EPOC Flex

User Manual

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Introduction

This document is intended to help you get started using the EPOC Flex. The EPOC Flex is a 32-channel, flexible EEG system. It was built on the award winning EPOC+ technology and is designed for researchers who would like to have a more flexible sensor placement and / or greater density of sensors. The reference sensors can be placed in any location on the ear with included earclips. EmotivPRO v1.4+ is required for operation.

If you have any queries beyond the scope of this document, please contact us through our online support.

Safety Precautions

- EPOC Flex is a consumer product, it is not intended to use be used for in-patient health care or in hazardous environments.
- EPOC Flex is designed to be used at room temperature; rapid changes in temperature will affect the performance of the amplifiers and increase the noise floor.
- EPOC Flex can be used with gel or saline based sensors.
- WARNING: EPOC+ is powered by a Lithium-Polymer battery that is rated for operation in <45C environments. It is not user replaceable, please contact support if you suspect a fault or have any questions.
- WARNING: Do not open the enclosure. Doing so will void the warranty and can damage the headset.
- WARNING: Do not charge EPOC Flex while wearing the device. In the unlikely event your PC has a faulty power supply you and your headset could unintentionally become the ground path and so If EPOC Flex detects a USB connection when turned on it will stop communicating.

Technical Specifications

No. of Channels	32 (plus CMS/DRL references)
Channel names (International 10-20 locations)	Configurable on standard 72 channel 10-20 map.
Sampling method	Sequential sampling. Single ADC
Sampling rate	128 SPS (1024 Hz internal)
EEG Resolution	14 bits 1 LSB = 0.51μV (16 bit ADC, 2 bits instrumental noise floor discarded)
Max Slew Rate	32.64uV/sample (Compression required for BLE data transmission)
Bandwidth	0.2 - 45Hz, digital notch filters at 50Hz and 60Hz
Filtering	Built in digital 5th order Sinc filter
Dynamic range (input referred)	+/- 4.12 uV
Coupling mode	AC coupled
Connectivity	Proprietary 2.4GHz wireless, BLE(coming soon)
Battery Capacity.	LiPo battery 680mAh
Battery life (typical)	9 hours
Impedance Measurement	Real-time contact quality using patented system
IMU Part	ICM-20948 (support coming soon)
Accelerometer	3-axis +/-8g
Gyroscope	3-axis +/- 2000 dps
Magnetometer	3-axis +/- 12 gauss
MEMS Sampling	16 Hz
MEMS Resolution	16-bit
Sensor Material	Sintered Ag/AgCl can be used with gel

Compliance Accreditation

FCC ID Number 2ADIH-FLEX01 and IC ID Number: 12769A-FLEX01.

EMOTIV has undertaken testing and confirms:

This device complies with the radio equipment directive (2014/53/EU).

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 equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or experienced person for help.

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. *This device may not cause interference.*
2. *This device must accept any interference, including interference that may cause undesired operation of the device.*

Please Note: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Controller Assembly›

The EPOC Flex controller pictured above has 16 channels connected on the left + CMS input and 16 channels on the right + DRL output. These channels are connected in two rows A-H and J-Q, In software L or R is added in front to make it LA, LB, etc and RA, RB, etc. These labels allow users to easily trace signal problems from the name shown on software to the sensor. The connectors shown are JST PHD-18VS which are easily sourced from digikey if replacements are required.

Charging and LED Indicators

The EPOC Flex has a single RGB LED to indicate power on and charging as shown in the table below.

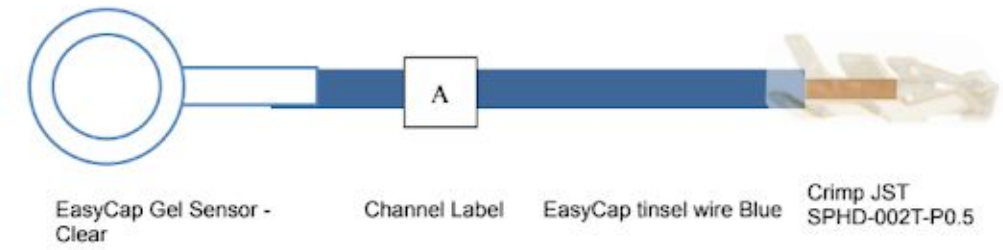
Action	**LED Colour**
Power OFF / Battery Flat	OFF
Powered On	BLUE
USB connected / Charging	ORANGE
Charge complete	GREEN
Firmware failure	Fade On - Fade Off Blue
USB connected / powered On	WHITE

It is recommended that your headset is fully charged prior to taking recordings. The charge time depends on the remaining capacity in the Lithium Polymer cell and can take up to four hours. If the EPOC Flex LED does not turn blue on power on it requires charging. Please use the provided USB Micro-B cable to recharge using any usb port.

