

## Lesson 1 How to Read the Data of the Potentiometer

In this lesson, we will learn how to read the data of the potentiometer and convert the data into an angle.

### 1.1 Components used in this course

Components	Quantity	Picture
Aadept Arm Drive Board	1	
Micro USB Cable	1	

### 1.2 Introduction of Potentiometer

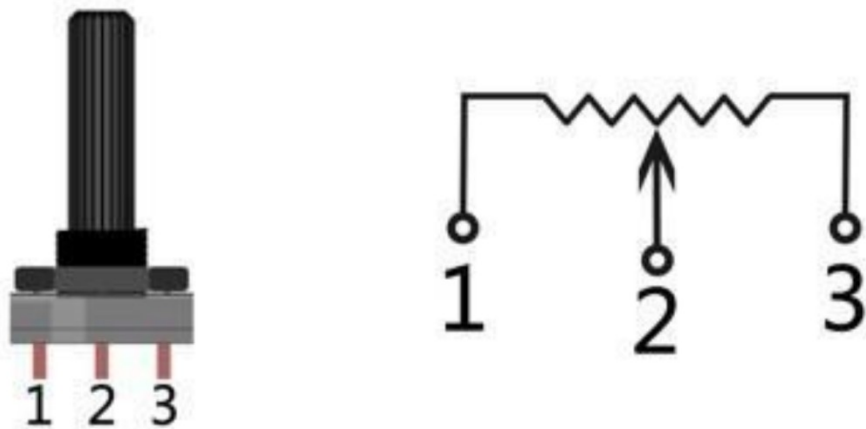
#### (1) Potentiometer

The potentiometer is a resistance element with three terminals and the resistance value can be adjusted according to a certain change law, which is equivalent to a variable resistor. Because its role in the circuit is to obtain a certain relationship with the input voltage (external voltage) to output Voltage, so called potentiometer. Potentiometers can be divided into rotary potentiometers, push-pull potentiometers, straight slide potentiometers, etc. according to the adjustment method. Our course experiment uses a rotary potentiometer. Its three pins are showed as below:

The rotary potentiometer is an adjustable resistance element. It is composed of a resistor and a rotating system. When a voltage is applied between the two fixed contacts of the resistive body, the position of the contact on the resistive body is changed by the rotating system, and a voltage that has a certain relationship with the

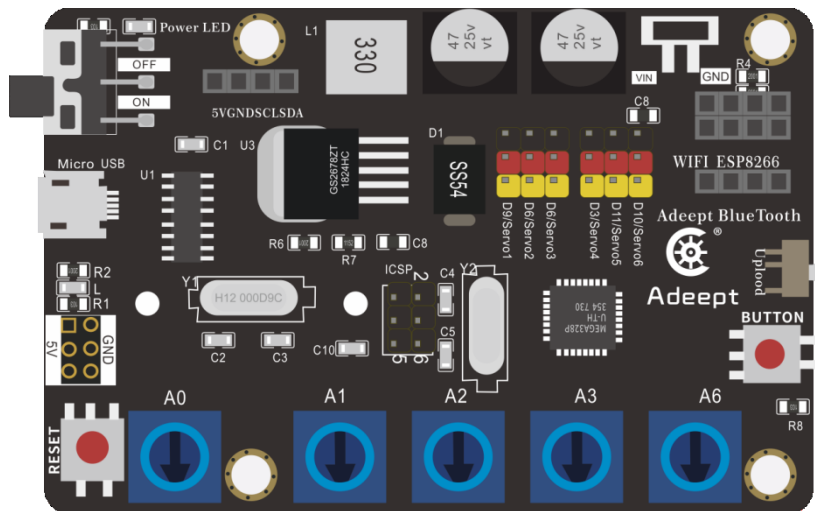
position of the moving contact can be achieved between the moving contact and the fixed contact. Potentiometer can be used to adjust the voltage and current.

Our course uses a rotary potentiometer. Its structure is as shown in the figure below. By rotating the knob, the position of pin 2 is changed, thereby changing the resistance value from pin 2 to both ends. In the experiment. Connect pin 1 and pin 3 to the GND and 5V of the development board respectively. And then read the voltage divided by the pin 2 of the potentiometer through the analog input pin A0. The range is between 0V and 5V. The analog input function of Arduino has 10-bit precision, that is, it can convert the voltage signal of 0 to 5V into an integer form of 0 to 1024.



