

BRAINCAP

Modular EEG-Recording Caps¹



MANUAL FOR BRAINCAP WITH RING ELECTRODES

EASYCAP GmbH

¹ Patent No. 19601807

Thank you for deciding to use BRAINCAP modular EEG-recording caps. During the last years BRAINCAP has become a standard in most german and some european research labs. The experiences gathered there now were brought into practice with the second generation of caps: **BRAINCAP with ring electrodes**. Without giving up the previous advantages – superior signal quality, modularity, expandability, subjects comfort – working with BRAINCAP now has accelerated by one third. Still all components are available singular, such allowing to update the system to current affordances. Still we always will give our best advice in case of questions, we will try to constructively participate developing custom made solutions, and finally, we still are eager to get your feedback to further evolve the BRAINCAP principle.

In that sense: Allways good data!

CONTENT	page
Mounting the cap	3
Minimizing impedances	6
Hints	8
Cleaning and care of caps and electrodes	9
Attachement: Mounting further electrode adaptors	10
Available at:	10

IMPORTANT!

This manual does not dispense you of regarding your local safety and hygienic rules.

Mounting the cap

To start, measure your subjects head circumference (hat size) and the distance Nasion-Inion. Then first try the next larger cap (cap size = head circumference). Beginning from the forehead, where the subject may fix it, the cap is turned over the head (Figure 1). Next, adjust the electrode position Cz half way between Nasion and Inion. The frontopolar and occipital electrode positions should now be placed correctly. Otherwise choose another cap size.



Figure 1: The cap is turned over the head starting at the forehead. For assistance the subjects may fix the cap on the forehead.

Then make sure, that Cz is right-left-centered as well, and that lateral electrode positions are symmetrical.

Affix the cap either with the chest belt (Figure 2a) or the chin belt (Figure 2b). When using the chest belt, attach the chin straps in that way that a flat side points towards the skin. Similarly the chest belt has a soft side, which should point towards the skin. With both methods only minimal tension is necessary. The ears should be pulled out of the slits completely to allow the cap to fit snugly onto the skin behind the ears, that is, on the mastoid positions.

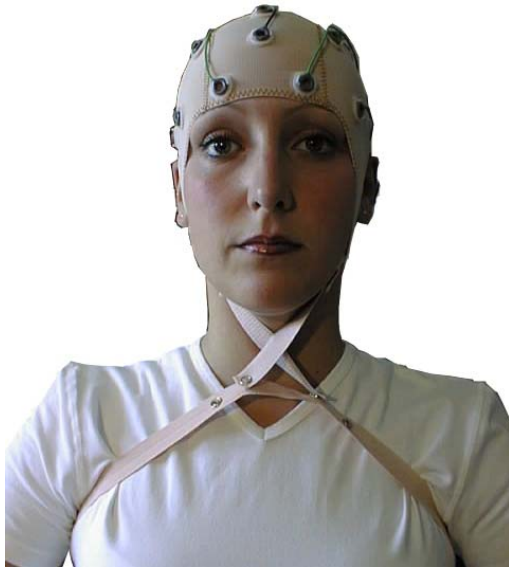


Figure 2a: The chest belt should come to lie directly below the shoulders. The chin straps are attached crosswise. The tension of the chin straps is regulated by the length of the chest belt.



Figure 2b: The chin belt requires only minimal tension and is less restrictive than the chest belt. On the other hand, with some subjects it exerts pressure on the larynx and it is not suitable when subjects ought to speak during acquisition.

Tip: When measured correctly, the frontopolar electrodes (e.g. Fp1/Fp2) should lie directly above the eye brows. With some subjects the caps tend to slip backwards. To test this, make your subjects frown several times, and, given sliding caps, attach washers to the frontopolar electrode adaptors inside the cap (use alcohol for skin degreasing). This will prevent the caps from slipping backwards.

Now all electrodes can be snapped into their adaptors. Let the leadwire point towards the narrow side of the adaptor (Figure 3a) and pay attention not to bend or even break the leadwire where it leaves the electrode. Preferably you aid yourself by using e.g. an old ballpoint pen, where you have removed the mine (Figure 3b).

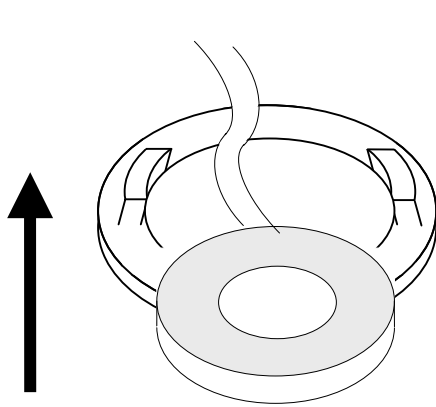


Figure 3a: The leadwire should point towards the narrow side of the adaptor. Such the electrode cannot be pulled out of the adaptor and after acquisition you know automatically, in which direction the electrodes have to be pushed out of the adaptor.

