emotiv epoc

user manual

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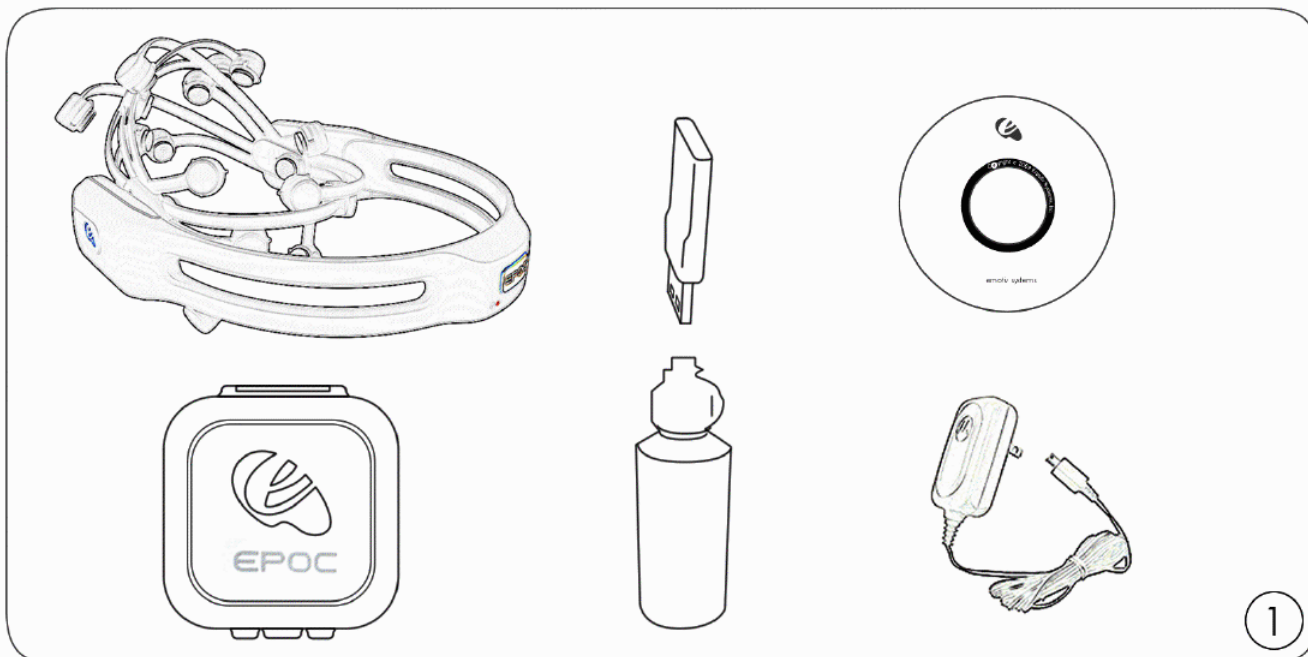
Initial charging of headset

- Make sure the small switch on the rear underside of the headset is set to the Off position before starting.
- Plug the mini USB cable attached to the supplied battery charger into the slot at the top of the headset and the power cord into a 50 or 60 Hz
  100-250 V electrical outlet.
- The Lithium battery can be recharged to 100% capacity in approximately 4 hours depending on the initial state of charge. Charging for 30 minutes usually yields about a 10% increase in charge.
- The EPOC Headset contains two status LEDs located at the rear and next to the power switch at the back of the headband. When the power switch is set to the "on" position, the rear LED will illuminate and appear blue if there is sufficient charge for correct operation, unless charging is in progress. The charging LED will appear red during battery charging; when the battery is fully-charged, the charging LED will display green.
- NOTE: The Headset should not be charged when still on the head.

Insert the supplied EPOC CD setup disk into your computer's CD/DVD drive and follow the step-by-step installation instruction.

After software installation, start-up the EPOC Control Panel program, loading the Headset Setup screen
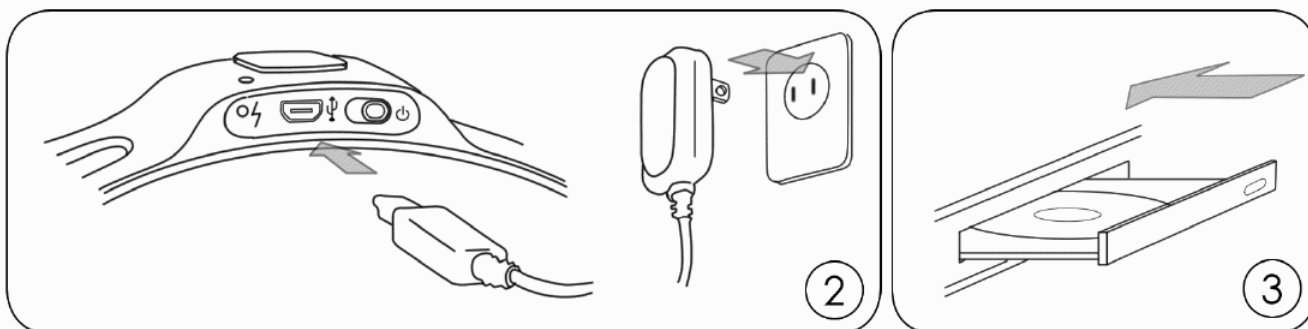
Items in the EPOC Headset Kit: Make sure all items are present in your kit before starting.

- Headset Assembly with Rechargeable Lithium battery already installed
- USB Transceiver Dongle
- CD Installation Disk for Windows XP or Vista
- Hydration Sensor Pack with 16 Sensor Units
- Saline solution
- 50/60Hz 100-250 VAC Battery Charger
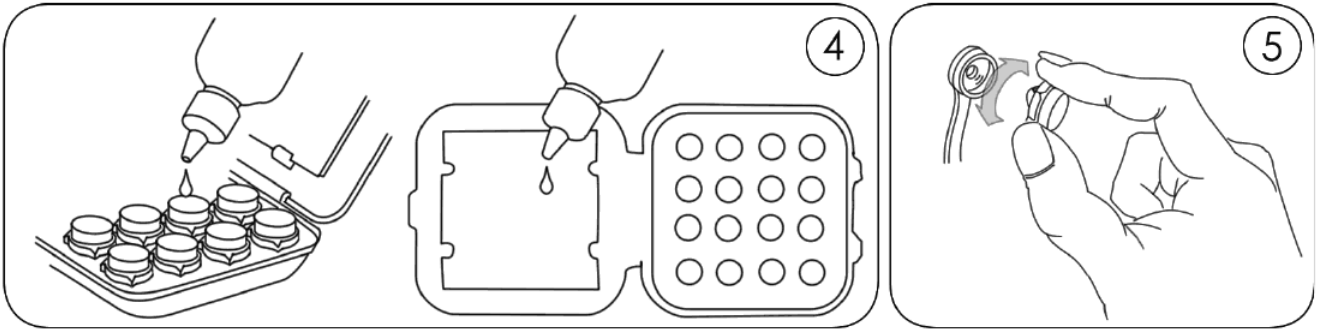
Open the Saline Hydration Sensor Pack with the white felt inserts inside. The inserts will eventually be mounted in the headset arms but must be properly wetted with saline solution first. Begin wetting each of the felt inserts with the supplied saline solution. The felts should be wet to the touch, but not soaking wet!
Note: This is standard multipurpose contact lens saline solution and is available from any local drug store in case you run out of solution. However, the bottle supplied with the kit should be sufficient initially. See the User Manual on the EPOC CD setup disk for recommendations.

