Name/NetID:	Teammate/NetID:

Module: Getting the Vehicle to Move

Module Outline

In this Module you will build the Magicians chassis and with your new-found skills in using the power supply enable the motors to run. The motors will tolerate a voltage as high as 12V but they drive the vehicle chassis at a fast enough speed using only 5V. After building the chassis some switches with tethers will be available so that you can drive your car around for fun,

Notes:

Procedures

Building the Vehicle's Chassis

The first step is to build the chassis – the plastic platform that holds the motors and the circuitry. Following the instructions provided by SparkFun at https://learn.sparkfun.com/tutorials/assembly-guide-for-redbot-with-shadow-chassis. Because the chassis was designed to the platform for their RedBot the instructions include some parts that you will not need right now. You can look through the whole set of instructions but you will leave out some portions.

- ✓ Make sure you have all of the chassis parts – the black plastic body, the motors with black and red wires to the terminals of the motors already soldered on, the wheels, and wheel encoder kit.
- ✓ Navigate on the website to the first set of instructions labeled - 1. Wheel Encoders (SIK). Assemble the wheel encoders. These will give you the ability to sense the rotational speed of the motors.
- ✓ Navigate to the next page labeled – 2. Wheels and Motors. Attach the wheels and motors to the bottom of the body.
- ✓ Skipping the instructions for loading the line-following sensors (you may need these instructions later) and mechanical bumpers move on to the section labeled – 5. Chassis.

For now this is all you will need.

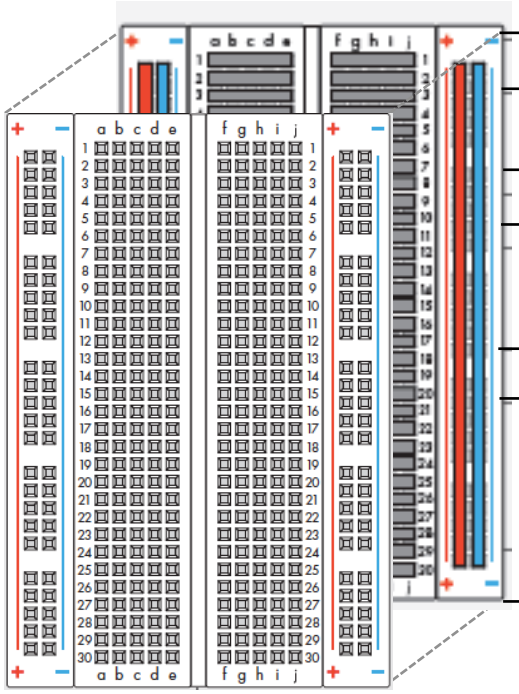
Notes:

Powering the Motors

The motors will start spinning when a high enough voltage is applied across the terminals. You will investigate this behavior in depth in a subsequent lab. For now let's just use the power supply to run the motors and see how fast the car moves when connected to just the battery.

- ✓ Place the protoboard on top of the chassis. You can attach with a bit of velcro which can be removed easily

A protoboard? This is the white board with lots of holes in it. This board helps with building prototypes – the first version of a design. The holes are connected in a useful way as shown in the diagram below**. CHALLENGE: Using the DMM in the mode to measure resistance figure out for yourself how the protoboard is connected.**



Power (positive voltage rail) +

The + "rail" makes the positive battery terminal available along this vertical column.

Ground (negative voltage rail) –

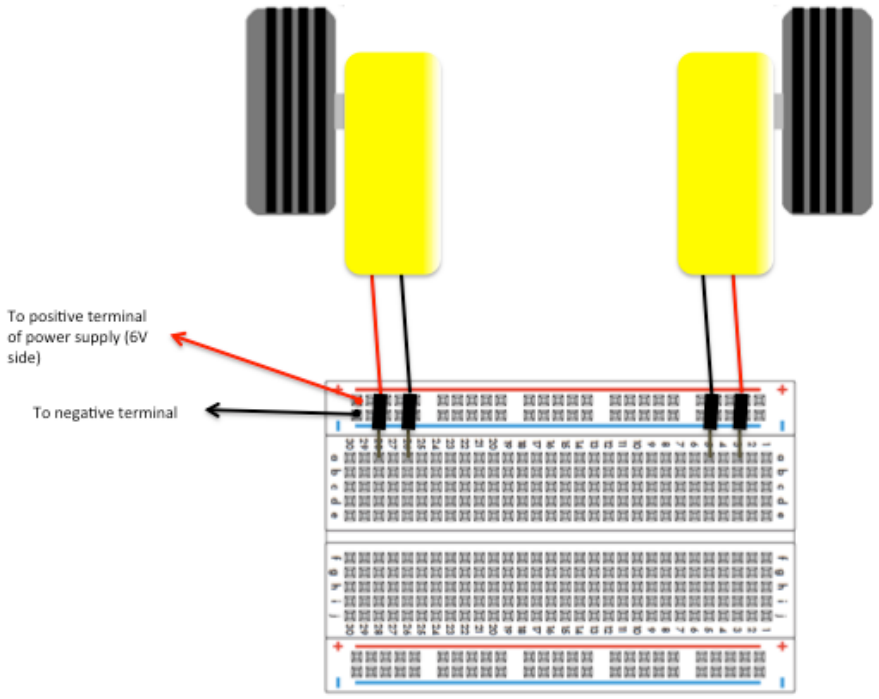
The - "rail" makes the positive battery terminal available along this vertical column.

