FRI-2147-OpenBCI

Headband for OpenBCI

User's Guide

The FRI-2147-OpenBCI Headband for OpenBCI provides a convenient holder for the OpenBCI data acquisition board, while measuring EEG signals from the brain. The band has a number of spaced holes, where electrodes can be placed in the desired locations for signal measurement. The OpenBCI unit and its corresponding battery pack, are attached securely to the top of the head. Electrodes are placed on the skin side of the headband, with the top snap portion emerging through the hole. The electrode cables are snapped on top. The headband is completely adjustable for most sizes.

http://www.floridaresearchinstruments.com

Usage notes

This kit provides materials to attach your own OpenBCI unit to the headband, and electrode/lead sets for measuring brain signals. OpenBCI board is not included in this kit, you provide your own. You use the spacer attachments provided by OpenBCI in your original kit. The spacers are attached to your board, then the adhesive standoffs in this kit, are used to attach the OpenBCI unit to the plastic back of the battery pack. The sticky-back hook and loop is stuck to the back of the battery pack between the standoffs, and the top crosswise strips of Velcro are centered across the battery pack and placed at right angles to each other. They are used to strap down

the battery pack & OpenBCI board to the top of your head, and attach to the headband from ear-to-ear, and from front-to-back. Once it is attached, the holes in the straps can also be used to place additional electrodes.

To use the headband:

We will describe 3 steps to attaching the headband for use.
1) Placing the headband on the head in the correct direction
2) Attaching the OpenBCI unit to the battery pack and straps
3) Attaching the OpenBCI straps to the headband
4) Insert saline into electrode for best signal quality

1) Placing the headband on the head in the correct direction

Place the longest round piece of hook and loop material around the head just above the ears. Lower the front as close to the eyebrows as possible. Pull the band tight to your head. It should be difficult to slide a piece of paper underneath the band, but not cut off circulation or give you a headache. If the band leaves a mark in your skin, it is probably too tight. You may get a good signal, but it will likely be uncomfortable for long-term wear.

The headband is now approximately in place, and can be tightened/loosened for a custom fit.

2) Attaching the OpenBCI unit to the battery pack and straps

This kit provides connectors so you can assemble the OpenBCI board, and its battery pack, together into a unit. Once they are connected it is easier to attach it to your head for a secure and comfortable fit.
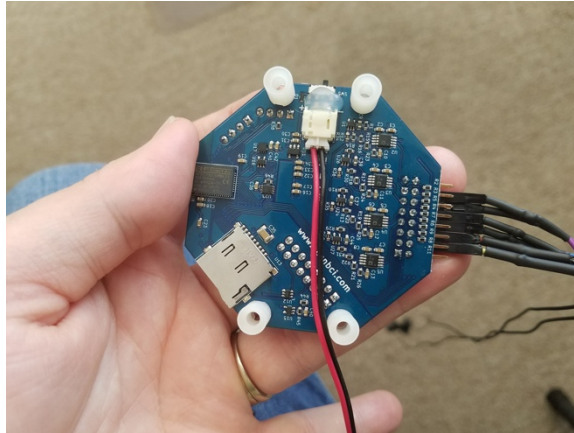A. White Standoffs
The white plastic standoffs, are used to attach the OpenBCI board securely to the battery pack.
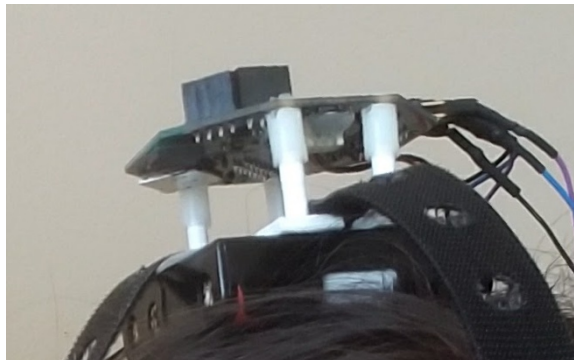Your OpenBCI board came with 4 plastic feet. These fit into the 4 holes on the board.
The standoffs are designed to slide into the center holes of these feet.

