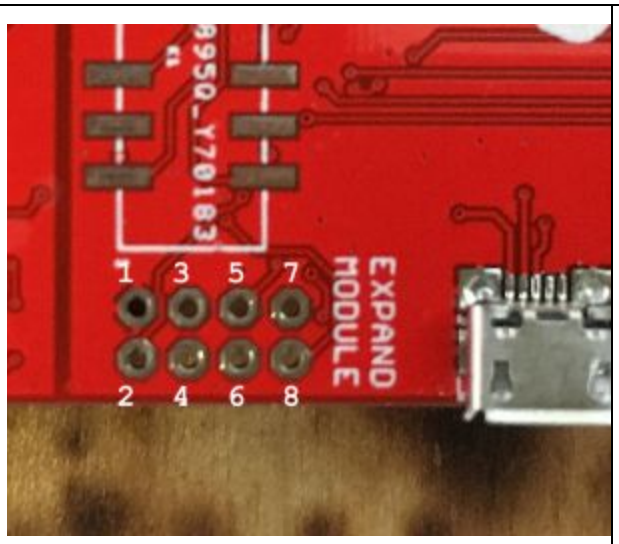
SpikerBox Pro Hardware SDK

Introduction

This document describes the hardware I/O interface to the Backyard Brains Muscle and Neuron SpikerBox Pro v1.0. Both SpikerBox Pros have the ability to accept external event signals, external analog signals, and provide the recorded signal as an analog output.

Pinout

The SpikerBox Pros expose 8 expansions pins:



Pin 1: Ground
Pin 2: I/O (configurable)
Pin 3: I/O (configurable)
Pin 4: I/O (configurable)
Pin 5: I/O (configurable)
Pin 6: I/O (configurable)
Pin 7: Mode Select Encoder (I)
Pin 8: Vcc (3.3V)

Mode Selection

In order to provide multiple uses for the limited number of I/O pins, an I/O Mode schema has been developed to allow the pins to take on various roles. A description of these modes are described in Table 1 below:

MODE	**Mode Select Voltage (Pin 7)**	**Description**
MODE 0	0 - 0.5V	5x digital inputs
MODE 1	0.5 - 1V	2x analog inputs
MODE 2	1 - 1.5V	Raw analog outputs (BNC)
MODE 3	1.5 - 2V	Reserved
MODE 4	2 - 2.5V	Reserved

MODE 5	2.5 - 3V	Reserved
MODE 6	3 - 3.3V	Reserved

Table 1: List of SpikerBox Pro v1.0 Modes

In order to select mode of operation user needs to apply voltage on Mode Selection Pin (pin 7) according to second column in Table 1. Since Mode Selection Pin has internal pull-down resistor default state of both SpikerBox Pros is MODE 0.
When SpikerBox Pro detects voltage change on Mode Selection pin it will wait 1.5 seconds for voltage to stabilize and then it will measure voltage and change operation mode accordingly.

(Note: convenient way of generating voltage on Mode Selection Pin is to wire up appropriate external resistor to Vcc pin 8 that will make voltage divider with internal 20kOhm pull-down resistor)

Mode 0: 5x Digital Event Markers (Default)

Mode 0 sets pins 2,3,4,5,6 to a digital input mode. Using pins 2-6, the user can generate events via the SpikerBox Pro that will be sent via USB interface to software on host computer. This allows for external events (mechanical switches, Each time SpikerBox Pro observe rising edge of input signal (logic level high must be 3.3V for at least 200ms), an event will appear on the SpikeRecorder Software.

There are unique event numbers associated with each pin and are assigned as follows:

Hardware Pin	Software Representation
Pin 6	Event 1
Pin 5	Event 2
Pin 4	Event 3
Pin 3	Event 4
Pin 2	Event 5

Table 2:Mapping of hardware pin to software events in Mode 1

Developer information:

We have described the USB Software Interface to the SpikerBox Pro in detail our [?] document. In our software protocol, external events are indicated by the

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EVNT:X;
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Where EVNT is dedicated message identifier and X can be substitute with event number as shown in Table 2.

Mode 1: 2x Analog Inputs

MODE 1 will put pins 2 and 3 into analog input mode. These inputs will have high input impedance and operating voltage range 0 to 3.3V (Vcc). Signal applied to these inputs will be digitized and sent to software on Host computer along with signal from SpikerBox Pros standard inputs.
Pins 4, 5 and 6 will remain in digital input mode and can be used to generate events in a same way as in MODE 0.

Mode 2: Raw analog outputs (BNC)

In this mode SpikerBox Pro will route signals from onboard 2 channels bioamplifier to pins 2 and 3. Rest of configurable pins (4,5 and 6) will remain in digital input mode and can be used to generate events in a same way as in MODE 0.

Rest of modes from Table 1 are reserved for future use.