

OpenBCI Node.js SDK
Voltage Test Plan & Results

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Abstract:

[OpenBCI](#) produced a biosignal acquisition board (referred hereafter as the “Board”) that utilizes a [TI ADS1299](#) (referred hereafter as “IC”). Push The World™ produced a [Node.js module](#) (referred hereafter as the “Module”) that provides an interface between JavaScript and the OpenBCI Board. Due to the research intentions of the Board, we must verify the Module’s proper operation.

Purpose:

The purpose of this document is to 1) present a test plan that will validate the OpenBCI Node.js Module and 2) present the results of following the test plan.

About the OpenBCI Board:

The IC features 8 24-bit A/D blocks with the capability of generating internal test signals as well as accepting externally injected test signals. The Board transmits a new sample every 4ms at a frequency of 250Hz.

Version History:

2/25/2016 – AJ Keller – Initial document creation

Test Plan:

1. Internal Voltage Verification – Slow Pulse 1x Amplitude.
 - a. A Mac OS X and the Module has been installed by following the guide at the [bottom of the readme.md](#) page.
 - b. JavaScript [found here](#) on the readme.md is used to connect and start streaming from the Board to start triggering the “[sample](#)” event.
 - c. Write out samples to a CSV file for offline analyses.
 - d. After 2 seconds, the command “-” is written to the Board using the [.write\(\) function](#).
 - i. The “-” triggers the [Board to configure the IC](#) to internally generate a signal that is 1x Amplitude slow pulse.
 - ii. From page 41 on the IC [datasheet](#) this signal is defined as
$$1 \times \frac{(VREFP - VREFN)}{2.4mV}$$
 - iii. When using the internally generated signals, VREVP = 4.5V and VREFP = AVSS, where AVSS = 0V
 - iv. The expected voltage is an oscillatory square wave with amplitude of 1.875mV

- e. After 9 seconds, call [.disconnect\(\)](#) function with the Module to disconnect the board.
2. Internal Voltage Verification – Slow Pulse 2x Amplitude.
 - a. A Mac OS X and the Module has been installed by following the guide at the [bottom of the readme.md](#) page.
 - b. JavaScript [found here](#) on the readme.md is used to connect and start streaming from the Board to start triggering the [“sample” event](#).
 - c. Write out samples to a CSV file for offline analyses.
 - d. After 2 seconds, the command “-” is written to the Board using the [.write\(\) function](#).
 - i. The “-” triggers the [Board to configure the IC](#) to internally generate a signal that is 2x Amplitude slow pulse.
 - ii. From page 41 on the IC [datasheet](#) this signal is defined as

$$2 \times \frac{(VREFP - VREFN)}{2.4mV}$$
 - iii. When using the internally generated signals, VREVP = 4.5V and VREFP = AVSS, where AVSS = 0V
 - iv. The expected voltage is an oscillatory square wave with amplitude of 3.75mV
 - e. After 9 seconds, call [.disconnect\(\)](#) function with the Module to disconnect the board.

Test Results:

1. Internal Voltage Verification – Slow Pulse 1x Amplitude - **Pass**
 - a. The entire test is shown in Figure 1. Note the floating voltages prior to the internal signal generation command being sent. Refer to test plan 1.d.i.
 - b. Analysis
 - i. After the internal signal generation code was sent, the Board emitted a square wave that oscillated between 1.845 mV and -1.89 mV. See Figure 4.
 - ii. The expected voltage was 1.875 mV.
2. Internal Voltage Verification – Slow Pulse 2x Amplitude - **Pass**
 - a. The entire test is shown in Figure 2. Note the floating voltages prior to the internal signal generation command being sent. Refer to test plan 2.d.i.
 - b. Analysis
 - i. After the internal signal generation code was sent, the Board emitted a square wave that oscillated between 3.711 mV and -3.758 mV. See Figure 4.
 - ii. The expected voltage was 3.75 mV.

Figures:

