

Interlock Rochester

15 Minute Quick Talks
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Controlling Motors with Arduino

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Pulse-Width Modulation (PWM)

- Computers work with 1's and 0's – On or Off
- We live in an analog world
- Solution: Turn a signal on/off/on/off very fast
- Motors can't respond as fast as the high frequency and can treat this signal as the average value of the line of on/off

Varying the Speed of Brushed Motor

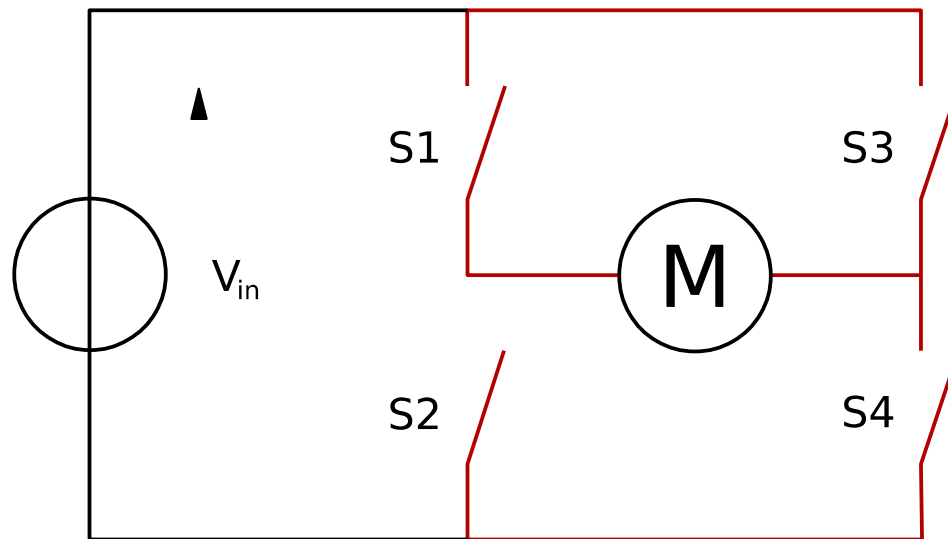
- The simple answer (very simple - motor guys will yell at me for saying this) is change the voltage on the motor.
- For a given load more-voltage → more speed
- To a motor: changing PWM → changing applied voltage

Make the Small 1's and 0's Into Big 1's and 0's

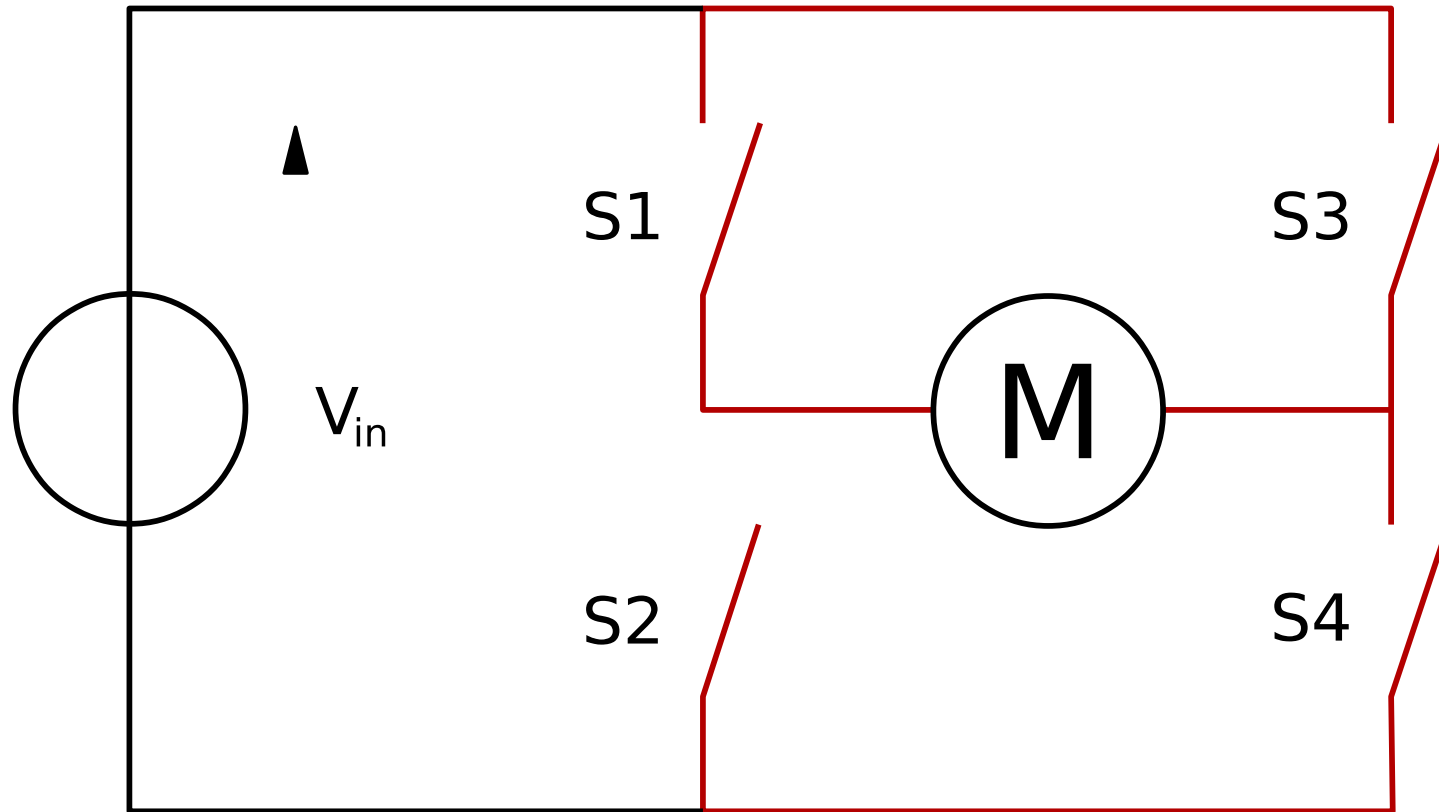
- The GPIO pins on the Arduino (ATmega328) can only drive 40mA abs max (and this is ALOT for a microcontroller).
 - Motors require at a minimum 100's of mA
- The output voltage is 5V
 - 5V is barely enough to drive most motors. These itty-bitty motors should be able to work with 5V
- Solution: Use a motor drive IC → H-Bridge
- The one we'll use is the SN754410

