
BrainAccess MIDI Electroencephalograph

Version 2.0

User's Manual
Version 2.0
June, 2022

Introduction

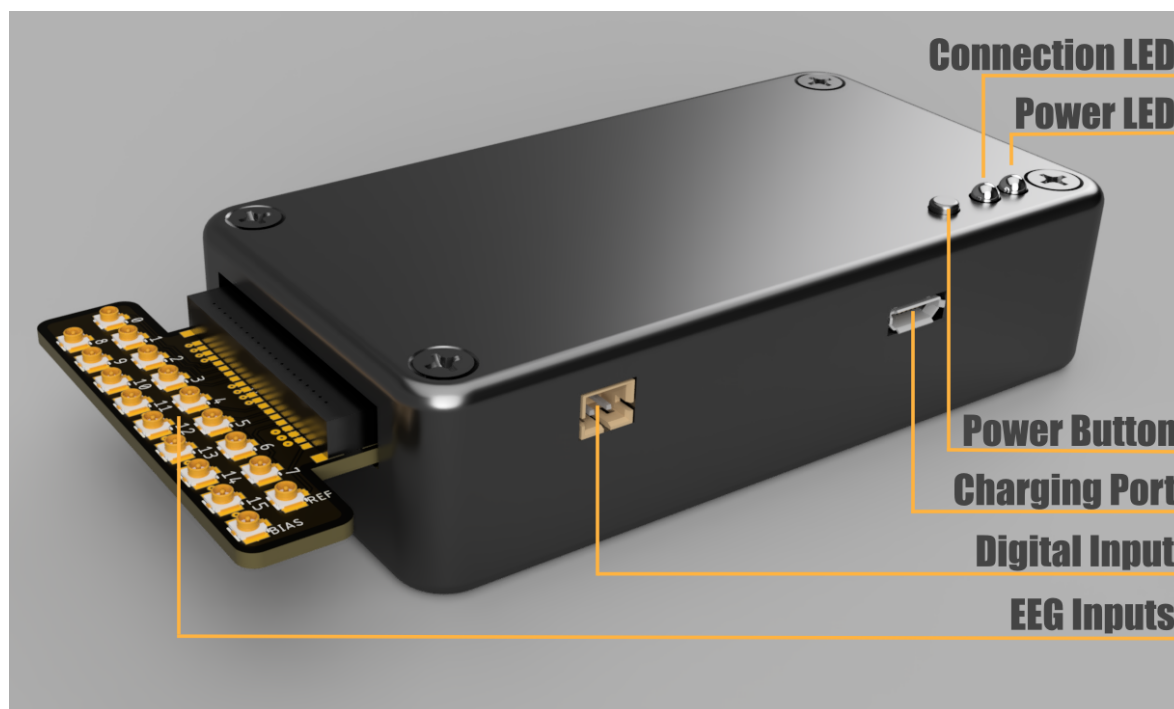
Welcome to the user's manual of BrainAccess MIDI electroencephalograph. It overviews the main features and specifications of the device and guides you through the set-up procedure. Should you have any further questions not covered in this guide please visit www.brainaccess.ai where you can find more information or contact us at brainaccess@neurotechnology.com.

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I Device Overview

The BrainAccess MIDI is a 16 channel electroencephalograph with a common reference channel. It offers high input channel density, Bluetooth connectivity and long battery life. Please, get acquainted with device's main components and connections before use.



USB Bluetooth adapter. In the package you will find a USB Bluetooth 4.2 adapter, which is used to communicate and stream data to computer from BrainAccess MIDI. If preferred, a different Bluetooth adapter such as an integrated Bluetooth adapter in a laptop may be used instead.

Power switch. Press and hold a push button for a couple of seconds to turn the device on/off. The blue LED will start breathing once the device is on.

Charging port. The device's battery can be charged via micro-USB port using standard 5V chargers such as mobile phone chargers with micro-USB plug. The charger should be capable of providing at least 800 mA of current. Do not use the device when charging with chargers powered from grid electricity due to safety reasons and potentially 50/60 Hz noise affecting the signals. The device can be used when charging from power bank though.

Connection LED. After power up this LED goes into breathing mode. If a Bluetooth connection is established between a computer and the device it turns solid blue.