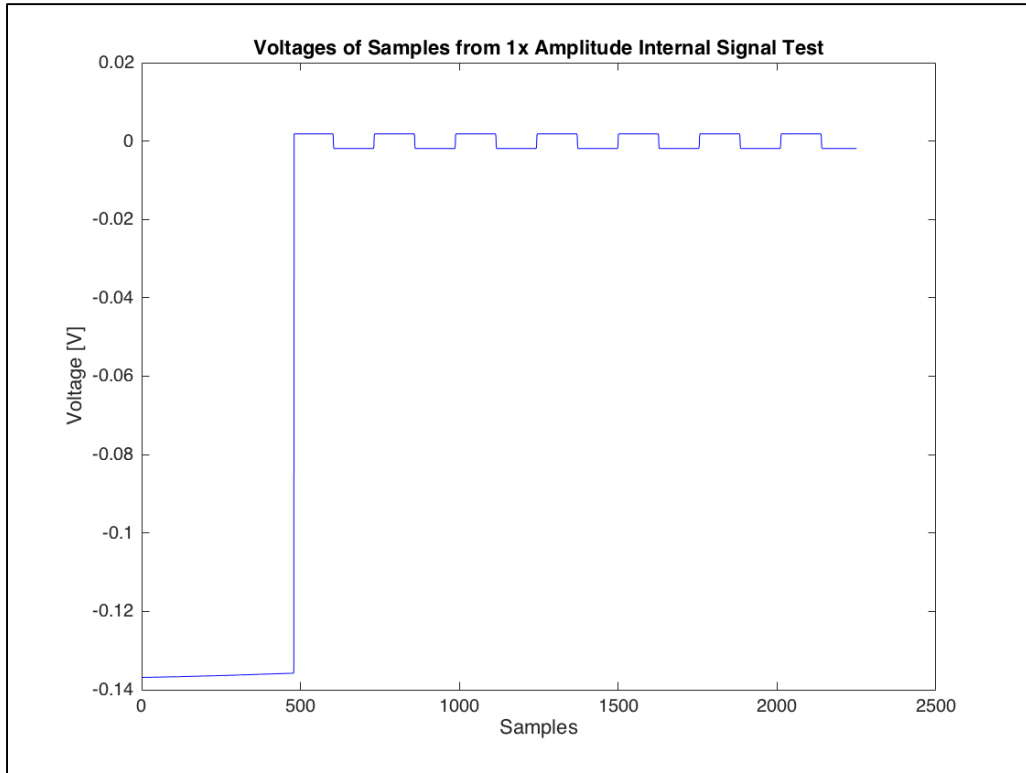


Figure 1 - Complete 1x Slow Pulse Results

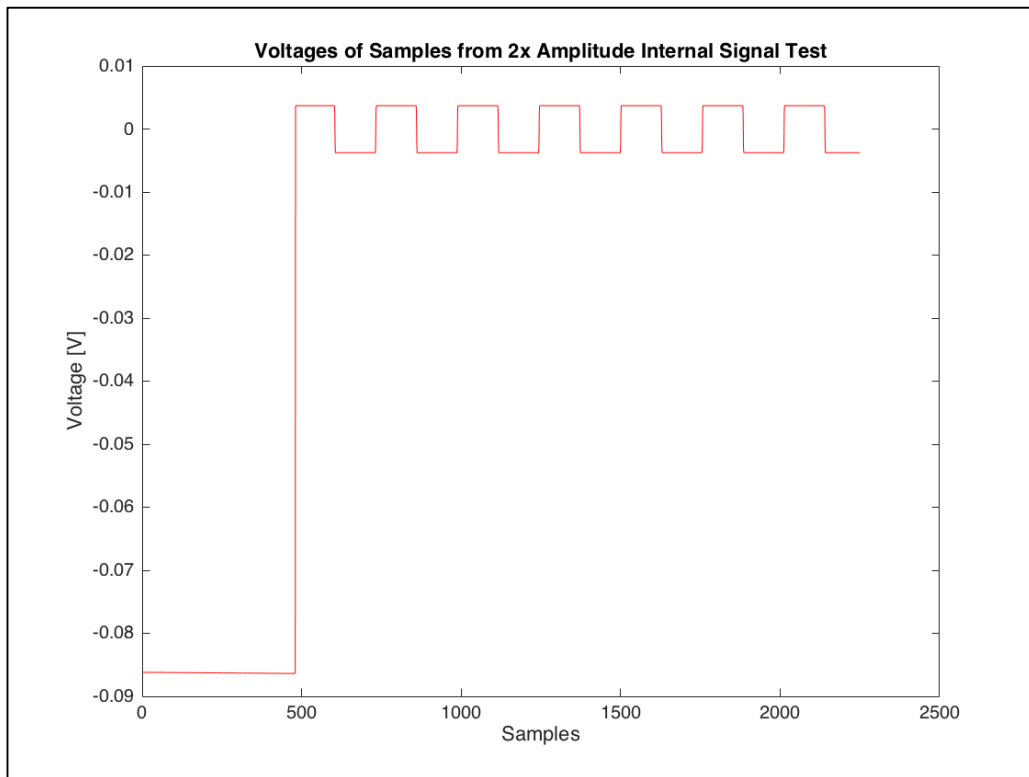