Horizontal lines

Each of the rows numbered 1-30 have two sets of 5 holes (abcde and fghij) running horizontally separated by a trench down the center of the board. In each row, abcde are connected and fghij are connected, but there is no connection across the trench.

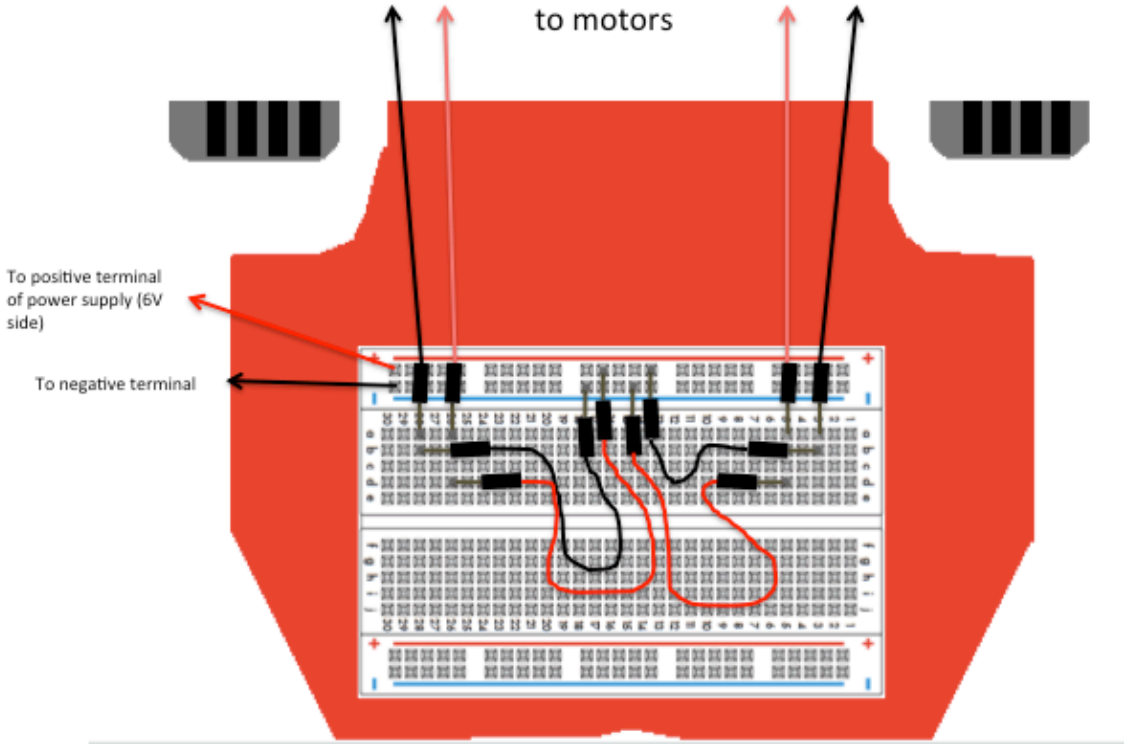
Notes:

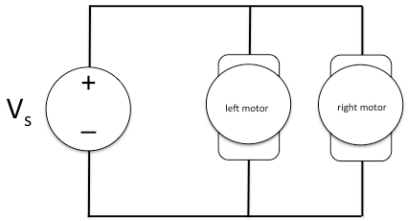
- ✓ Insert the motor leads to the protoboard so they can be accessed individually – see figure below
- ✓ Set the power supply to 5V and set the Output Off
- ✓ For this part get two of the wooden blocks and use them as a stand so that the wheels are not touching the ground.



Notes:

- ✓ Connect the positive terminals of one motor using a jumper cable and do the same to the negative terminal. Switch power supply on. The motor should be rotating. Below is a physical diagram of the connections (for both motors – for now just connect one side) including the jumper wires and the equivalent schematic shown in the sidebar to the right.





Question 1: Vary the voltage starting at 0V to about 5V or more. Write your observations. They should include things like i) qualitatively, how the voltage is related to the speed of the motor, ii) at what voltage does the motor start turning, iii) when the motor is not turning is current being drawn from the supply… Motors have complex and interesting behavior write what you observe.

Notes:

- ✓ Connect both motors to the power supply set to 5V. Very carefully set the car on the table – be prepared to catch it as it moves vey quickly. Just to show you how fast the car moves without any speed control.
- ✓ Get one of the control boards that are just switches you control by hand turning the motors on and off so that you can drive the car around the lab for fun.

Question 2: Was it fun?

Question 3: Play with the controls a bit and find a method to control the speed of each motor so that the car can run continuously but at a slower speed. Describe the method you used.