Power LED. It is a red-coloured LED that indicates the battery and charging status. If the power LED starts blinking, it indicates that the battery level is below <10%. When the device is charging the LED starts breathing and turns solid red when fully charged.

Reference input. An input that should be connected to a common reference electrode. In BrainAccess Kit setups it is typically an electrode placed at Fp1 location. The connection is denoted as 'R' on the device.

Bias input. An input that should be connected to a bias electrode. In BrainAccess Kit setups it is typically an electrode placed at Fp2 location. The connection is denoted as 'B' on the device. It is a

driven bias which reduces the common mode noise such as noise coming from the grid electricity. The bias signal is derived from any of the EEG inputs which can be chosen in software. They are denoted as 'bias feedback channels' in software. Use only channels/electrodes that have good quality signals for bias feedback.

Inputs. These inputs should be connected to electrodes that measure EEG activity with respect to the reference electrode.

Input connector-converter. An input connector-converter has input connections for all the cables coming from each electrode on one end and a single socket connection to the MIDI on the other end. This allows, for example, disconnecting MIDI quickly from an EEG cap and connecting to another EEG cap with a different setup.

Digital input. The device has an additional digital input that is sampled at the same rate as EEG signals and is treated as an additional input channel in software. It can be used for connecting external sensors or for synchronizing multiple BrainAccess MIDI devices, read more on this in Section 3.

Accelerometer. The device has also an integrated 3-axis accelerometer. It can be used for example to record any body/head movements when it is attached to the EEG cap.

Velcro tape attachment. A velcro tape can be found at the bottom of the device, that can be used to attach it to the BrainAccess CAP.

2 Specifications

Main specifications of BrainAccess MIDI electroencephalograph are given in the table 2.

Connectivity	
type	Bluetooth 4.2
range	up to 10m (using the provided Bluetooth adapter)

EEG Input Channels	
number of channels	16 + common reference channel
sampling frequency	250Hz
input resolution	24 bits
analog gain values	1, 2, 4, 6, 12, 24
input voltage range	4500 mV / gain value (w.r.t. reference channel)
input connector	Ultra-mini RF coaxial connector

Digital Input Channel	
type	internally pulled-up, driven low by closing the input contacts
sampling frequency	250Hz
connector	JST right-angle, 2 mm pitch

Accelerometer	
number of axis	3
sampling frequency	50Hz (resampled to 250Hz in software)
range	$\pm 2g$
resolution	10 bits

Battery	
type	Li-Po
capacity	2200 mAh
operating time	up to 9 hours (continuous streaming, all channels turned on)
charging time	3 hours
charger input	5V 800 mA min (charger not included)
charger connector	micro-usb

Mechanical	
mass	85g
dimensions	92x50x23 mm

Table 1: Specifications of BrainAccess MIDI electroencephalograph.

3 Digital Input

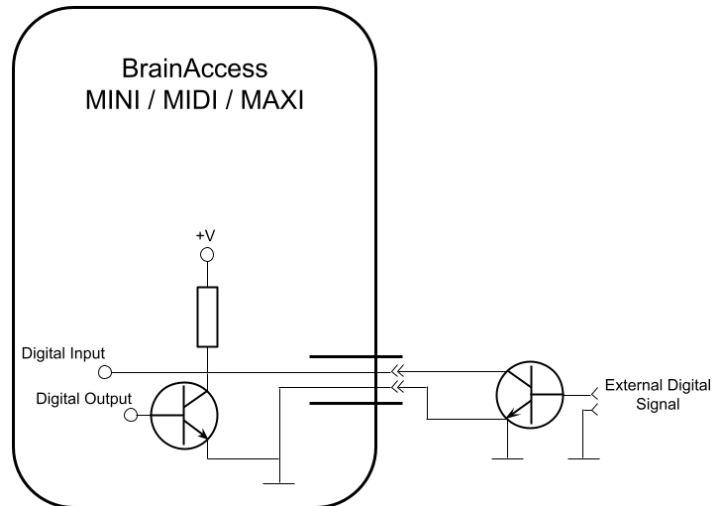
BrainAccess MIDI features a digital input which can be used for connecting external sensors or other devices. The sampling of the digital input coincides with the sampling of the EEG channels. The digital input is internally-pulled high and is driven low when input contacts are closed. An external switch or open-collector/open-drain circuits can be used to close the digital input contacts and drive the digital signal low. The open-collector/open-drain circuit can be realised with an

NPN bipolar transistor or N-type MOSFET as shown in the diagram below. Microcontrollers or sensors may already have an open-drain output operation capability and an external transistor would not be required in such a case.