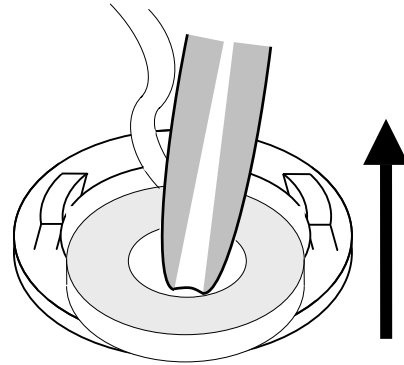


Figure 3b: The electrode can be pushed with the fingers or with an aid **into** the adaptor. Later, when pushing the electrode **out** you should use an aid in any case.

Tip: When you know the necessary cap size in advance, e.g. on repeated measures, you can snap the electrodes into the cap before your subject arrives, such saving time.

Minimizing impedances

You need:

- ✓ Several cotton swabs with a free wooden end
- ✓ Isopropylalcohol 70%
- ✓ *Abralyt 2000* (abrasive electrolyte gel)
- ✓ A customary syringe (without needle) to fill in the gel. A 20 ml syringe will last for 30 adaptors minimum.
- ✓ Tissues or towel to remove remaining gel.

Supply sufficient illumination. If possible subjects should come with their hair washed without using additives like conditioner, spray, etc. That helps significantly to achieve low impedances.

With the wooden end of the cotton swab through the opening of the electrode you push the hair aside until the skin is **clearly visible** (Figure 4).

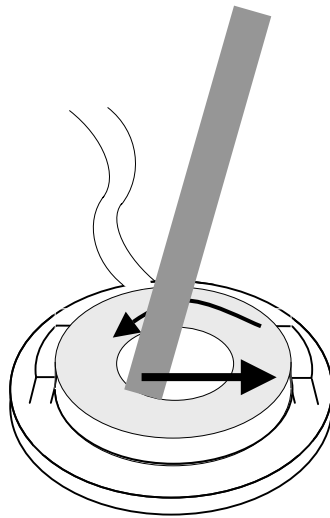


Figure 4: Push the hair aside into **one direction**. When you have to handle long hair, lift up the adaptor a little bit, but let it down again, while moving back the swab to grab a new bunch. That will prevent the hair from slipping back.

Important note: At this step check that the adaptor is not located above a mole, scar or pimple. The following application of abrasive paste could cause inflammations. If needed move the adaptor a little bit to the side.

Now dip the cotton swab into alcohol and degrease the scalp through the electrode opening by twirling the swab between thumb and index finger (Figure 5).

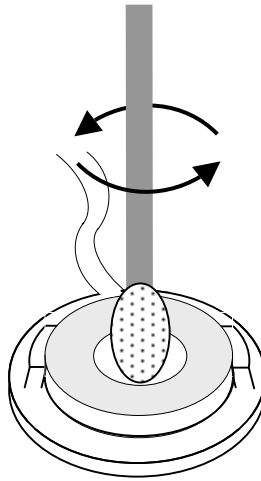


Figure 5: Dip the swab in alcohol and degrease the skin by rotating.

Using only alcohol you'll achieve impedances from 10 – 15 k Ω , with children even better.

To get still lower impedances, dip a second swab into the Abralyt and twirl on the skin with this one too. **For this, exert none or only very low pressure. Pressure will cause scurf.** Due to the abrasive ingredients by this procedure impedances from 1 to 5 k Ω are achieved easily. Moreover you make a thorough connection between skin and electrolyte this way. Now completely fill the space from skin to electrode with the electrolyte in the syringe. When electrodes are closely spaced, draw back the syringe concurrently to prevent electrolyte from swelling underneath the adaptor rim and bridge to adjacent electrodes.



After the acquisition session push the electrodes out of the adaptor either with the help of the above mentioned ballpoint pen or with the wooden end of a swab (Figure 6). In any case it is important to use an aid, because now you are pushing on the side of the electrode where the leadwire is. Without aid it is nearly inevitable to bend the leadwire.



Figure 6: This figure shows how to push an electrode out of the adaptor with the wooden end of a swab.

Some more hints

Ground and reference should be placed at first and both with very good impedances. This will significantly facilitate good impedances of the remaining electrodes.