Note 1: The headset will charge faster if connected to a dedicated USB port.
Note 2: If the headset it heavily depleted or hasn't been used for a few months, leave it connected for 24hrs.

Electrode Assemblies

Emotiv has developed the EPOC Flex to use EasyCap Multi-rode gel sensors that are pre-configured and easy to setup. The electrodes are attached to 150mm of tinsel wire and terminated with JST gold plated crimps. This length is designed to be long enough to reach any position on the cap.



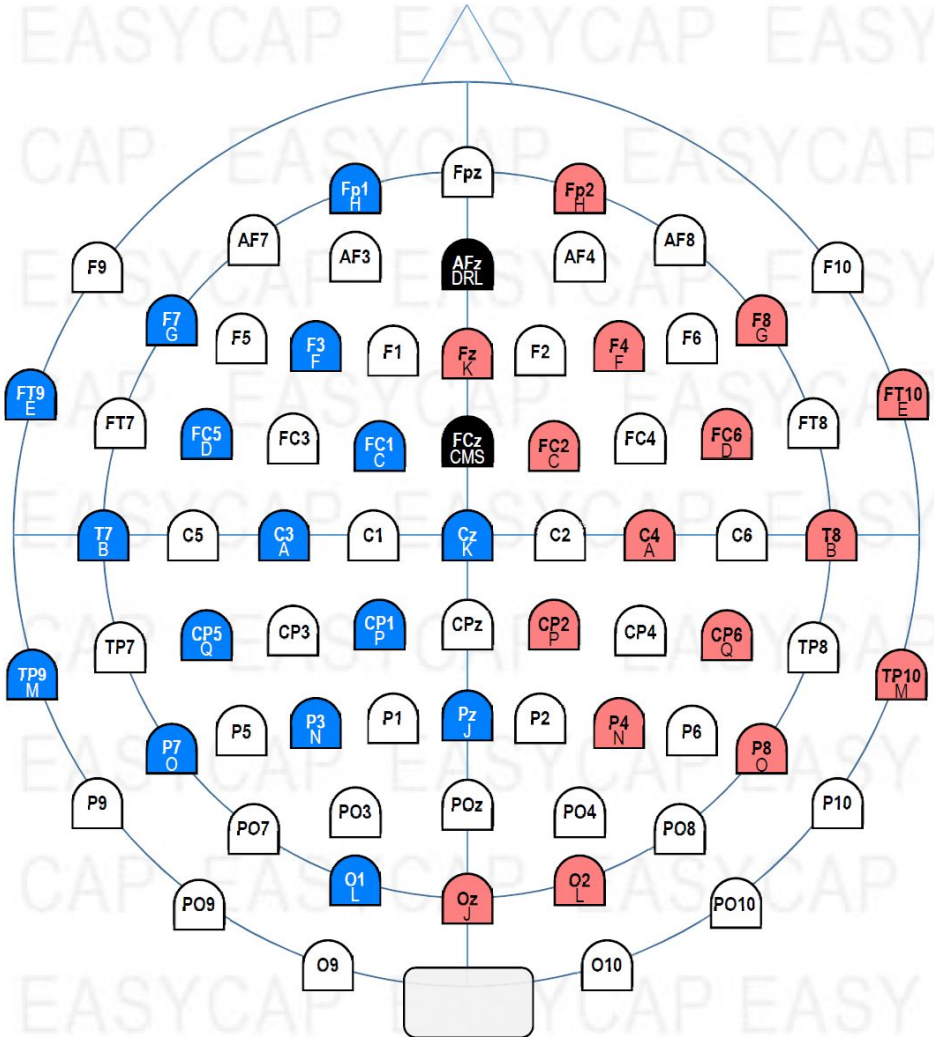
Electrodes are colour coded, blue for left, red for right and black for references. In addition each sensor will be individually labelled with the channel name connected. The aim of this colour coding is simple, when troubleshooting you can quickly identify the colour and channel name in the software and quickly find the electrode on the cap.