The device comes with preassembled plug for the digital input. Please follow this cable colours to distinguish between device ground contact (black colour) and signal contact (red colour).

Important! Do not connect a voltage source to digital input, only use open-collector/open-drain circuits to close the digital input contacts. Only connect sensors (or other devices) that are battery powered to the digital input. Do not connect sensors that are powered from grid electricity unless electrical isolation can be guaranteed.

Operation as Output. The device has an internal circuitry allowing to drive the digital input low, essentially allowing it to work as digital output as well. This could be used, for example, to synchronize multiple BrainAccess electroencephalographs by connected the digital inputs of all devices in parallel and driving the digital input of one device low for some period of time. This impulse will be observed by all devices and could be used to align EEG signals.



4 Set-up

Follow the steps below to get start using the BrainAccess MIDI electroencephalograph.

- If not connected, connect the electrodes to the BrainAccess MIDI EEG inputs.
- Press the power pushbutton and hold for a couple of seconds, the blue LED should start breathing indicating that BrainAccess MIDI has turned on.
- Plug in the provided Bluetooth adapter to your computer, the drivers should install automatically. Skip this step if using an integrated or some other installed Bluetooth adapter.
- This step is for **Windows only**. Open 'Bluetooth & other devices' settings. Click 'Add Bluetooth or other device' icon and BrainAccess MIDI should appear on the list. Connect to it and close the settings window. The MIDI device is now paired with your PC and you will not need to repeat this step again.
- If you haven't done this already, download the BrainAccess Board application. The software can be downloaded from the download centre at <https://www.brainaccess.ai/resources/download>.
- Launch the BrainAccess Board, connect to the MIDI device using Configurator and start the stream. Under Apps tab you can find an EEG viewer, launch it to confirm that EEG data is being streamed.

Visit <https://www.brainaccess.ai/resources/> for more info on available software options, tutorials and other.

5 Safety Notice

BrainAccess MIDI electroencephalograph will be referred as 'the device' in this safety notice.

- Do not use the device outside in rainy/snowy conditions.
- Do not use the device near the water or in extremely damp conditions.
- Do not use the device in an explosive atmosphere.
- Use the inputs of the device only for their designated purpose. Do not connect any electrical power sources to the device's inputs.
- Do not connect any voltage or current source to digital input of the device.
- Do not connect the device to a person via electrodes when charging it with a charger powered from grid electricity. The device can be used when charging with power bank though.
- Connect external sensors (or other devices) that are only battery powered to digital input of the device. Do not connect sensors (or other devices) that a powered from grid electricity unless electrical isolation can be guaranteed.
- Do not use the device with suspected failures. In cases such as, but not limited to, the device does not operate as expected, physical damage is visible on the casing, the device was dropped into the water/snow, the device was dropped from substantial height, other objects has been dropped on the device, liquid has been spilled on the device, have the device inspected by qualified personnel before further operation.
- The device should be serviced by authorized personnel only.

6 Warranty

Neurotechnology ltd. warrants this product (BrainAccess MIDI electroencephalograph) against defects in materials and workmanship for one (2) year from purchase date under normal consumer use conditions. If the product fails during normal and proper use within the warranty period, Neurotechnology will repair or replace the product. The liability of Neurotechnology does not include any incidental or consequential damages.

This warranty does not include failure caused by improper set-up, operation, maintenance, accident, damage, misuse, modifications not approved by Neurotechnology, normal wear and tear, any event or act outside Neurotechnology's control.

This warranty does not apply if serial number of the product has been altered or removed, the casing of the product has been opened or the product has been tampered or repaired by unauthorized personnel.

7 Support

Please contact Neurotechnology if you have any problems using any of the BrainAccess products.

Neurotechnology ltd.

Address: Laisves av. 125A, Vilnius, LT-06118, Lithuania

Phone: +370 5 277 3314

Email: brainaccess@neurotechnology.com

Website: www.brainaccess.ai