Add a few drops of saline to saturate the large white hydrator pad attached to the top cover of the hydrator, then close the cover and gently shake the hydrator pack. This will maintain the moisture of the felt pads when they are not in use. Open the pack and check that each of the pads had been wetted. If not fully wetted, then add a drop or two of saline to any pads not sufficiently wet using the dropper bottle. Be careful not to overwet the pads. If you have connection problems, add more saline to each felt pad.

After the wetting process, remove the sensor units with their felt pads from the hydrator pack and inset each one into the black plastic headset arms, turning each one clockwise one-quarter turn until you feel a definite "click". The "click" indicates each sensor is correctly installed in a headset arm. If you have difficulty with this step, apply a little more force until you feel the "click" but be careful not to exert excessive force as damage might occur.
NOTE: When not in use, the sensor units should be removed from the headset arms and stored in the hydrator pack for subsequent use.
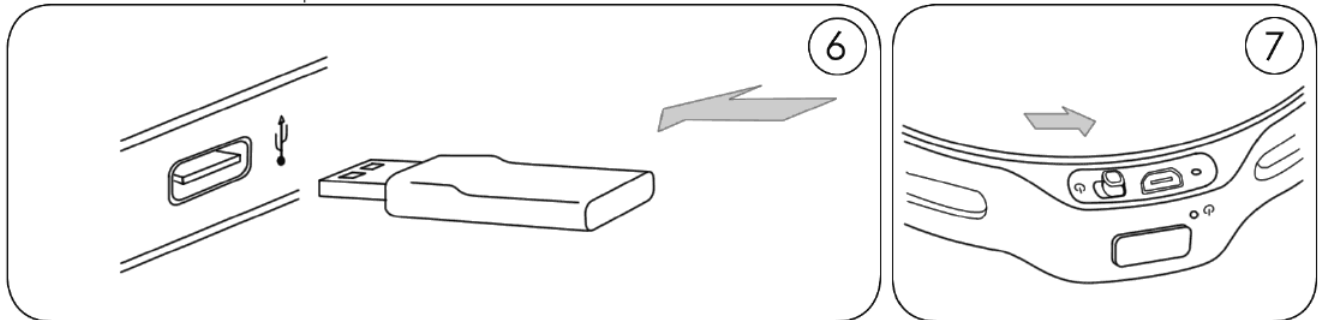
Insert the supplied USB Transceiver Dongle into one of your computer's USB slots. Use a USB extension cable and position the Transceiver in a prominent location away from your monitor and PC to improve poor reception.

Then turn-on the headset using the switch at the bottom end of the headset, holding it close to the Transceiver.
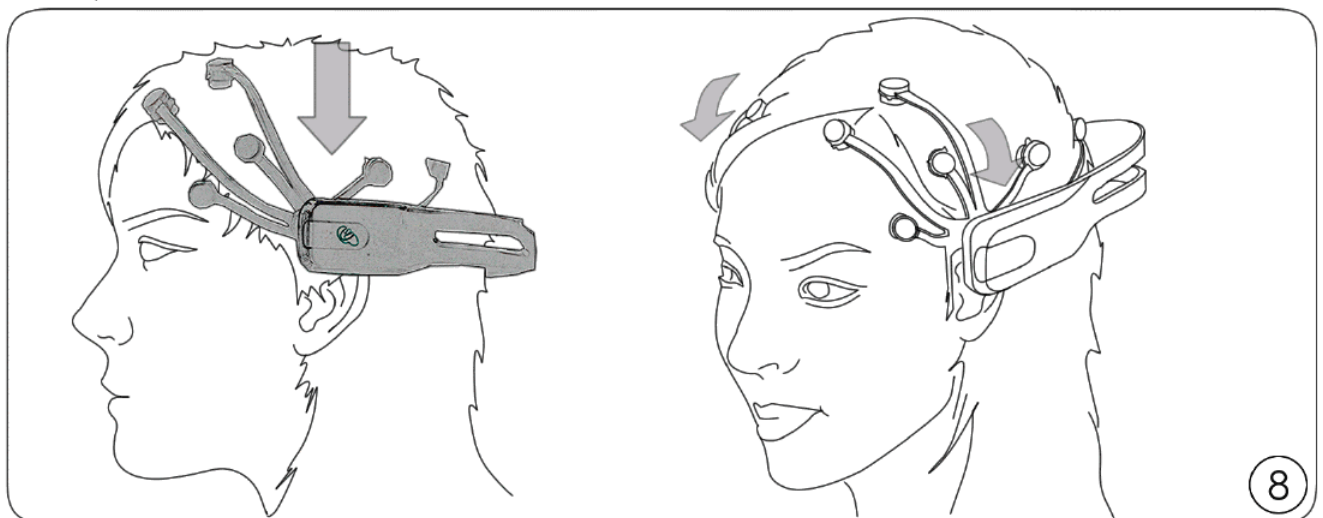
You are now ready to put the EPOC headset on your head. Using both hands, slide the headset down from the top of your head. Place the arms approximately as depicted, being careful to place the sensors with the black rubber insert on the bone just behind each ear lobe. Correct placement of the rubber sensor is critical for correct operation.
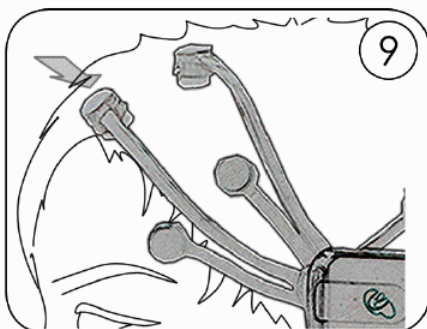
Notice the 2 front sensors should be approximately at the hairline or about the width of 3 fingers above your eyebrows.

reference sensor location (same position on both left and right sides of the head)
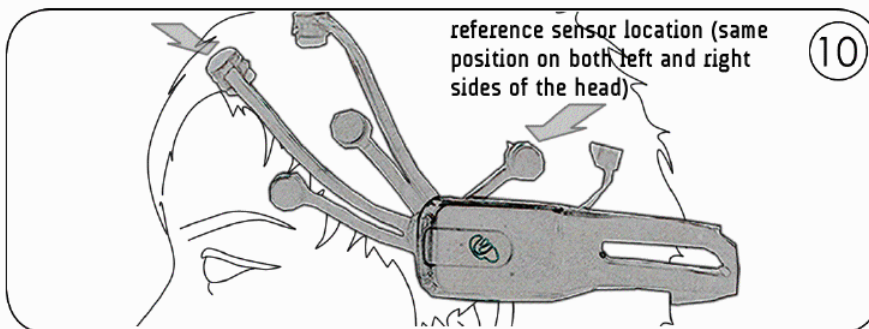
After the headset is in position, press and hold the 2 reference sensors (located just above and behind your ears) for about 5-10 seconds. **Good contact of reference sensors is the key for a good signal.** Check that the lights corresponding to these 2 reference sensors turn from red to green in the EPOC Control Panel Headset Setup screen.

