

Goal – By the end of this lesson the student will be able to spin a motor at different speeds both forward and in reverse under the control of an Arduino. Using an add-on Motor Shield.

What is a Shield? – In our last unit we built our circuits by using the proto-board. Which for us was conveniently mounted next to the Arduino. A shield is a thing that stacks on top of the Arduino board that “carries up” all the Arduino pins. It allows pre-build additional hardware to be added the Arduino as a unit. There are LOTS of shields for Arduinos. Wi-fi (turn your Arduino into a web server), GPS(where are you in the world?), Motor Control. Drone Controllers, Neo Pixel (Lots of LEDS). Servo controller, Home automation, just to name a few.

For this project you will be using a Motor shield to control up to four DC motors. Now you may be thinking, but we controlled a motor with just the proto board. Yes. But now we can make it go backwards and more importantly, we can use a much bigger motor than the Arduino could ordinarily power by itself.

Which Shield do you have? – We have two brands of motor shields. One from Adafruit and another from seed studio. The seed has the big aluminum heat sink on it. Doesn't matter which one but you might need different software depending on which one you got. For our class you will be installing both libraries because they each expose you to two different ways to add libraries to the Arduino Integrated development environment.

Step One – Attach the shield, please be VERY careful with this step. Unlike our last unit we do not have spare shields. If you break it you bought it. ALL the pins need to be lined up perfectly before pressing it on. Once it is on you will not have to remove it. If you are uncomfortable with this step Mr. McCluskey will help you.

Step Two – Install the Adafruit Shield Software into the Arduino Integrated Development Environment (IDE). Open the IDE. Select the “**sketch**” Menu item at the top. Then “**Include Library**”, then “**Manage Libraries...**”. Then in the **filter your search** box enter “**Motor shield v2**”. Find the one that says “**Adafruit Motor Shield V2 Library by Adafruit**”. Press the Install Button. Now if you go to examples you should have the library under your examples. Which will add motor specific commands to your version of the “C” programming language.

Step Three – go to MrMcCluskey.com, click on Makerspace then click on “Seed motor Shield V2 Software for Arduino”. Then click the green button labeled “Clone or download”. Choose Download zip. This will download the library into your downloads folder.

Next, start finder (the blue/white face thing) and select “Documents”. There should be a folder labeled Arduino and under it one called libraries. Open the libraries folder. Copy the SeedMotorShieldV2-Master from your downloads into the libraries folder. Rename the folder to cut of the “-master”. Start or Restart the Arduino Integrated Development Environment (IDE). The “SeedMotorShieldV2” Library should now show up under custom libraries.

Step Four – Show Mr. McCluskey that you have both libraries installed in you IDE for credit.

Step Five – Once you can show Mr. McCluskey that you have the library installed. He will give you a pigtail for your motor, and a different pig tail to connect he Arduino to your battery.

Step Six – Attach the motor pig tail to the motor. Find one of your motors. CAREFULLY slide the connector with the RED WIRE to the motor connection next to the “A” of “Actobotics”, and Black wire next to the “c”.

Step Five – Attach the Battery Connector to the Shield -- DO NOT CONNECT THE BATTERY CONNECTOR TO THE BATTERY until the other end is connected to the shield. Connecting it before both end are connected will most likely cause the battery to short out and fry the fuse.

Step Six – Attach the Motor to the shield. Use the small screw driver. For the seed connect it to Out one and Out Two. Polarity doesn’t really matter at this point. Reversing the polarity will simply reverse the motor.

Step Seven – Attach Shield power connector to the battery. It only goes together one way. To disconnect it, you need to wiggle it while holding the “ lock” open, at least at first then pull on both the connectors and the wires.

Step Eight – Run Motor Test – if you have the adafruit shield this software is under “File | Examples | Adafruit Motorshield V2 | DC Motor Test” . If you have the Seed shield you need to google “SEED motorshield V2 DC Motor” the software is under the link. Cut and paste it into a blank Arduino sketch.

Step Nine – Show Mr. McCluskey your running motor for credit.