To enhance contact with the scalp gently move the electrode in circles while holding its body.

Wet electrode placement

Each electrode has a marking on the top side. Depending on the designation, the location of the electrode on the cap differs. There are only three types of designations:

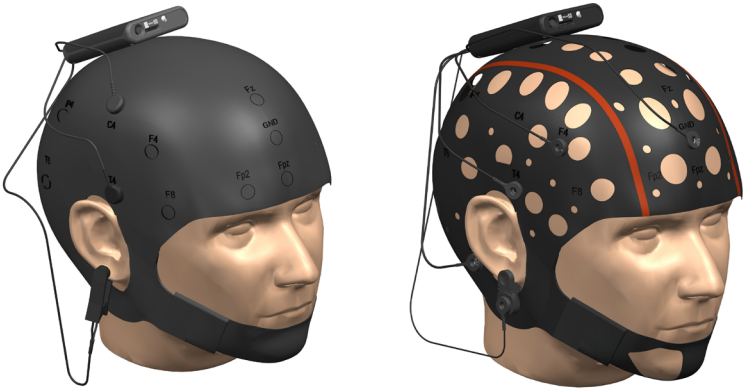
- **Ref** – the electrode is located behind the ear on the mastoid process. This location corresponds to points TP9 or TP10 on the cap.
- **Gnd** – the electrode is located in the middle at the top of the forehead. This electrode is placed at the GND point on the cap.

The electrodes with alphanumeric designations are placed on the cap according to the International 10-20 system to record EEG signals from specific brain regions.

A groove runs through the center of the electrode. To insert the electrode, draw back the fabric at the proper location and insert the lower half of the electrode into the hole on the helmet (which is smaller in diameter than the diameter of the electrode). The electrode is properly positioned when the bottom of the electrode is fully visible from the underside and the cap fabric fits snugly into the groove around the whole circle.

Conducting the session

The ready-to-use device (depending on the supply kit) looks like this:



Follow these steps to conduct the session:

1. Prepare the amplifier module and all necessary system components for operation.
2. Attach the Lead I and Lead II cables onto the EEG cap corresponding to the client's head size.
   Ensure that the markings on the electrodes and the cap align during the attachment process.
3. Place the EEG cap on the client's head, starting from the forehead and gradually stretching it towards the back of the head.
   The Cz electrode must be placed exactly in the middle of the line connecting the nasion (bridge of the nose) and the inion (occipital protuberance). The frontal electrodes Fp1 and Fp2 must be positioned directly above the eyebrow arches. All electrodes should be placed symmetrically with respect to the midline.
   The reference electrodes A1 and A2 must be placed on the mastoid processes.

To improve the quality of the recorded signal (by reducing impedance) at the points of contact between the electrodes and the skin:

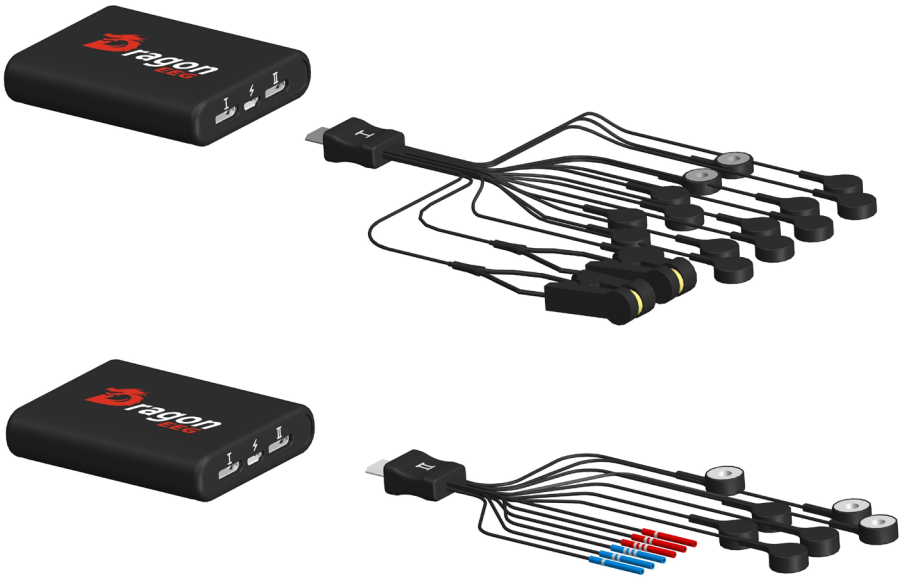
- for wet electrode systems: prepare the skin using special conductive gels, following the product instructions, or clean the area with alcohol wipes;
- for dry electrode systems: ensure the hair is parted and the electrodes make good contact with the scalp. Gentle pressure may be applied to enhance contact. Alcohol wipes can also be used to clean the scalp