Gently press and hold each remaining sensor against your scalp until all the lights corresponding to those sensors turn to green in the EPOC Control Panel.

If you are unable to get anything except 2 red sensors, add saline to the reference and other sensors, or try the alternate reference locations – swap the reference sensors with the rubber comfort pads located directly behind the ears, making sure the reference sensors contact directly onto the bare skin on the bony bump.
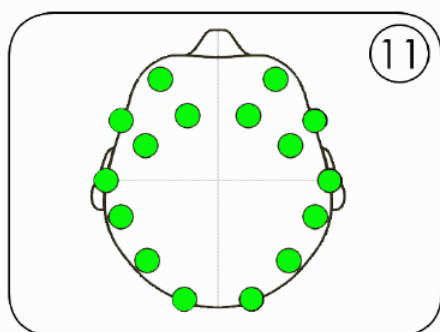
Your objective is to achieve as many green lights as possible using the EPOC Control Panel and adjusting the position of the various arms accordingly. (See full User Manual Document contained on the CD for detailed instructions) Note that the EPOC will still function with some sensor locations showing yellow or orange, and will even cope with a few red or black however the detections will be less reliable in this state. Often the contact quality will gradually improve after a few minutes use, so don't be too discouraged if setup is not perfect at first.

You are now ready to begin using the EPOC headset.

If you experience difficulties with initial headset start-up, fine tuning or operation, you may contact Emotiv EPOC Customer Service by email at *customerservice@emotiv.com* or by phone at 1-800-604-3060 (toll free within the USA).

Introduction to Emotiv EPOC Neuro-technology Headset

Fulfill the fantasy of having supernatural powers and controlling the world with your mind!

For over a millennium, mankind has dreamed of the ability to control objects with the power of thought. Today that dream has become reality! Now you can experience the fantasy of having supernatural powers and controlling the world with your mind.

Based on the latest developments in neuro-technology, Emotiv has developed a revolutionary new personal interface for human computer interaction. The Emotiv EPOC uses a set of sensors to tune into electric signals produced by the brain to detect player thoughts, feelings and expressions and connects wirelessly to most PCs.

Headset Features:

- Limited edition design
- 16 saline sensors offer optimal positioning for accurate spatial resolution
- Gyroscope generates optimal positional information for cursor and camera controls
- Hi-performance wireless gives users total range of motion
- Dongle is USB compatible and requires no custom drivers
- Rechargeable Lithium battery provides 12 hours of continuous use

Safety:

Please note the following safety considerations:

CHOKING HAZARD – detachable small parts. Keep away from small children.

DO NOT attach the headset to the charger or USB connector while in use. AWAYS remove the headset during charging and avoid touching the sensors if fitted. Although unlikely, an insulation failure in the charger or USB source may cause the headset to become live. The headset will automatically enter sleep mode while attached to the charger, so it is not possible to extend use while charging.

WARNING: Radio emissions may interfere with appliances and medical equipment including heart pacemakers and automated medical dosimetry systems. Use with caution.

WARNING: Discontinue use if the system becomes uncomfortable to wear or if skin irritation occurs. Users are advised not to share sets of sensors to avoid cross-infection risks.

Regulatory Requirements:

FCC REQUIREMENTS PART 15

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the radio or television off and on, the user is encouraged to try to correct interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on another circuit.
4. Consult the dealer or an experienced radio/TV technician for help.

NOTE: Modifications not expressly approved by Emotiv Systems, Inc. could void the user's authority to operate the equipment

1.0   Getting Started

EPOC Headset Kit Components:

- EPOC Headset Assembly with Rechargeable Lithium battery already installed

- USB Transceiver Dongle

- CD Installation Disk for Windows XP or Vista

- Hydration Sensor Pack with 16 Sensor Units

- Saline Solution

- 50/60Hz 100-250 VAC Battery Charger

- Quick Start Guide

All of the components of the Emotiv EPOC Neuroheadset are delivered in our standard shipping box. Inside the box you will find all of the components neatly stored for shipping and storage.

Note: Never put the Emotiv EPOC, or any of its components, back into the packaging until they have dried completely. Make sure the Hydrator sensor pack is sealed and is not leaking. If wet, wipe the seal clean before closing.
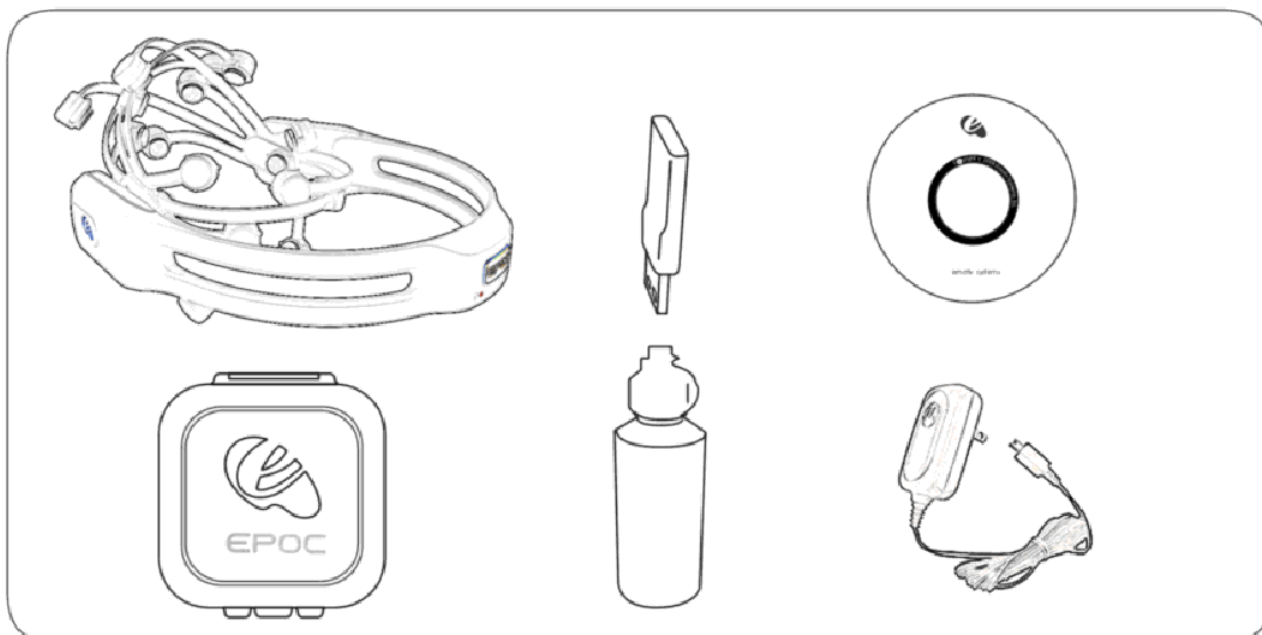