Figure 2 - Complete 2x Slow Pulse Results

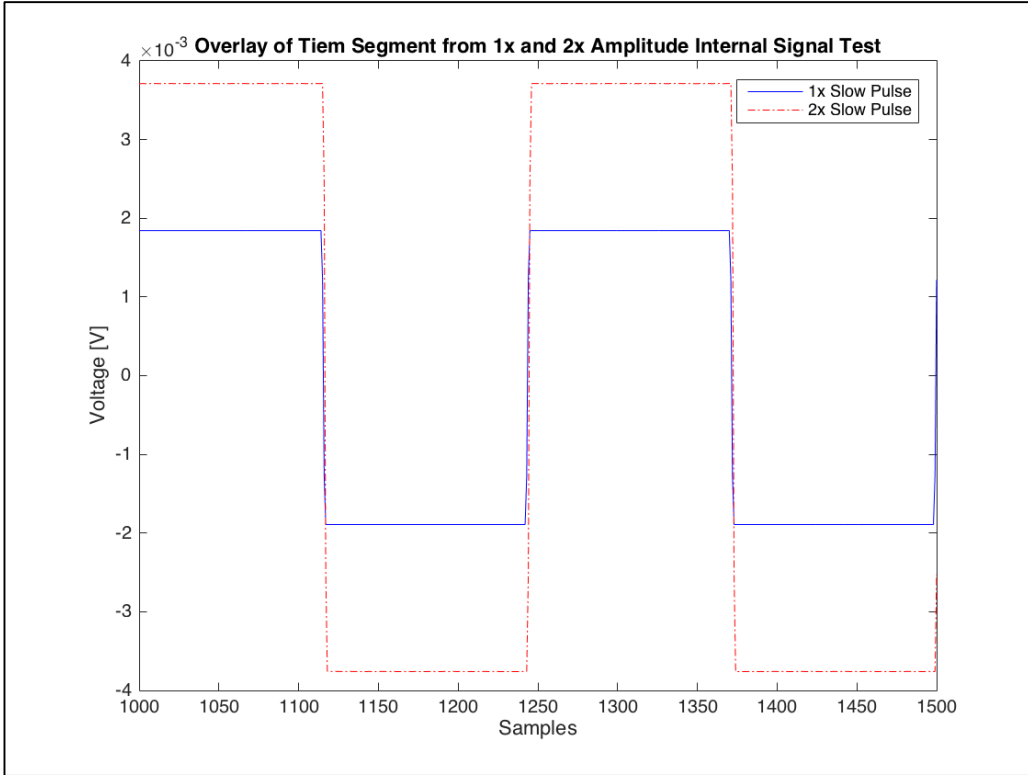


Figure 3 – Graph visually showing the 2x signal is twice the amplitude as 1x signal

