Boston University
Electrical & Computer Engineering
EC463 Capstone Senior Design Project

First Prototype Testing Plan

EEG-based Brain-Computer Interface

Submitted to:

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by

Team 04
Brain Force

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Required Materials

Hardware:

- Handheld digital multimeter and test probes
- Oscilloscope
- Operational amplifiers
- Resistors / Capacitors
- Power supply
- Conductive paste
- Alligator clips

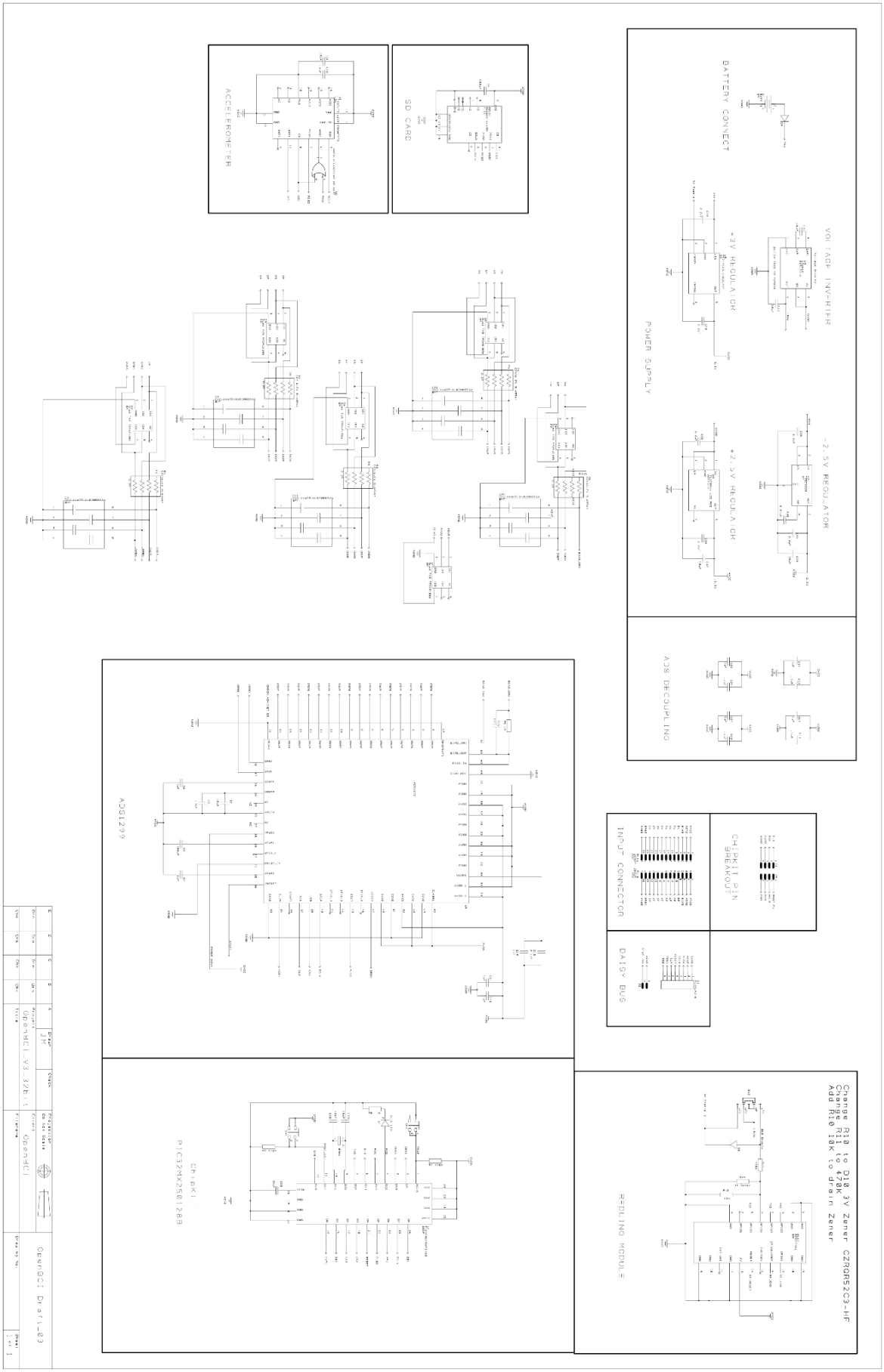
Set Up

The goal of this testing is to ensure that the PCBs we have recently received have adequate connections and to measure an output of a single EEG sensor. In order to test the integrity of the PCB we will be using a handheld digital multimeter to conduct a series of continuity tests across vital components. To test the output of our EEG sensors we will build a simple amplifier circuit with a low pass filter to bring the raw voltage from tens of microvolts to a tens of millivolts range. We will connect the amplified output to an oscilloscope so we can view the sensor output in real time. We have not yet measured an output voltage from an EEG sensor, so any data we can receive will be considered a success. Multiple resistors may be on deck in case our gain is insufficient.

Set Up Procedure

Testing the integrity of the PCB will take essentially zero setup. Just need a multimeter and a few wires to ensure it is working properly. We will also have a schematic of the PCB to ensure we are only testing the connections we are concerned with.
For the second part of our test, the EEG sensor, we will need to design a simple amplifier circuit using an OPAmp with a gain of around 1000x. A low pass filter will be applied using a series of capacitors. We will also need to hook up a power supply to the op amp and an oscilloscope to the voltage output. Before connecting the sensor, we can test the functionality of the circuit by using the power supply as an input and ensuring we get the expected output.

The schematic below shows the design of the PCB. We will be using this to decide where to test.


ACCELEROMETER
SD CARD
POWER SUPPLY
VOLTAGE INVERTER
BATTERY CONNECT
+3V REGULATOR
-2.5V REGULATOR
+2.5V REGULATOR
A3S DECOUPLING
ADS1299
INPUT CONNECTOR
CHIPKIT PIN BREAKOUT
DAISY BUS
PIC32MX250128B
RADIUNO MODULE
Change R18 to D18 3V Zener CZRQR52C3-HF
Change R11 to 470K
Add R10 10K to drain Zener
OpenEEG Draft_03
OpenEEG v3 32bit
JM

Testing Procedure

The testing procedure for the PCB includes:

1. Testing the multimeter on a single wire to ensure the continuity function works correctly.
2. Testing each component listed in the score sheet to ensure it is connected correctly. The result of each test will be recorded in the table below.

Testing the EEG Sensor will be done by:

1. Connect the power supply to the OpAmp, and hook up the oscilloscope to the correct location.
2. Use conductive paste to connect a single EEG sensor to a user's scalp.
3. Connect the opposite end of the electrode wire to the OpAmp input.
4. See if we get an output on the oscilloscope.
5. If so, mark a few data points in an excel sheet and take a picture / video of the oscilloscope screen.
6. If we cannot get a reading, make sure all of the wires and connections are hooked up correctly.
7. If still no reading, try increasing the gain.

Measurable Criteria

- Voltage output of OpAmp circuit
- Continuity of printed circuit board
- Number of working PCB components

Score Sheet

Part Name:	**Status (Y/N):**