Figure 1 Emotiv Headset Kit Components

2.0 Minimum Hardware and Software requirements

2.4 GHz Intel Pentium 4 processor (or equivalent)

Microsoft Windows XP with Service Pack 2 or Microsoft Windows Vista

1GB RAM, minimum

50 MB available disk space.

One or two unused USB 2.0 ports (depending on the number of EPOC Headsets you wish to use simultaneously)

Insert the Installation Disk into you pc disk drive and install the EPOC software and follow the instructions. For instructions on Windows 7, any other application issues, contact Emotiv Customer Service at customerservice@emotiv.com Toll Free in USA: 1-800-604-3060

2.1 Charging the EPOC Headset Battery

The Emotiv EPOC Headset contains a built-in rechargeable lithium battery which is designed to run for approximately 12 hours when fully charged. To charge the EPOC battery, set the power switch to the "off" position, and plug the EPOC Headset into the Emotiv battery charger using the mini-USB cable provided with the EPOC Headset. Using the supplied battery charger, a fully drained battery can be recharged to 100% capacity in approximately 100 minutes; charging for 15 minutes usually yields about a 10% increase in charge.

The EPOC Headset contains a status LED located next to the power switch at the back of the headband. When the power switch is set to the "on" position, the LED will illuminate and appear blue if there is sufficient charge for correct operation. The LED will appear red during battery charging; when the battery is fully-charged, the LED will display green.

NOTE 1: The Headset should not be charged when still on the head.

NOTE 2: Do not expose battery or headset to prolonged temperatures above 122°F (50°C). Damage to the battery or headset may occur.
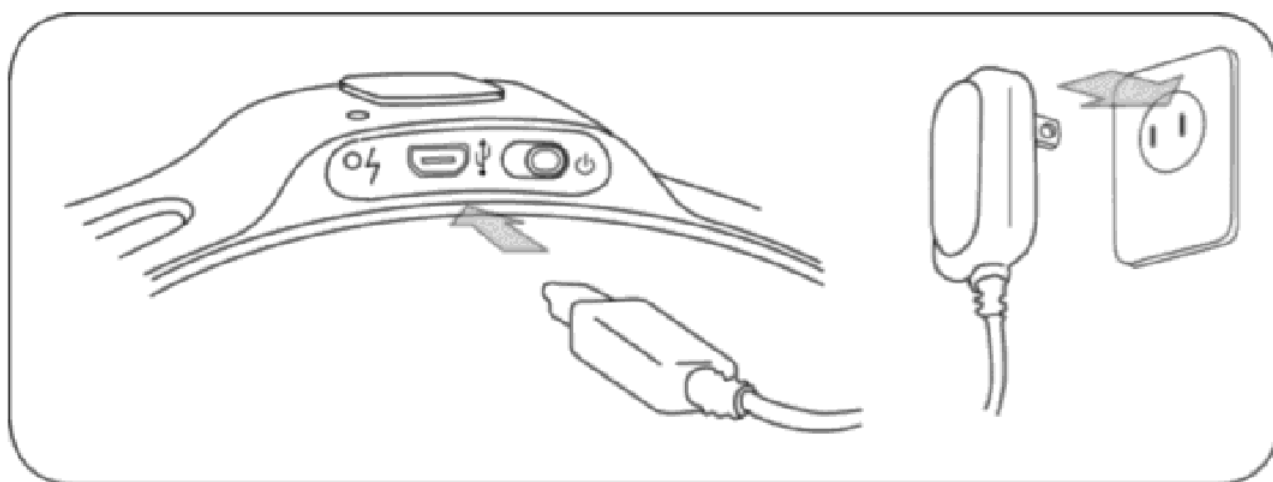

Figure 2 Charging the EPOC Headset battery

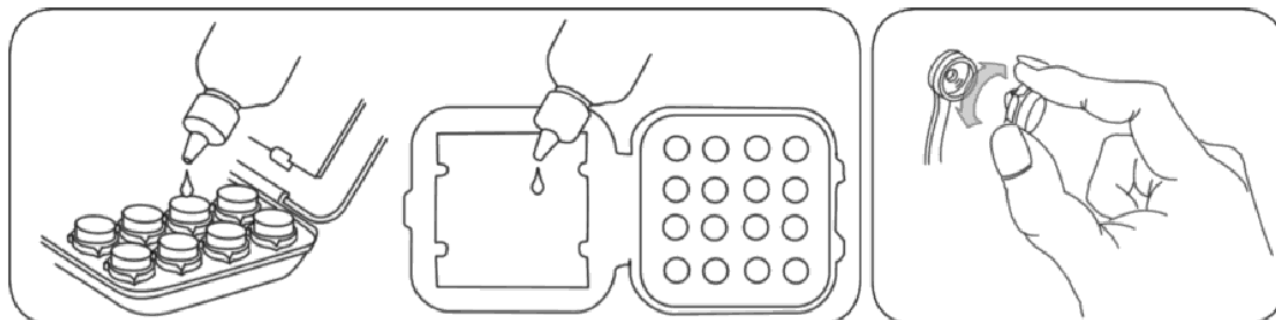## 2.2   Use of Saline Hydration Sensor Pack and Felt Inserts

Figure 3 Applying Saline Solution to the sensors and attaching the sensors to the headset arms

Open the Saline Hydration Sensor Pack with the white felt inserts inside. The inserts will be mounted in the headset arms but must be properly wetted with saline solution first. The saline solution is harmless but allows the felt pads to make good contact with the skull when properly positioned on the head. This is a very important step.

Pour a small amount of saline onto each of the sensors. Once you have moistened the sensors, pour a small amount of saline onto the large white hydrator pad to evenly moisten the entire pad. Close the hydrator and allow the sensors to absorb some of the saline. You can shake or invert the hydrator unit so that the liquid is evenly distributed and absorbed into the felt pads. Note: For user comfort the sensor pads should be damp but not dripping wet.   If the pads do not feel slightly wet, you may also place one or two more drops of the solution directly on the pads from the top to speed the process of absorption.

Following the initial hydration step, each of the inserts must be removed from the pack and securely mounted in the EPOC headset arms by turning the inserts one quarter turn to the right and listen/feel for the click. If you do not hear or feel the click, try again until you do. A very firm force may be needed but be careful not to exert excessive force.