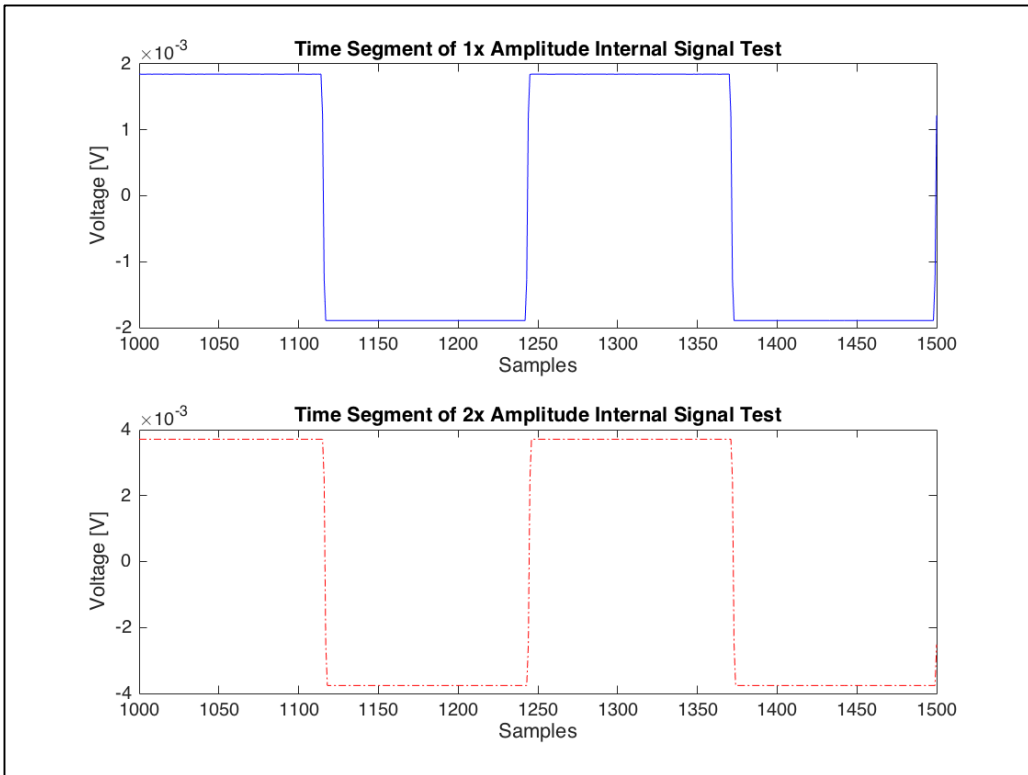


Figure 4 – 2 second time segment of both 1x and 2x signals

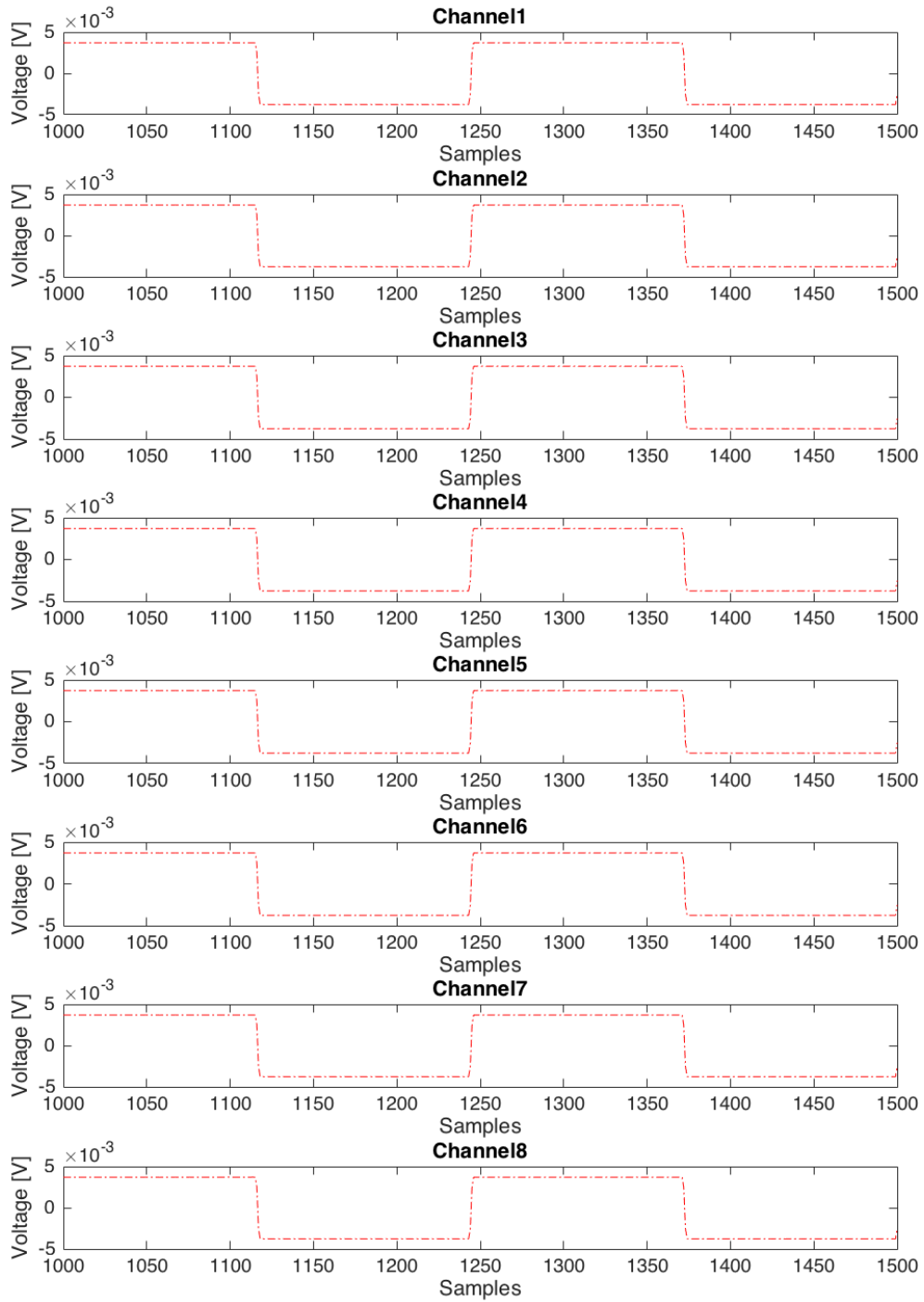


Figure 5 – All 8 channels reporting the same signal