H-Bridge IC's

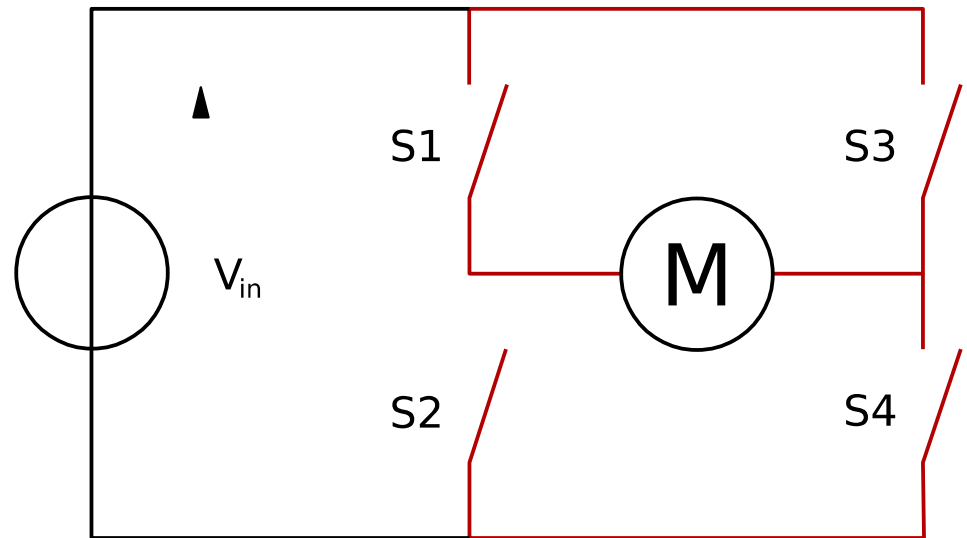
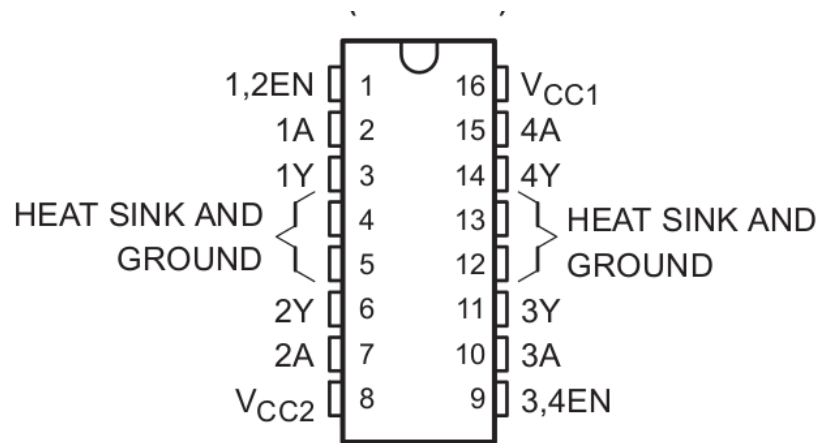
- In very simple terms. An H-Bridge is just switches that can handle the current/voltage the motor requires.



Reversion Motor Direction



Actually Making It Work



#A = Input (from Arduino)

#Y = Output to motor

Useful Arduino Library Functions

- `analogWrite(pin, value)`
 - Pin: the pin to write to
 - Value: the duty cycle: between [0,255] (8-bit)
- `digitalWrite(pin, value)`
 - Pin: the pin to write to
 - Value: HIGH or LOW
- `pinMode(pin, mode)`
 - Pin: the number of the pin whose mode you wish to set
 - Mode: INPUT or OUTPUT

Tips and Tricks

- `AnalogWrite()` can only be used on pins marked with “PWM” on the silk of the Arduino
- Make sure you enable the motor drive IC
- Make sure you power the motor drive IC

Connection Check-list

- Power (5V) connected to IC
 - VCC1 = Logic Voltage
 - VCC2 = Power Voltage
- GND connected to IC
- PWM 1+2 Connected to IC
- Both Motor phases connected to IC
- Half-bridge Enable signal tied high