

## ECE496 Weekly Status Report

Team GA-5

2016-02-15

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**Meeting Leader:** Michael Norcia

### Previous Goals and Progress Toward Those Goals

- Mount hexaphonic pickup into guitar and restring it [Shane, Michael] – Completed. The pickup is firmly mounted in the guitar using the original pickup bracket, and each of the wires is routed through the back of the guitar.
- Finalize amplifier circuit design [Shane, Michael] – Completed, but this circuit has not yet been integrated into the design. Still needs to be tested with the guitar.
- Connect motor to guitar head [Duke, Michael] – Shaft couplers have been mounted, but the full motor control subsystem has not been completed. See unresolved problems for the issue with setting the stepper motor driver's current limit.
- Tune motor control for stepper motor [Duke, Michael] – Ryan designed a basic C motor control program capable of turning the stepper clockwise or counter-clockwise. It currently only outputs print statements, but we found and downloaded a C GPIO interfacing library for the Pi. The motor control program will be updated to use this library once the issues with the stepper motor driver have been resolved.
- Design one channel of analog to digital converter for the Tiva [Ryan, Jules] – Found Simulink tutorial on ADCs learned how to use the raw ADC block. In the process of learning how to use the Tiva GPIO.
- Connect the Tiva to GPIO interface of the Raspberry Pi and show frequency plots from the string on the Pi's display [Ryan, Jules] – Not completed. However, we have downloaded an FFT C library for the Raspberry Pi, written a program that generates, transforms, and graphs sine waves with the FFT library, and learned to use the GPIO C library mentioned above. We are waiting on the hardware issues to be resolved before full system integration and the finishing touches to the software can be completed.

### Goals for the Next Week

- Test and integrate amplifier circuit with guitar's hexaphonic pickup output [Michael, Shane].
- Set current limit on stepper driver [Duke, Michael].
- Integrate Stepper Motor circuit with Raspberry Pi [Duke, Ryan].
- Design and test Tiva ADC. Use external power supply for testing [Jules].
- Integrate all existing hardware to form a complete circuit for one string [All team members].
- Put the finishing touches on the Raspberry Pi C code to allow frequency read-ins [Ryan].
- Update the motor control C code to actually move the stepper motor [Ryan].

### Unresolved Problems

- We are struggling to get consistent behavior from the voltage potentiometer that controls  $V_{REF}$  (and therefore controls the current limit) inside of our stepper motor driver ([DRV8834](#)). We set the motor up following the circuit in Figure 1, which was attained from the official product's website. We also followed an instructional video on the site, but the voltage on the potentiometer seems to jump from 0-3 millivolts and 1.0-1.6 volts in a random fashion. We have tried using another chip, double checking the capacitor's capacitance, and re-wiring the circuit – all chips give the same behavior. We know from the website that we need  $V_{REF} = 1$  volt for each stepper since  $\text{Current Limit (in amps)} = 2 * V_{REF}$  (In volts). The circuit in Figure 1 is vague as to if the two ground connections shown are isolated or not, but we have tried both and neither work (Two grounds in one circuit seems weird, anyway). We are fearful to proceed until the current limit inside the chip is set, since it could blow the motor if incorrect (or worse, the Raspberry Pi). We are out of ideas for proceeding with this, so we have contacted the TAs via email.
- Ryan attempted testing Michael's amplifier circuit with the guitar pickup, but Michael was not present and Ryan was unable to get the circuit working. After supplying the circuit with 4.5 volts on the power bus, soldering wires to the pickup leads to make them more accessible, connecting the pickup to the input of the circuit, and connecting a multi-meter to the output of the circuit, Ryan observed the output of the amplification circuit stayed around 0.6 volts and did not react to the guitar string being strung like the pickup does. Ryan will repeat these tests with Michael and Shane as soon as possible.

### Questions

In attempting to set up the stepper motor driver chip ([DRV8834](#)), we found out it is rated for 1.5 A per phase. Our stepper motor ([NEMA 17 Bipolar Stepper](#)) itself is rated for 2 A per phase. Do we need to replace one of the models of components?

### Other information

None.

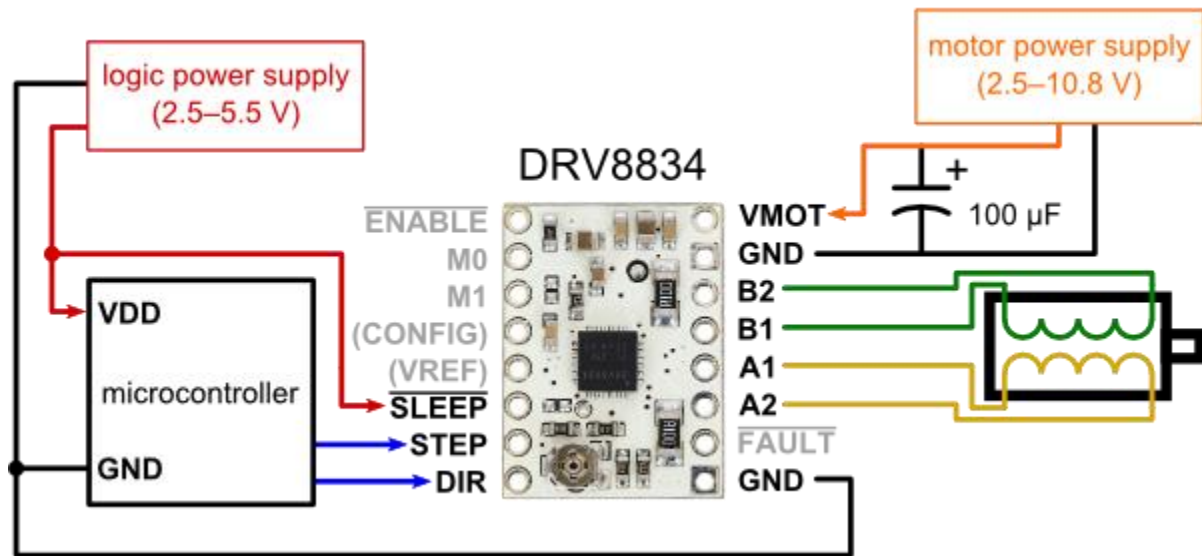


Figure 1. Stepper Motor Circuit.