Ensure that each sensor is locked in place. Note that the sensor location behind the ears is fitted with a soft rubber comfort pad. This should remain in place unless the normal Reference sensors do not contact properly (see below for alternative Reference Sensor location)
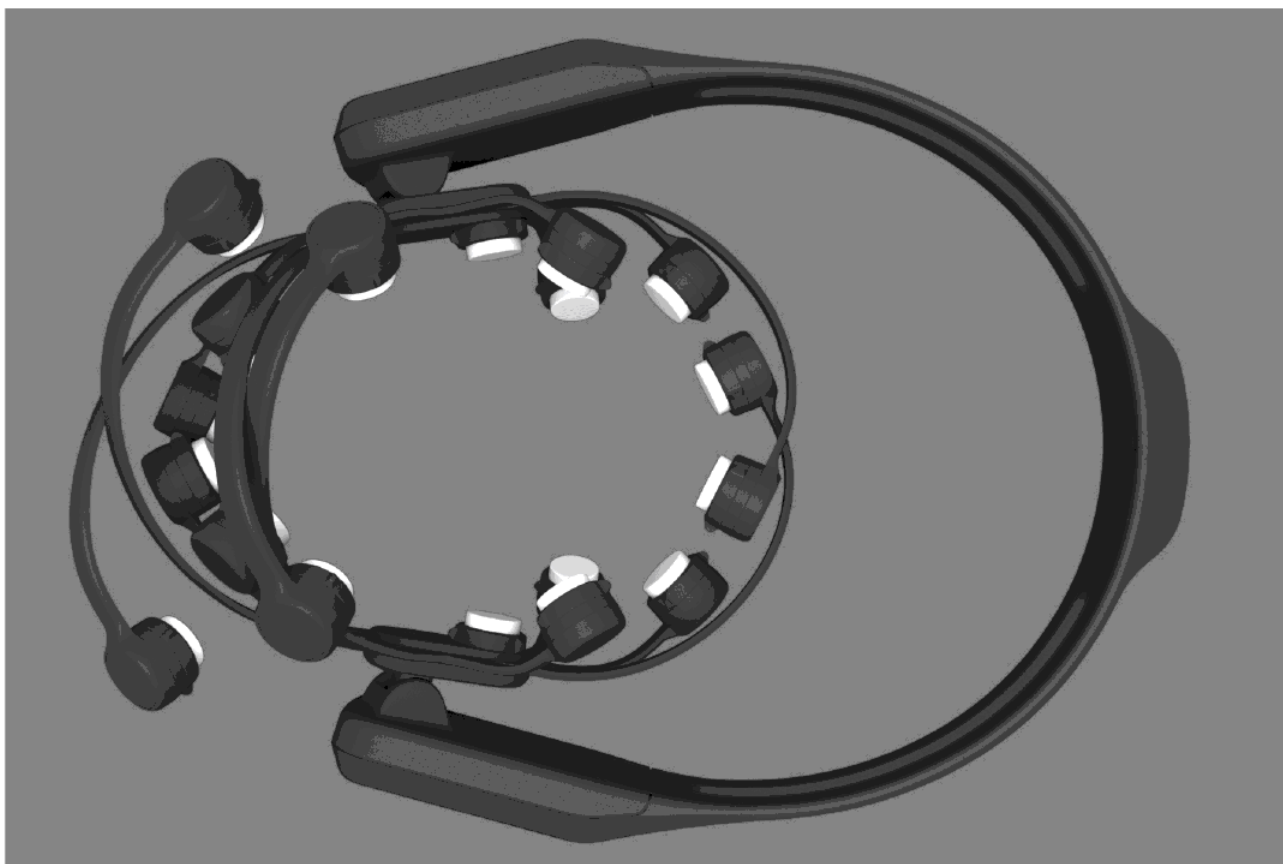
The fully populated headset should look like this:

Figure 4 A fully populated headset

After first use, the pads should be rewet the next time EPOC is used by using a dropper to wet the sensors and hydrator pad again. The sensors should be removed from arms after use and stored in the hydrator unit to keep the sensors moist for subsequent use.

Note on saline solution: When the initially provided saline solution has been exhausted, additional saline should be purchased from a local drug store. We recommend the use of Multi-purpose Contact Lens Solution if possible, but do not use Contact Lens Cleaning or Sterilising Solutions. Multi-purpose Solution contains non-allergenic anti-microbial agents which help to keep your sensors fresh and prevent transfer of microbes between users. Normal saline between 0.7% and 4% w-w sodium chloride may also be used, but we recommend adding a small quantity (no more than 4% by volume) of a household disinfectant such as 70% iso-propyl alcohol.

2.3   USB Transceiver Installation

Plug the provided Emotiv USB transceiver into an unused USB port on your computer. After one or two seconds you should see a single LED flashing slowly, or a single bright LED and another dim LED if the transceiver has already paired with a nearby headset. The transceiver should be recognized and installed automatically by your computer as a USB Human Interface Device. Please wait for a moment until Windows indicates that the new hardware is installed and ready to use.
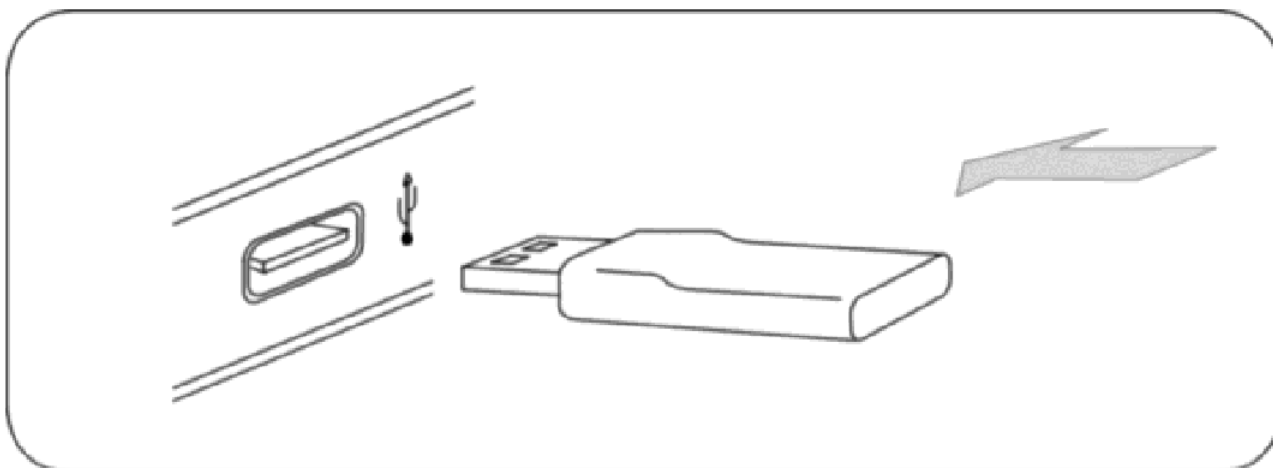