and improve electrode contact.
Note: skin preparation products (e.g. gels, wipes) are not included in the delivery set and may be required for both wet and dry electrode systems, depending on the specific application.

Secure the EEG cap using the chin strap. Ensure that the EEG cap fits the client's head properly: it should not cause discomfort or exert excessive pressure on the head, while maintaining firm contact with the scalp and keeping securely in place.

4. Installing the MicroSD card into the amplifier.
   The MicroSD card slot is located on the side panel of the recording module. When inserting the MicroSD card, ensure the label faces upwards. Insert the MicroSD card until you hear a click, indicating that it is securely in place.

5. Attach the recording module to the EEG cap between the Cz and Fz electrodes using the Velcro fastener located on the bottom of the module and on the cap.
6. Connect the Cable I and Cable II systems to the recording module, inserting them into the corresponding ports on the side panel of the module.



7. Position the client in a comfortable chair (sitting position) or on a bed (reclined or lying down position) if prolonged EEG monitoring is planned.
8. Turn on the recording module by pressing and holding the power button (with LED backlight) for two seconds.

If the recording module is powered on but not used to record EEG signals for 7 minutes, it will automatically turn off.

9. Conduct the study using your EEG software.

If signal loss occurs during the study, you can recover the signal from the MicroSD card using a MicroSD card reader (USB adapter).

10. Turn off the recording module by pressing and holding the power button (with LED backlight) for two seconds.
11. Disconnect the Cable system I and II from the recording module.
12. Detach the recording module from the EEG cap.
13. Carefully remove the disposable electrodes and the EEG cap from the client. Inspect the skin where the device was in contact for any damage, redness, or other undesirable effects. Remove any remaining gel from the client's head using a tissue.
14. Remove any remaining gel from the electrodes and the EEG cap.
15. Analyze the recorded data and prepare a report based on the conducted study.
16. If no further studies are planned for the day, it is recommended to:
    - inspect all system components for any visible damage;
    - carefully return the components back to their individual packaging;
    - store the components in the carrying case for safekeeping and transportation.

Cleaning and disinfection of electrodes

Cleaning the electrodes

For wet electrodes:

1. Rinse the electrodes in water with a mild detergent.
2. Rinse the electrodes thoroughly under clean, running water to remove any detergent residue.
3. If your tap water is particularly hard, rinse the electrodes in distilled water as a final step.
4. Place the washed electrodes on a clean towel and allow them to air dry completely.

For dry electrodes:

1. Gently wipe the electrode surfaces with a clean, damp cloth.
2. Optional: for more thorough cleaning, use a cotton swab dipped in isopropyl alcohol to clean the electrode contacts.
3. Allow the electrodes to air dry completely before storing.

Cleaning the EEG Cap

1. Rinse the electrodes in water with a mild detergent.
2. Rinse the cap thoroughly under clean, running water to remove any detergent residue.
3. Place the cap flat on a clean towel and allow it to air dry completely.