Insert all 4 feet into the board.

then slide all 4 standoffs into the feet.
Remove the sticky paper from the standoffs and
stick onto the back of the battery pack.

After the standoffs are stuck to the battery pack, you will be
able to pull the board off. Then place the sticky hook onto the back, and attach
the black hook-and-loop straps on top of it crosswise.
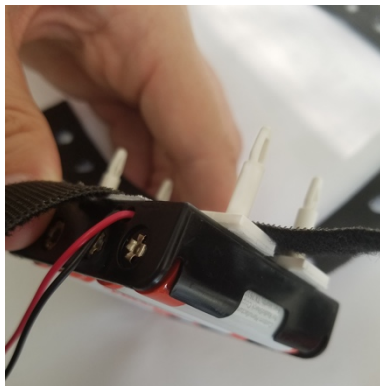
B. Connect electrodes to OpenBCI unit

Here is an initial connection configuration for EEG with the OpenBCI Ganglion unit.

a. Set all 4 switches to the Down position. They are marked SW1, SW2, SW3 and SW4 on the board. This connects all the EEG input pins to the same reference voltage which will help reduce noise and improve your measurement sensitivity for EEG signals, which have a small amplitude.

b. Connect the Ear Clip electrodes.
- Right ear: D_G pin. This grounds the OpenBCI board to your head.
- Left ear: REF pin. This grounds all the OpenBCI measurement pins to the left ear, since all the switches are in the Down position.

c. Connect the head electrodes.
- Fp1 (left forehead): Channel 1
- Fp2 (right forehead): Channel 2
- O1 (left back of head): Channel 3
- O2 (right back of head): Channel 4

d. Check your input signal using the OpenBCI software
- Start the data acquisition.
- Check to make sure you see signal occurring.
- Check the impedance. This will stop the data acquisition. Checking the impedance will allow you to see if your electrodes are making good contact. This is the test you will perform when you inject saline into the electrode, you will immediately see the improvement in the reduction of electrode impedance.
- Check the output of each electrode. Switch back to the signal acquisition mode.

    Tips: If you are able to raise/lower one eyebrow at a time, or blink one eye at a time, you will be able to see a clear jump in Fp1 or Fp2. If you are able to wiggle your ears independently, you will be able to see a jump in O1 or O2.
    If you can't move your eyebrows or ears independently, at least you will be able to see changes in both of the signals together. Also, try holding one eyebrow still with several fingers, while moving the other eyebrow.

3) Attaching the OpenBCI straps to the headband

Once the OpenBCI board/battery pack/hook and loop unit is assembled, you can attach it to the headband.

Place the unit on top of the head with the OpenBCI board on the top. Pull the left/right straps to the front of the ears and press firmly onto the headband just in front of the ears. Then pull the front/back straps down and press firmly to the headband in the middle of the forehead, and the back of the head. If the strap is too long, you can roll the end up and fasten it to itself.

3) Insert saline into electrode for best signal quality

The electrodes with prongs, are designed to measure signals through hair without the use of messy gel. You will get the best signal, though, if you insert liquid saline into the electrode. An effective substitute for liquid saline is easy to make, has good conductivity so you can get a good signal from the scalp.

Make a saline substitute by mixing 200ml of water with 1 teaspoon of NaCl (table salt). We suggest using distilled water and non-iodized salt to reduce unexpected contaminants. The kit includes a bottle with a syringe tip. The mark on the bottle shows the approximate 200ml mark. Fill to this mark and add 1 teaspoon of non-iodized salt.

Insert the salt water saline mixture, into the center of the electrode using the syringe bottle.

You will be able to immediately see the improvement of the signal if you set the OpenBCI software to the impedance check. You should see the impedance drop to very low levels (1k ohms – 10k ohms) after injecting saline into the electrode. If you don't see this drop, check the connection of your electrode to the lead and to the OpenBCI board.

Now you are ready to measure EEG signals! Good luck with your project!

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