OpenNerve Windows Controller V0.1 – User Guide

The OpenNerve software controller V0.1 is configured to enable bipolar output on a single pair of electrodes (channels 1 and 2 on the OpenNerve dev board). The controller connects to the dev board via Bluetooth Low Energy (BLE); while the board requires power using a USB-C connector, it does not require being plugged in to the Windows computer or tablet running the controller software and can instead be powered by a portable battery or wall outlet.
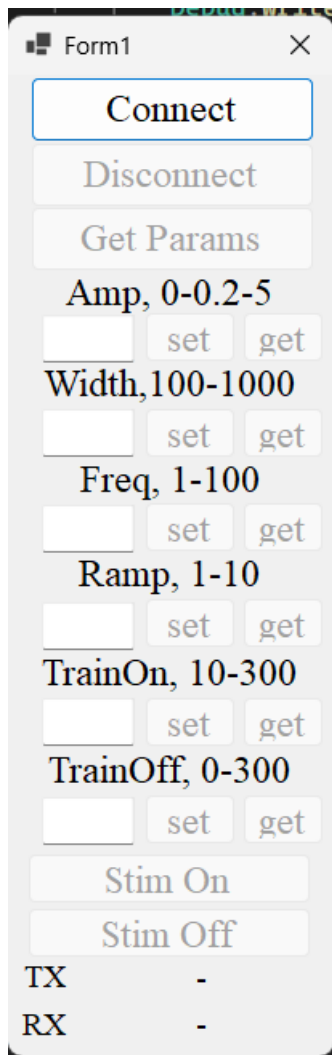

Figure 1. User Interface for V0.1 controller software

The controller UI is shown in Figure 1. "Connect" searches for OpenNerve dev boards nearby and connects to them via BLE. "Disconnect" will disconnect the board and close the program.

For each stimulation parameter (amplitude in mA, pulse width in us, frequency in Hz, ramp time in seconds, train on time in seconds, and train off time in seconds) there are two BLE commands available: "set" and "get". "Get" queries the board and loads the current setting for that parameter. "Set" sends a new parameter to the board. After setting a parameter, you can use "get" to confirm that the parameter was set correctly. "Get Params" automatically queries all parameters and loads the current settings into the dialog boxes; when using this button, please allow all parameters to load before changing any.

"Stim On" starts stimulation. "Stim Off" stops stimulation. There is a 1-2 second delay between pressing "Stim On" and stimulation beginning; the delay is much less (~0.5s) when turning stimulation off. You can "set" new stimulation settings while stimulation is on, but to output the new settings from the dev board you must turn stimulation off and then turn it back on again.

BLE commands will show up in the TX and RX fields at the bottom of the controller. This can be used to confirm that a command was sent.

To use the controller:

1. Power the dev board up by connecting it to a standard USB-C power source.

2. Hold the included magnet over the magnetic sensor for 10 seconds to activate the board (Figure 2)
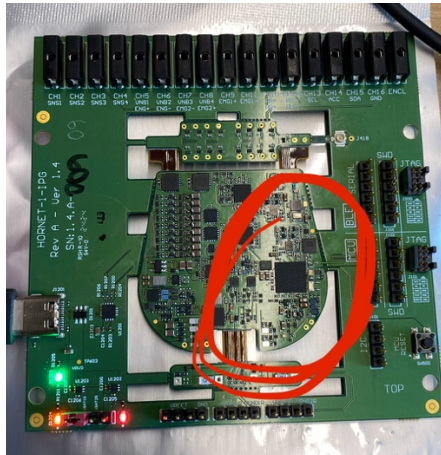

Figure 2. Place the magnet over the area indicated by the red circle.

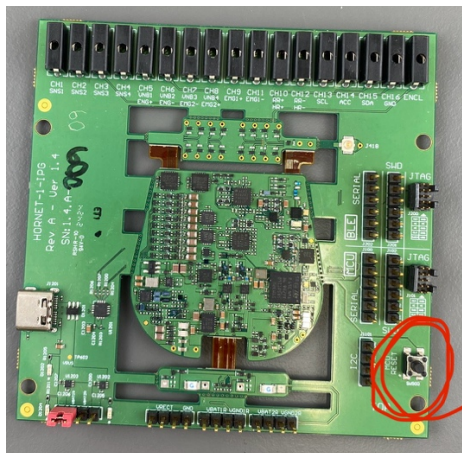3. Load the controller program and press the reset button (Figure 3)

Figure 3. The reset button is indicated by the red circle.

4. Press "Connect" and wait for the program to connect. FYI, every 2nd time the program shuts down during connection, just restart it and repeat the steps above.
5. Once connected, press "Get Params" to load the current settings from the board
6. Adjust the settings to match your test, pressing "set" on each setting once modified
7. Press "Stim On" to begin stimulation

Notes on stimulation

Stimulation is delivered by the OpenNerve dev board in bipolar alternating (aka interleaved) mode. This means that stimulation is delivered between two channels, with each channel serving as a current source during one phase of the stimulation pulse and as a current sink

during the opposing phase. This allows charged balanced stimulation between two electrodes while taking advantage of the full voltage headroom of the board. The opposing pulses are evenly spaced across each stimulation cycle (Figure 4). Therefore, stimulating at 100 Hz will cause one electrode to inject current at time t=0 and the opposing electrode to inject current at time t+0.005s.
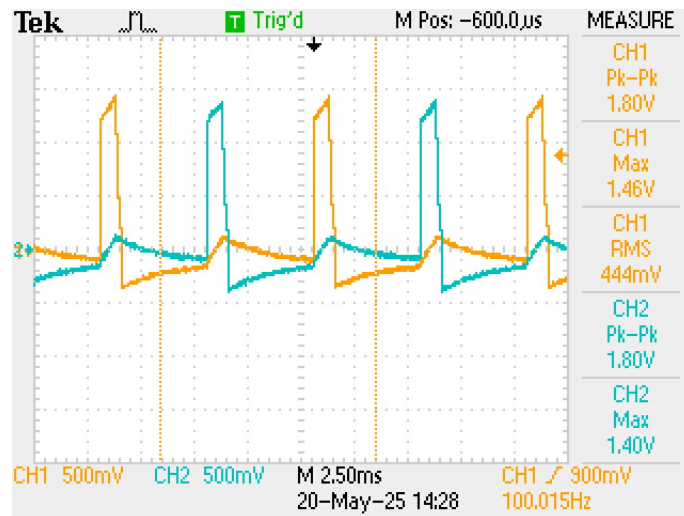

Figure 4. Example of bipolar stimulation showing the voltages on electrode 1 (ch. 1) and electrode 2 (ch. 2) referenced to the board ground when stimulating across a 500 Ohm resistor. Stimulation is applied at 100 Hz, 1000us pulse width, 3mA amplitude.