### 1.3 Wiring diagram (Circuit diagram)

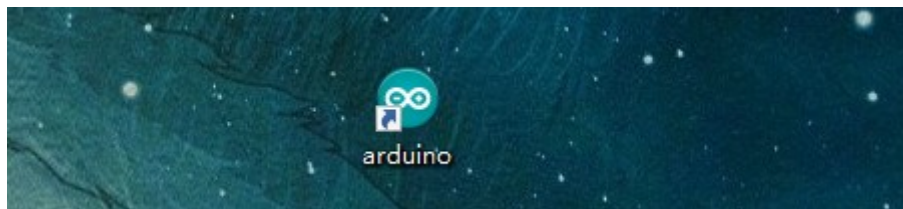
Figure as below:



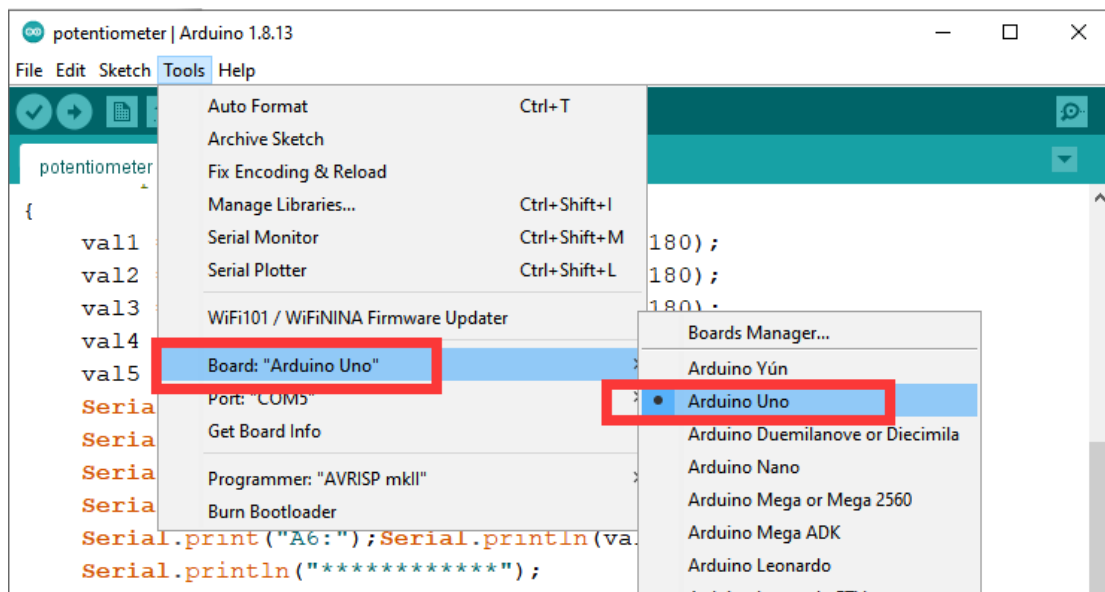
## 1.4 Reading the value of the potentiometer and converting it into an angle

### 1.4.1 Compile and run the code program of this course

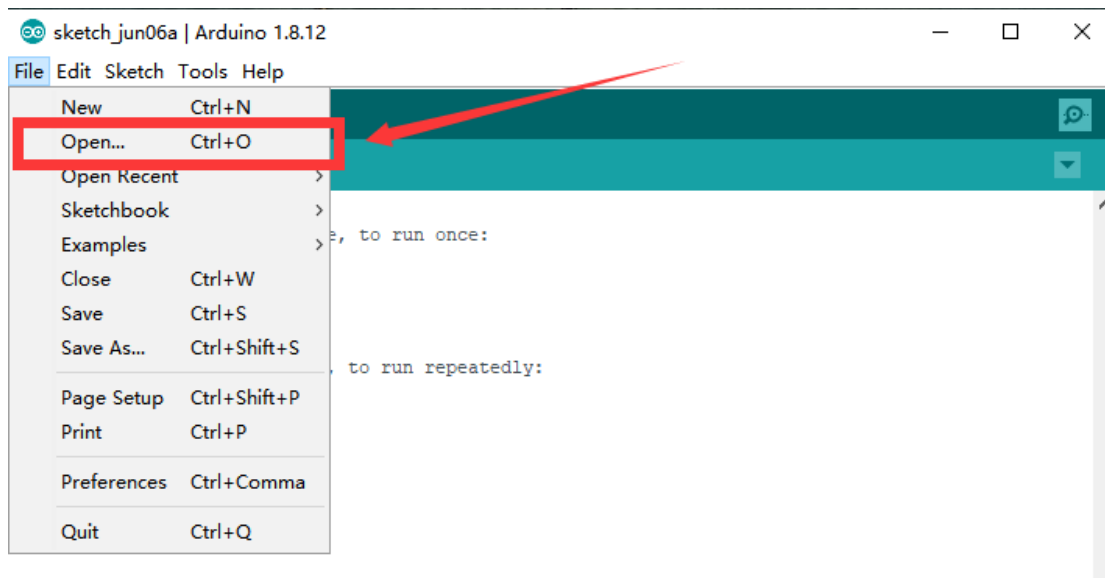
1. Open the Arduino IDE software, as shown below:



