Elemind Headband Manual

Last Updated: February 3rd, 2025  
  
This documentation is prepared for Nir Grossman’s group at Imperial.

1. Headband Tour (WIP)
   1. Hardware
      1. EEG
         1. 3 channel, 24bit EEG, with +/-2.5uVpp input-referred noise.
         2. sampled at 250Hz
         3. software bandpass filtered from 0.5Hz - 35Hz.
         4. Fp1, Fpz, Fp2 electrodes, with over-ear references (the references are electrically tied).
      2. Accelerometer
         1. x,y,z channel, 12bit, +/- 2g,
         2. sampled at 25Hz
   2. Power
      1. The headband does NOT have the ability to power-off.
      2. It takes about 4 hours to fully charge from a 5V, 500mA USB charger.
      3. Once fully charged it can be unplugged and sit idle for 5 days before running out of battery.
      4. Once fully charged, it can run for 2-3 days with a 10 hour session each day. A session is up to 1 hour of audio, and 9 hours of datalogging recordings
   3. Hard Reset

Press and hold the “Vol-” and “Action” buttons (diagonally opposite) for 8 seconds. The LED will flicker red very quickly. Give the headband a few seconds to power-on. After a power-cycle, the headband will lose track of human-time, and will need a time update. This can happen by connecting to the app, or by sending the “ble\_time” command described below.

* 1. Reset Bluetooth Pairing

The headband pairs (exchanges encryption keys) with the backend.  
Hold action button for 5 seconds - The headband will have a blue breathing light.

1. Commands
   1. Set human-time

ble\_time <unix-epoch-time> <time-zone>

<unix-epoch-time> - seconds since January 1st, 1970

<time-zone> - compact representation of time-zone in plus or minus, double-digit hour, double-digit minutes representation. i.e. Eastern Standard Time is “-0500”

Example command for February 3rd 2024 at 16:19:36 GMT.:  
ble\_time 1738599578 +0000

* 1. Help

help or ? prints out all available commands

* 1. List the files on the headband:

fs\_ls

Example to list root directory of headband:

fs\_ls

------name-----------size---------attrib-----

settings.ini 599 -----a--

audio/ < 2> ----d---

memfault/ < 2> ----d---

datalogs/ < 1> ----d---

user\_metrics/ < 0> ----d---

scripts/ < 0> ----d---

testlogs/ < 3> ----d---



Example to list datalogs directory of headband:

fs\_ls /datalogs

* 1. Move a file from one location of the band to another:

fs\_mv file-source file-destination

* 1. Remove a file or folder:

fs\_rm <file-or-folder>

* 1. Delete all datalogs, usermetrics, and memfault files (This command will be changing soon to fs\_clean):

fs\_rm\_datalogs

* 1. Enable Streaming Data:

stream <data-name> <0off-1on>

<data-name> - Can be one of: eeg, accel, audio, leadoff, inst\_amp\_phs, all

stream eeg 1

stream all 1

* 1. EEG filtering commands:

therapy\_enable\_az\_filters <0=disable,1=enable> - 0.5hz? high pass filter  
therapy\_enable\_line\_filters <0=disable,1=enable> - 35hz low-pass filter

therapy\_enable\_ac\_filters <0=disable,1=enable> - 31.2hz notch filter for leadoff excitation signal

1. File System:
   1. Audio - WAV 16bit PCM 22kHz Mono.

Stored in “/audio”

The file name doesn’t matter, but by convention we have used “filename\_22M.wav”

Pink noise is dynamically generated

1. Example Script:

Example Script:

data\_log\_open

user\_metrics\_log\_open

therapy\_enable\_alpha\_switch 1

therapy\_config\_alpha\_switch 5 10 1 2 6

eeg\_start

accel\_start

ml\_enable

echt\_config\_simple 10

echt\_set\_min\_max\_phase 134 224

echt\_start

audio\_set\_volume S.audio.volume

audio\_pink\_volume 1

audio\_pink\_fade\_in 60000

audio\_pink\_play

audio\_bg\_volume 0.2

audio\_bg\_fade\_in 500

audio\_bgwav\_play /audio/RAIN\_22M.wav 1



audio\_pink\_fade\_out 500

audio\_bg\_fade\_out 1000

audio\_pink\_stop

audio\_bgwav\_stop

echt\_stop

ml\_disable

accel\_stop

eeg\_stop

user\_metrics\_log\_close

data\_log\_close



Example Script to Play Audio (pink and background at full volume)

audio\_set\_volume 255

audio\_pink\_volume 1

audio\_pink\_fade\_in 0

audio\_pink\_play

audio\_pink\_unmute

audio\_bg\_volume 1

audio\_bg\_fade\_in 0

audio\_bgwav\_play /audio/RAIN\_22M.wav 1



Example Script to Stop Audio

audio\_set\_volume 255

audio\_pink\_volume 1

audio\_pink\_fade\_out 0

audio\_pink\_stop

audio\_pink\_unmute

audio\_bg\_volume 1

audio\_bg\_fade\_out 0

audio\_bgwav\_stop