There will be excess wire once the cap is fitted, we recommend that you place a cap over the top to stop these wires catching. If your research involves minimising motion artifacts keeping the excess wire secured will be required, either by tidying down the wire or feeding through adjacent empty holes. If a cap with electrode leads cut to length is required please contact us.

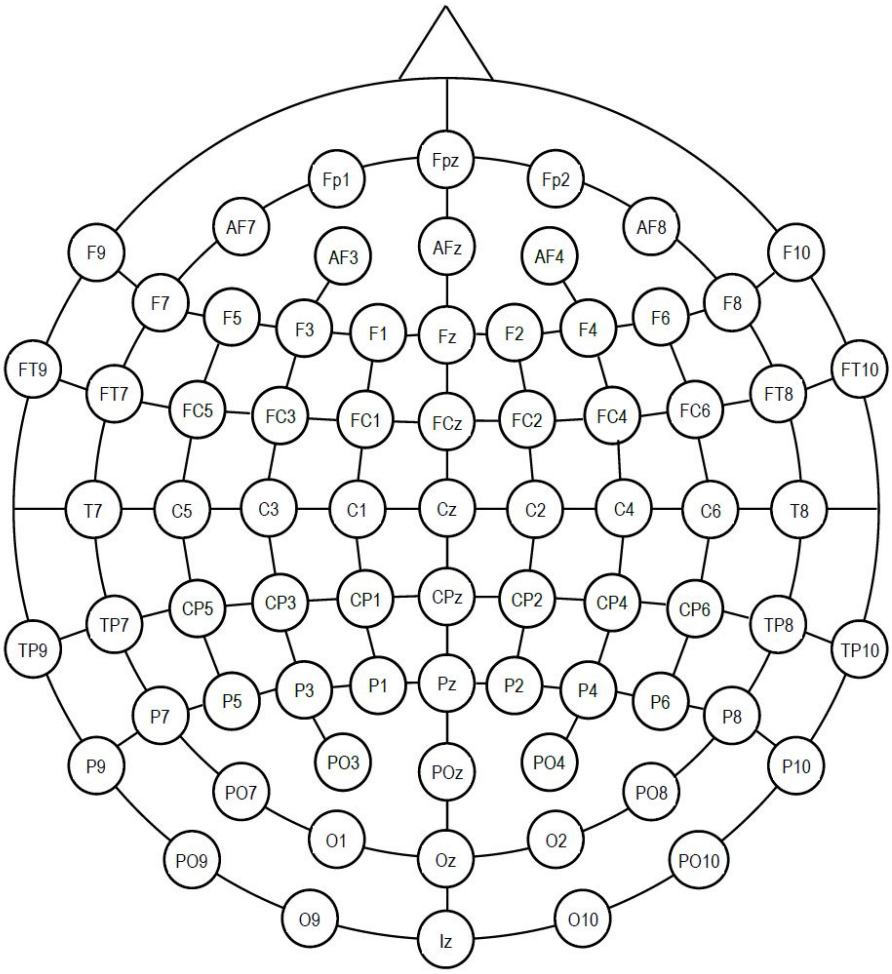
We know that researchers can have different needs for references, so we have included earclips and adhesive pads that fit the electrodes.

Example Electrode placement

Below is an example image showing the electrode placement as per the initial setup in EmotivPRO. This placement gives good coverage of the entire head, with the pod fitted in the back pocket.


Fpz
Fp1 H
Fp2 H
AF7
AF3
AFz DRL
AF4
AF8
F9
F10
F7 G
F5
F3 F
F1
Fz K
F2
F4 F
F6
F8 G
FT9 E
FT10 E
FT7
FC5 D
FC3
FC1 C
FCz CMS
FC2 C
FC4
FC6 D
FT8
T7 B
C5
C3 A
C1
Cz K
C2
C4 A
C6
T8 B
TP7
CP5 Q
CP3
CP1 P
CPz
CP2 P
CP4
CP6 Q
TP8
TP9 M
TP10 M
P7 O
P5
P3 N
P1
Pz J
P2
P4 N
P6
P8 O
P9
P10
PO7
PO3
POz
PO4
PO8
O1 L
Oz J
O2 L
PO9
PO10
O9
O10

