# Project 5

DC Motor Control

Motor Control Unidirectional

Build the circuit as shown in Experiment 9 using a MOSFET as switch to start/stop the motor operation. First, note the MOSFET pins and see the data sheet (e.g. http://eeshop.unl.edu/pdf/IRF520.pdf). Second note the polarity of the diode; the end with the stripe is the cathode and must be connected to the motor terminal which is connected to the positive DC source. The anode of the diode must be connected to the other motor terminal.
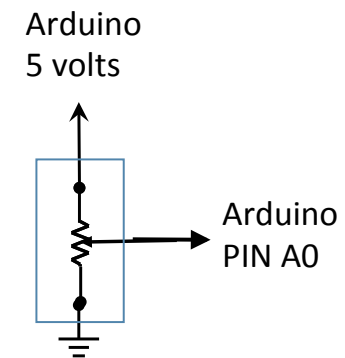
PART A

1) Build the circuit in as shown and run the sketch.
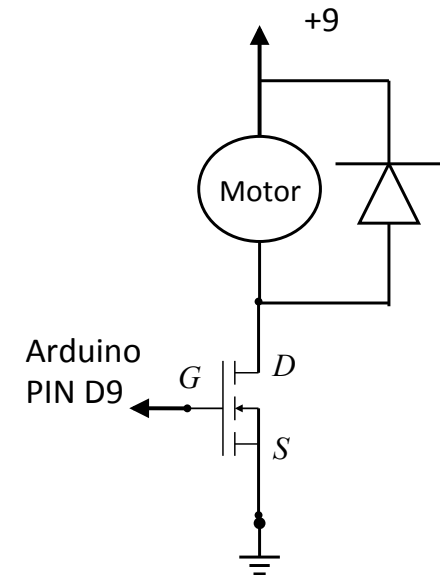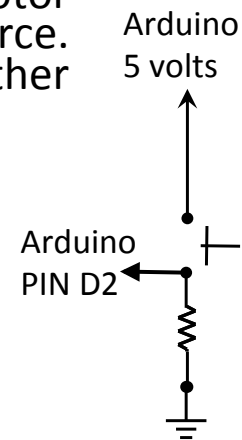
Motor Control Unidirectional

PART B

1) Add a Potentiometer to the circuit and use PWM to control the motor speed. Modify the sketch accordingly.

Arduino
5 volts

Arduino
PIN A0

Motor Control with H-Bridge

PART C

1. Wire the circuit with the H-Bridge as shown in Experiment 10. You can remove the MOSFET and diode.

2. In addition to the H-Bridge, you need a second momentary switch. Connect these switches from 5 volts to a 10k resistor to ground. The 10k resistor the switch terminal should be connect to Arduino pins D5 and D4.

3. Connect the H-Bridge (it's a 16 pin IC : L293DNE) as follows:

   a) Pin 1 to D9: Enable pin which can be used to send PWM to control motor speed.
   b) Pin 2 to D3 and Pin 7 to D2: These are inputs to the H-Bridges and control the direction of rotation.
   c) Pin 3 and Pin 6 to the motor leads
   d) Pins 4 & 5 to ground
   e) Pin 16 to 5 volts
   f) Pin 8 to 9 volts (MAKE SURE THAT THE 9 VOLTS **DOES NOT** CONNECT TO THE ARDUINO BOARD)

How an H-Bridge works
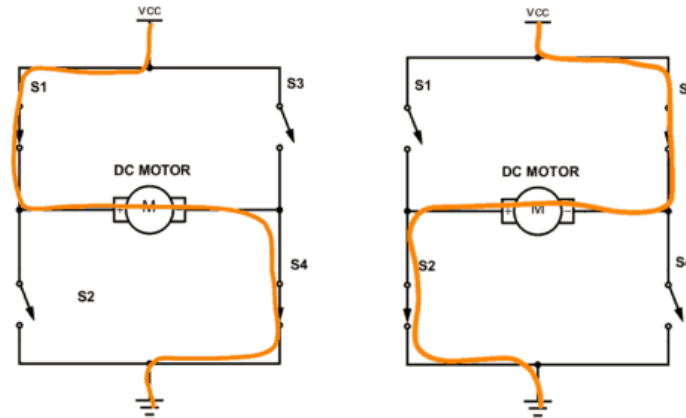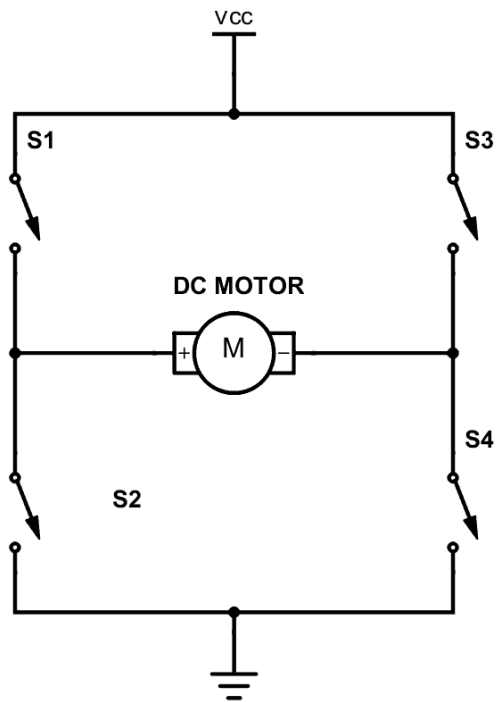
By switching the relays, the motor voltage is reversed and the changes direction of rotation.

https://www.build-electronic-circuits.com/h-bridge/

Motor Control with H-Bridge

4. Use the sketch in Experiment 10 to see how this circuit works.

PART D

1. Try to modify your sketch using a state diagram approach. For example:

State variable of the system

- Motor enabled
- ONOFF Switch
- Dir Switch

State	Motor Enabled	Dir Switch	ON OFF Switch	action
1	0	0	0	do nothing
2	0	0	1	enable Motor
3	0	1	0	do nothing
4	0	1	1	do nothing
5	1	0	0	update speed
6	1	0	1	disable motor
7	1	1	0	Change direction and update speed
8	1	1	1	disable motor