Figure 5 Plugging in the USB transceiver

Hold the Emotiv EPOC close to the USB receiver, and turn it on using the switch at the rear of the headband. You should see a new steady LED on the receiver, which indicates that the headset has properly paired with the USB receiver, and a more dim LED which flashes indicating successful data transfer.
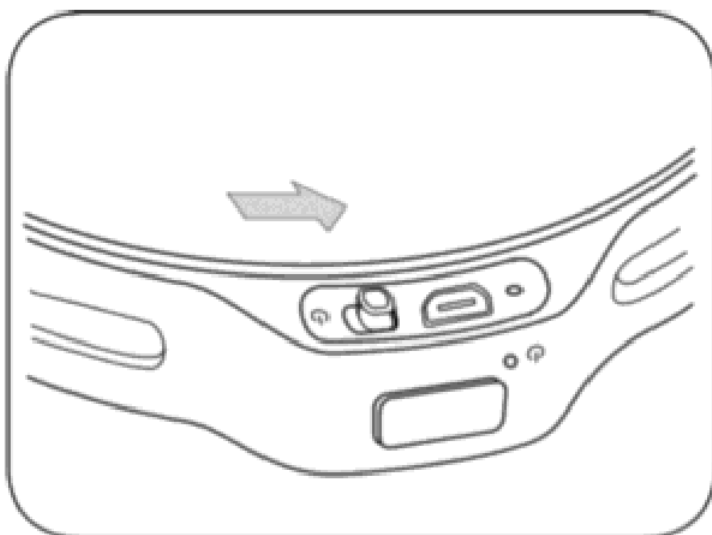

Figure 6 Switching on the headset

2.4 EPOC Control Panel™

This section explains how to use EPOC Control Panel to explore the Emotiv detection suites.

Launch EPOC Control Panel by selecting Windows Start →Programs →Emotiv→ EPOC Control Panel. When the Control Panel is launched for the first time, your firewall software (if installed on your computer) may notify you that the Control Panel is trying to accept connections from the network. For proper operation, you must allow EPOC Control Panel to use this port by selecting "Unblock" (or a similar option, depending on your firewall software).
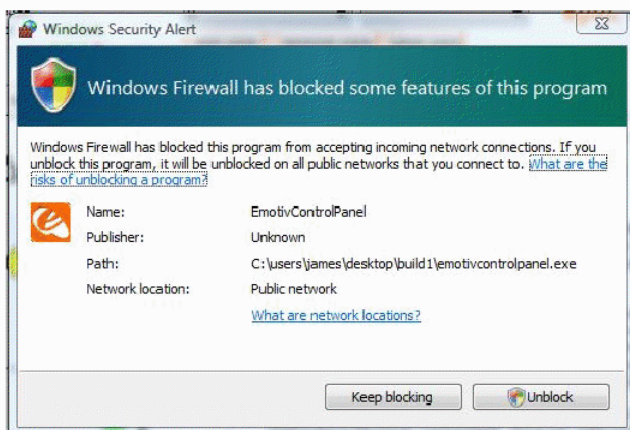
Figure 7 Windows Firewall warning about EPOC Control Panel – select Unblock

EPOC Control Panel showcases the capabilities of the Emotiv EPOC Neuroheadset to decipher brain signals, facial expressions and even mouse control using the in-built motion sensors.

2.5   Placement of Emotiv EPOC Headset on the Head

Carefully expand the EPOC headset to place it on subject's head. Using both hands, slide the headset down from the top of your head. Place the arms approximately as depicted, being careful to place the sensors with the black rubber insert on the bone just behind each ear lobe. Correct placement of the rubber sensor is critical for correct operation.

If any sensors fall out, replace them and ensure they are locked in place. The EPOC Headset should be positioned on the head as indicated by the following illustrations.

NOTE: Caution should be exercised never to bend the arms of the headset backwards out of their natural curvature. Damage may occur.
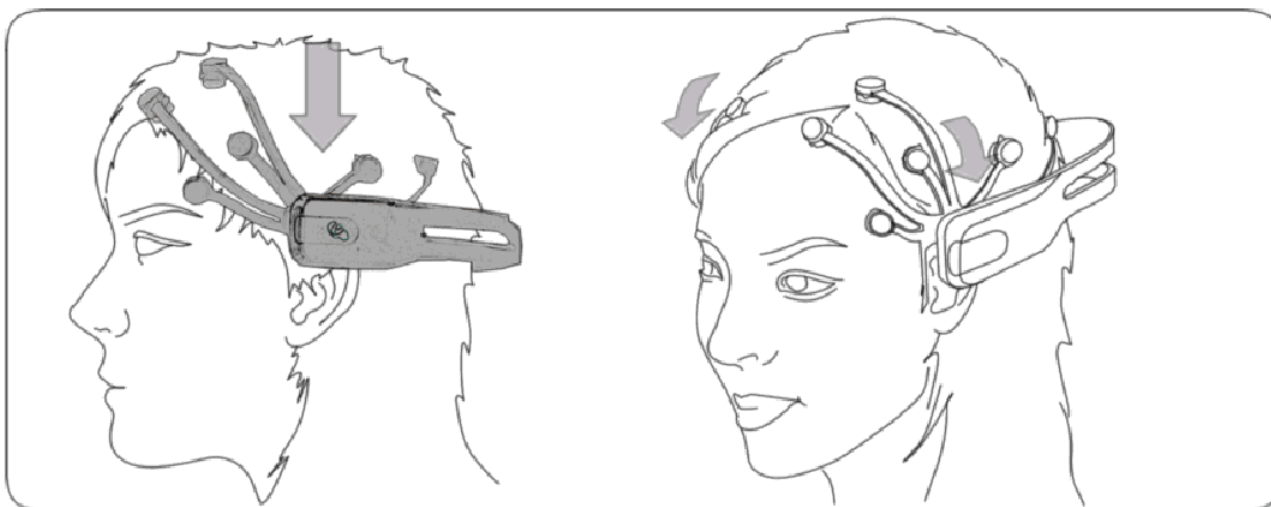

Figure 8 Putting on the headset and correct placement on the head

A view of a properly located Emotiv EPOC. Note that the front sensors are 2 – 2.5 inches (50-60mm or about three finger widths) above the eyebrows.
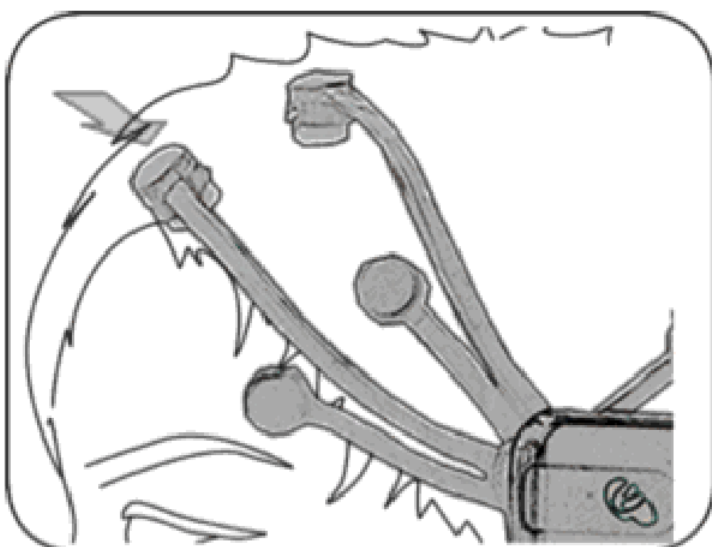