EPOC Flex Cap

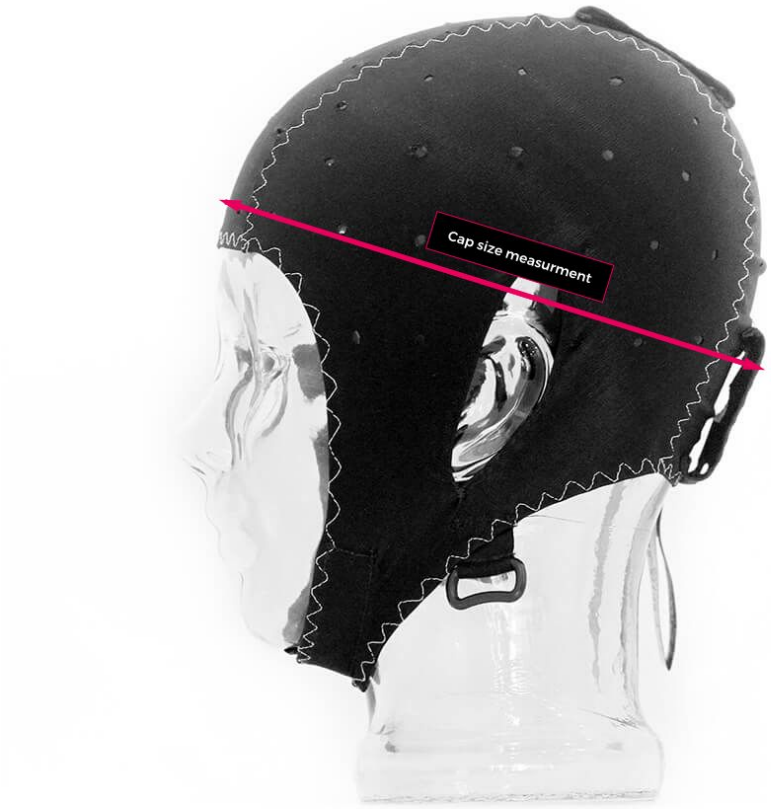


The standard EPOC Flex cap follows the official 10-20 system and has 72 openings as shown above. The controller has two pockets it can be placed in on the cap, one is fitted about Cz and the other Iz.

The caps can be ordered in our standard sizes are 54, 56 and 58 cm in a black high comfort material in a caucasian cut. Other sizes, hole positions, materials and cuts are available please contact online support for further information.

Specifying Cap Size

Specifying the right cap size is critical for keeping for ensuring the sensors are in the right place when taking measurements. Our supplier recommends measuring the head diameter in the horizontal circumference as shown in the image below.



Once you have the measurement for your test subjects you specify the closest size to the ones available for example 54.5cm → 54cm, 59cm → 58cm, etc. If you need larger or smaller sizes please contact support.

Package Contents

When you receive your order you will find a package that looks like this:

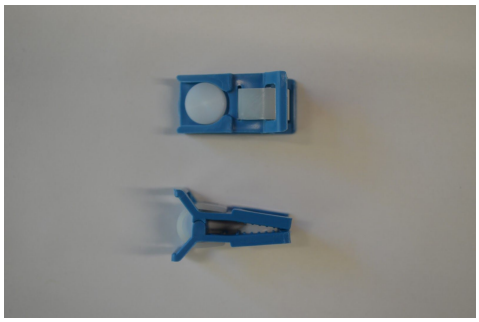
<White Box >

With this shipping box will be the EPOC Flex Package
<Image>

Please note if you order more than one cap or electrode set these will be in the shipping box.

EPOC Flex is designed to allow users to buy the components required to meet their research need. When you open the box you will find the following:

	
1. Controller	2. Universal USB Receiver (included with Controller)
	
3. EasyCap Emotiv Custom Cap	4. Electrode Sensors

	<IMAGE> 
5. Micro-B to A USB cable	Earclips + adhesive pads

Assembly Quick Start

We recommend that you use a polystyrene head when setting up the cap as this will make setup easier.

1. Remove the cap, electrode trees and controller from the packaging.
2. Fit the controller to the cap with the emotiv logo as pictured above.
3. Fit the blue wire tree into the left side of the controller and the red wire tree into the right side.
4. Starting with LA position your sensors into the cap, we recommend that you try to keep left and right as a mirror image to make setup simple. See our example layout above.
5. The cap is now ready for fitting onto the test subject.
6. Please plug in the universal USB receiver into your computer and ensure the power switch is to the right a blue LED will turn on indicating power on. You should also see the lights on the receiver change to indicate it is receiving data.

Cleaning and Maintenance