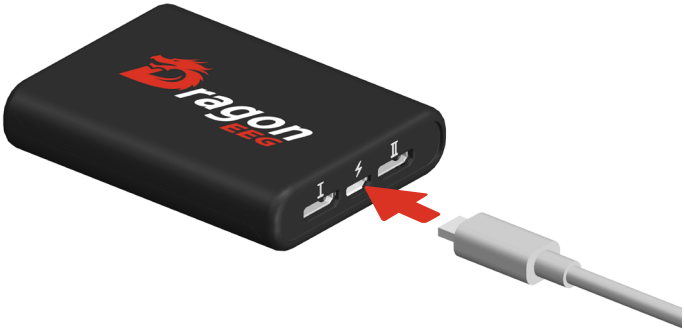
When cleaning the wet electrodes, prevent water or gel from entering the lead wire connector as this may cause clogging or oxidation of the connector contacts.

Recommendations for disinfection

- hydrogen peroxide solution: follow the manufacturer's instructions for dilution and application;
- 70% ethanol solution: apply the solution to a clean cloth and wipe down the surfaces of the equipment. Allow the surfaces to air dry completely.

Battery charge

1. Take the USB cable provided with the system.
2. Connect one end of the USB cable to a USB port on your PC.
3. Connect the other end of the USB cable to the Micro USB port on the recording module which is designated for connecting to a power source.



4. After connecting, verify that the amplifier is charging by checking if the LED is flashing.
5. Once the recording module is fully charged (the LED will be continuously lit), disconnect the USB cable from the PC's USB port and then from the recording module.

Recommendations for choosing the cap size

The supply kit includes two cap sizes. Measure the head's diameter to determine the appropriate cap size, then select the cap using the size matching table below.

Cap size	Cap for wet electrodes, cm	Cap for dry electrodes, cm
L	54 – 60	57 – 63
M	48 – 54	52 – 57

If none of the cap sizes fit you, please contact the manufacturer's technical support department: **support@brainbit.com**.

Transportation and storage

Transportation

The system can be transported using any covered mode of transportation under the following environmental conditions:

Temperature	+5°C to +40°C (41°F to 104°F)
Relative humidity	not exceeding 80% at +25°C (77°F) without condensation
Atmospheric pressure	from 70 kPa
BrainBit DragonEEG	during transportation, the BrainBit DragonEEG component must withstand climatic factors within the temperature range of -10°C to +50°C (14°F to 122°F)

Storage

The system, in its original manufacturer's packaging, should be stored in supplier warehouses under the following conditions:

Temperature	+5°C to +40°C (41°F to 104°F)
Relative humidity	not exceeding 80% at +25°C (77°F)
Air quality	the presence of acid vapors, alkalis, or other aggressive impurities in the air is not permitted

Manufacturer’s warranty

Warranty period of operation is 12 months.

Warranty period of operation for components is 14 days.

Warranty period of storage of the product is 6 months from the date of manufacture.

If repair work is required within the warranty period, the warranty will be extended by the duration of time the product was unavailable due to repairs.

Warranty repairs are carried out by the manufacturer at no cost to the customer. Post-warranty repairs are also performed by the manufacturer, but the cost is the responsibility of the device owner.

If the device fails during the warranty period as a result of improper operation, the cost of repair is paid by the owner of the device.

Troubleshooting

Please review the list of common issues and solutions before contacting

Problem	Solution
When attempting to start signal recording (by pressing the «Start» button), the following error appears on the monitor: *«Unable to establish connection with the device. Check the device connection and try again»*	1. Close the error window. 2. Ensure that the recording module is turned on and detected by the software during device search. 3. Restart signal recording by pressing the «Start» button.
When attempting to record signals to the memory card, the following error appears: *«Failed to start recording to the SD card. Check if the card is inserted into the device»*	1. Ensure that the microSD card is properly inserted into the recording module and press the «Start» button again. 2. If the error persists, it is recommended to format the microSD card using standard methods or replace it.
When restoring the signal wirelessly, the following error appears on the monitor: *«Unable to establish connection with the device. Check the device connection and try again»*	1. Close the error window. 2. Turn on the recording module. 3. Restart signal restoration by pressing the «Restore» button.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F3
C3
T3