Figure 9 Front sensors are about 3 finger widths above the eyebrows

The "Reference Sensors" shown here must have good contact with the subject to assess the Contact Quality of the remaining sensors. You many need to press these against the subject's scalp for a short period to establish a good conductive path.
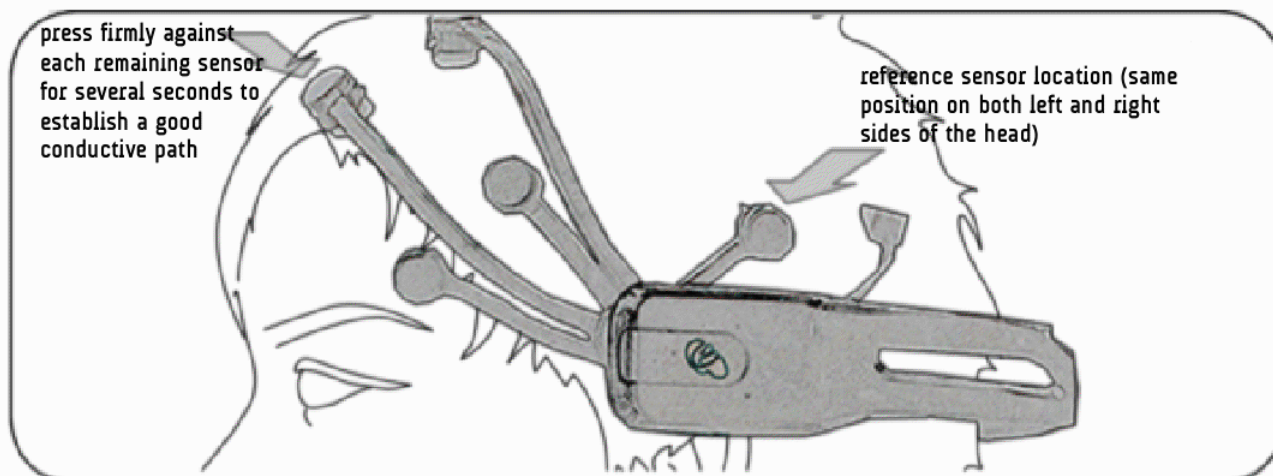

Figure 10 Getting Reference sensors and remaining sensors to establish a good conductive path

In the event that the Reference Sensors do not make proper contact (all or most sensors "black" on Control Panel screen), the behind ear locations can be used as alternative Reference locations.

Swap the Comfort Pads with the Reference Sensors as shown. Also check that all of the sensor pads are damp. Use the Reference Sensor which gives best overall performance.

2.6   EmoEngine Status Panel

The top pane of EPOC Control Panel is known as the EmoEngine Status Pane. This pane displays indicators that provide real-time information about EmoEngine status and EPOC Headset sensor contact quality. It also exposes user profile management controls.
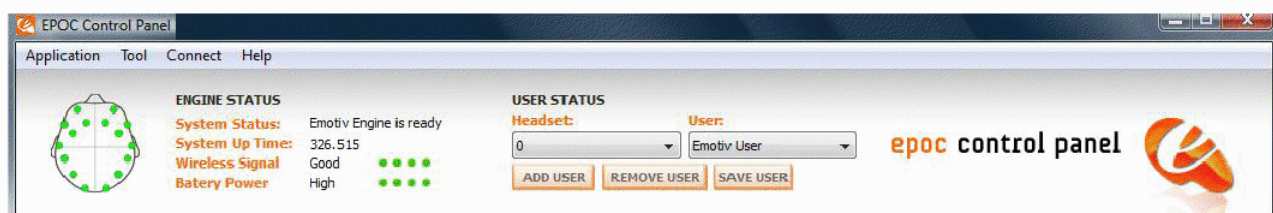

Figure 11 EmoEngine Status Pane

Engine Status

By default, the Control Panel will automatically connect to the EmoEngine when launched. In this mode, it will automatically discover attached USB transceivers and Emotiv EPOC Headsets.

There are four status indicators:

System Status: A summary of the general EmoEngine status.

System Up Time: The timestamp (in seconds) attached to the most recently received EmoState event. Generally, this corresponds to the length of time that the EmoEngine has been running with an EPOC Headset connected to the USB receiver.

Wireless Signal: This displays the quality of the connection between the EPOC Headset and the Emotiv wireless USB receiver connected to your machine. If you have not yet connected, the display will show "No Signal". If the wireless signal strength drops too low (displayed as "Bad" or "No Signal") then no detection results will be transmitted and the Control Panel will disable its detection suite UI controls.

Battery Power: Displays an approximation of the remaining charge in an EPOC Headset's built-in battery.

2.7   User Status

Use the controls in this section to manage user profiles and assign a specific user (via their profile) to a specific attached EPOC Headset. Although the EmoEngine supports up to two simultaneously connected EPOC Headsets, EPOC Control Panel only displays status information and detection results for a single EPOC Headset at a time. The Headset combo box allows you to specify the EPOC Headset that has the current "focus." In Figure 3 the User Status controls tell us that the Control Panel is currently displaying information for the user with profile "Emotiv User", wearing EPOC Headset "0."