When you use another electrolyte gel instead of Abralyt and before that an abrasive paste, take care to remove the paste by twirling with the electrolyte, since abrasive pastes are not composed for conductivity. When working with sensible or anxious subjects, e.g. children, you should change the cotton swab several times, since the wood presses through the wet cotton after a while. Some abrasive pastes are very sharp (e.g. Omniprep). If there is scurf the day after acquisition too much pressure was applied during twirling. **Only minimal pressure is needed.**

When you apply additional electrodes outside the cap, we recommend to use adaptors for these electrodes as well. Snap an electrode into an adaptor and attach it with a washer, after degreasing the skin with alcohol. This lasts very good and is suitable for e.g. EOG or even for EMG on arms or legs. Because of the twirling on the point, good impedances are achieved more easily

Cleaning and care of caps and electrodes

Under most circumstances cleaning of caps and electrodes in a mild detergent with a toothbrush suffices. **Note: Dish-detergents often leave a film. A childrens shampoo will be a good choice.** Afterwards rinse the cap with water and the electrodes with distilled water. Finally the moisture is taken away by wrapping in a towel. The rest can dry in the air.

If disinfection is required use 5% Sekusept-PLUS solution to soak the cap and the electrodes in for fifteen minutes. Afterwards clean and rinse as described above.

If it happens that the sensor element of the electrodes comes in touch with greasy materia (e.g. sweaty fingers) they have to be degreased with alcohol.

The electrodes should be stored in a dark and dry place. The live span of chinstraps and chest belts is enlarged if they are cleaned separately only when necessary.

When electrodes are not cleaned sufficiently or are not used for a long time a brown oxidation coating may occur. This coating can be removed by grinding the sensor pellet with abrasive paste or sanding paper. The sinter pellet is massive and 1 mm thick, so this surface renewal can be repeated several times. Afterwards clean the electrodes as described above. Sintered electrodes are not really suited for use in a supersonic cleaner. This procedure should be employed as seldom as possible.

The leadwires are made for moderate tension stress. Other strains as entangling or contusing (in locker doors) are to be avoided. With careful handling your cap system will work for several years.

The electrode manufacturer explicitly warns

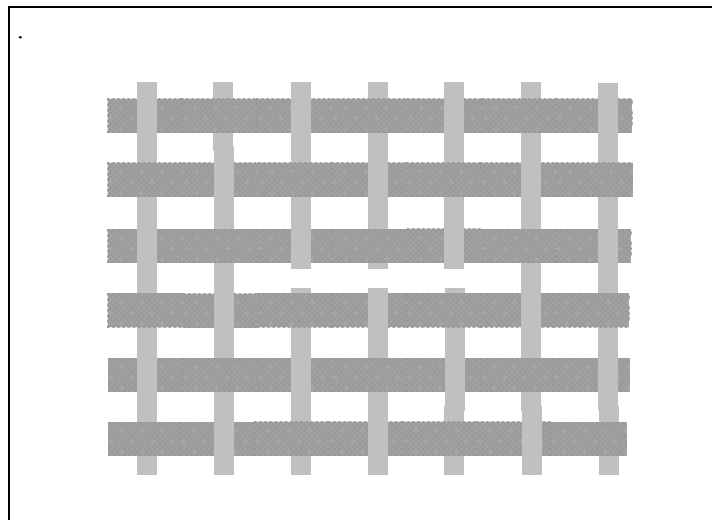
- not to soak electrodes in saline solution or chloride them, as corrosion of connections will result.
- not to autoclave or use other hot sterilisation methods as the wire insulation can be damaged.

Attachement: Mounting further electrode adaptors

A salient feature of the BRAINCAP Modular EEG cap system is to add further electrode adaptors any time you wish.

To add another adaptor you cut 6 woofs at the desired position (Figure 7). The woofs are the thinner threads in whose direction the fabric is more extensible. Into this incision the adaptor is buttoned in. **Note: When you do not use adaptors for ring electrodes, but adaptors for use with our previous electrodes, standard or extra-flat, only cut 4 woofs.**

Figure 7: Do not cut more woofs than necessary to button in an electrode adaptor.



Supplier

All mentioned utilities and consumables, every cap size and additional electrodes and electrode adaptors are available at

EASYCAP GmbH
Am Anger 5
D-82237 Woerthsee-Ettersschlag

Tel +49 (0) 8153 / 88702-00
Fax +49 (0) 8153 / 88702-10

www.easycap.de

* We will be glad to get improving suggestions or other feedback about this manual.*