Note: headset numbering begins with 0 and not 1 as you might expect. Other operations that are supported include adding, saving, removing, and switching between user profiles. Note: EPOC Control Panel will automatically save user profile data to disk when it exits so it is generally not necessary to use the Save Profile button.
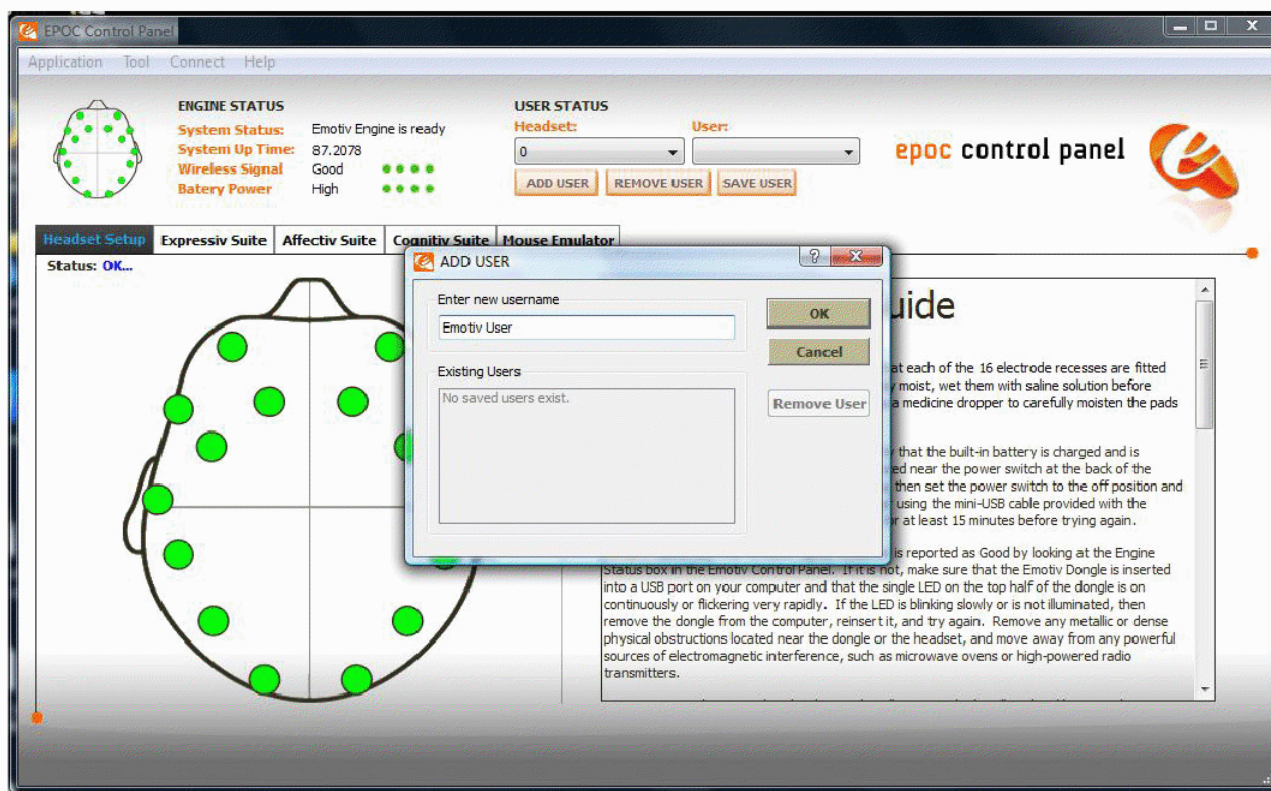

Figure 12 Add New User Profile

2.8 Sensor Contact Quality Display

Accurate detection results depend on good sensor contact and signal quality. This display is a visual representation of the current contact quality of the individual EPOC Headset sensors. The display is a smaller copy of the contact quality visualization found on the Control Panel's Headset Setup tab. Please see Section 3.0 for more information about fitting the EPOC Headset and achieving good signal quality.

2.9 Headset Setup

The Headset Setup panel is displayed by default when starting EPOC Control Panel. The main function of this panel is to display contact quality feedback for the EPOC Headset's sensors and provide guidance to the user in fitting the EPOC Headset correctly. It is important for the user to achieve the best possible contact quality before proceeding to the other EPOC Control Panel tabs. Poor contact quality will result in poor Emotiv detection results, although the EPOC will continue to perform moderately well with a small number of missing or lower quality sensors.
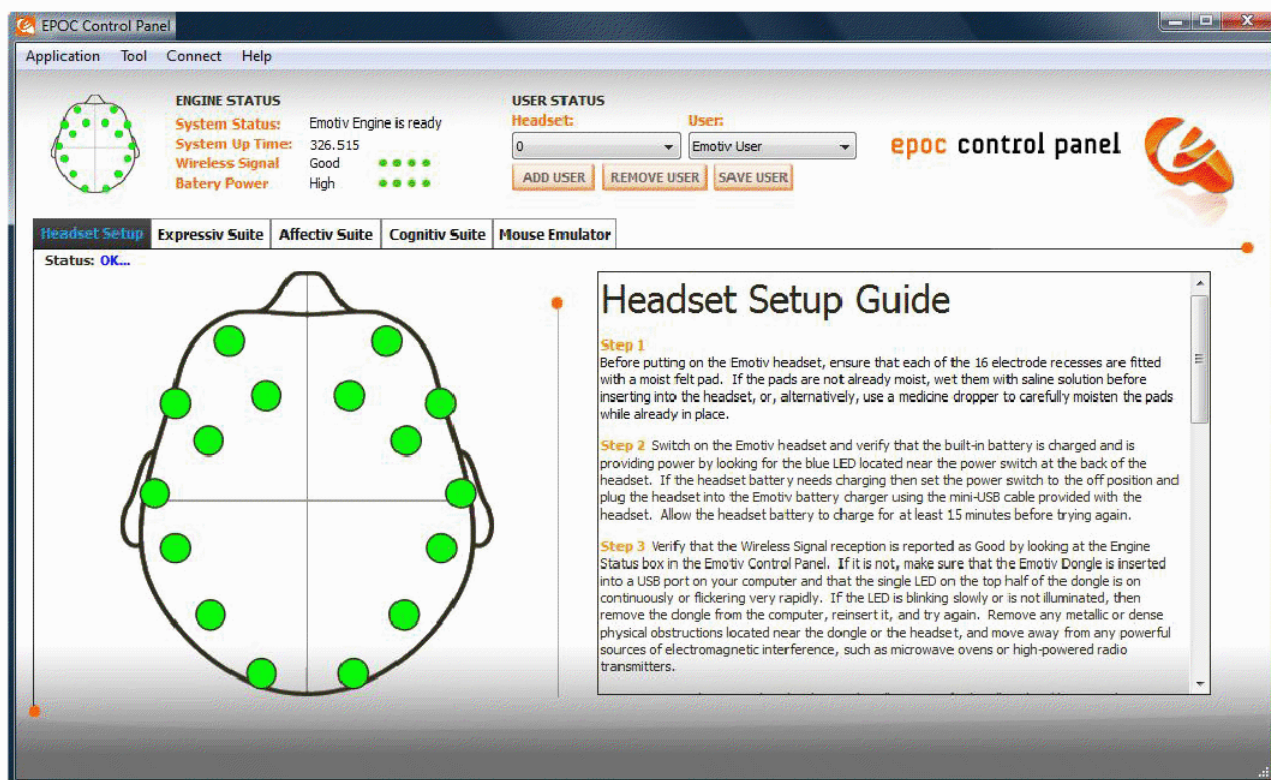

Figure 13 Headset Setup Panel

The image on the left side of the panel is a representation of the sensor locations when looking down from above onto the user's head. Each circle represents one sensor and its approximate location when wearing the headset. The color of the sensor circle is a representation of the contact quality. To achieve the best possible contact quality, all of the sensors should show as green.