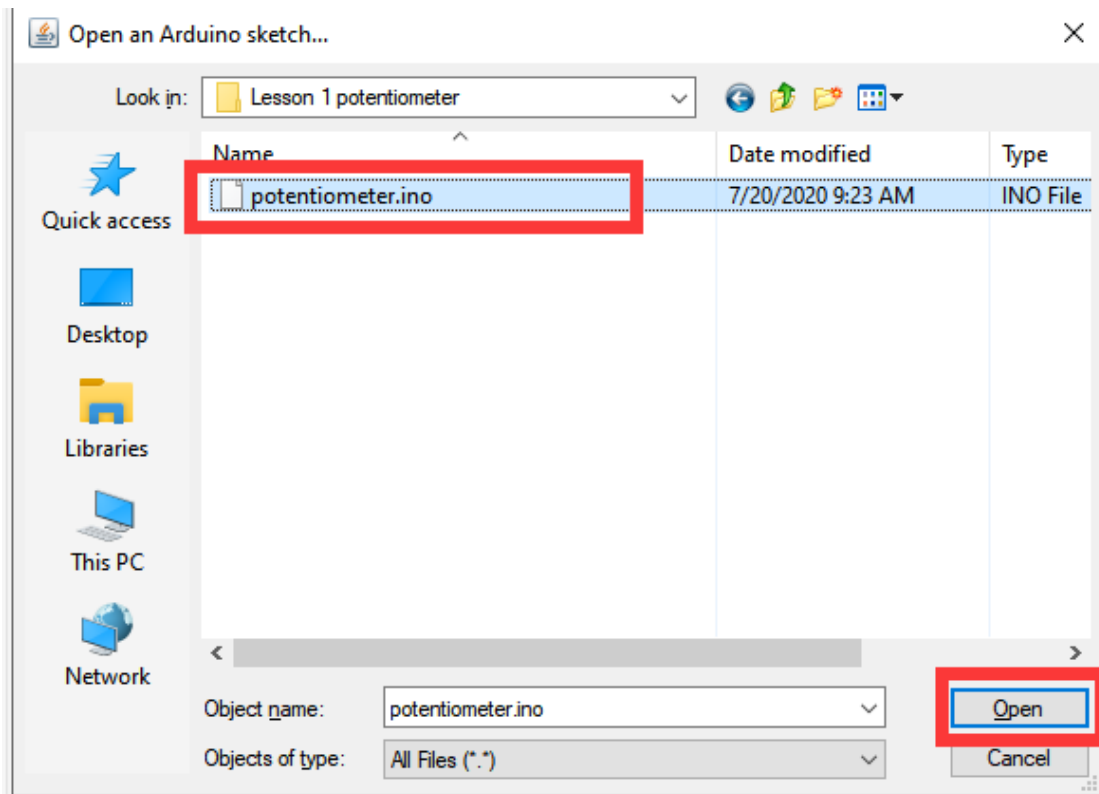
2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:




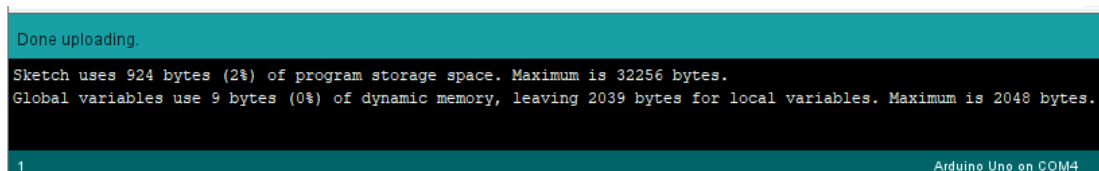
3. Click Open in the File drop-down menu:




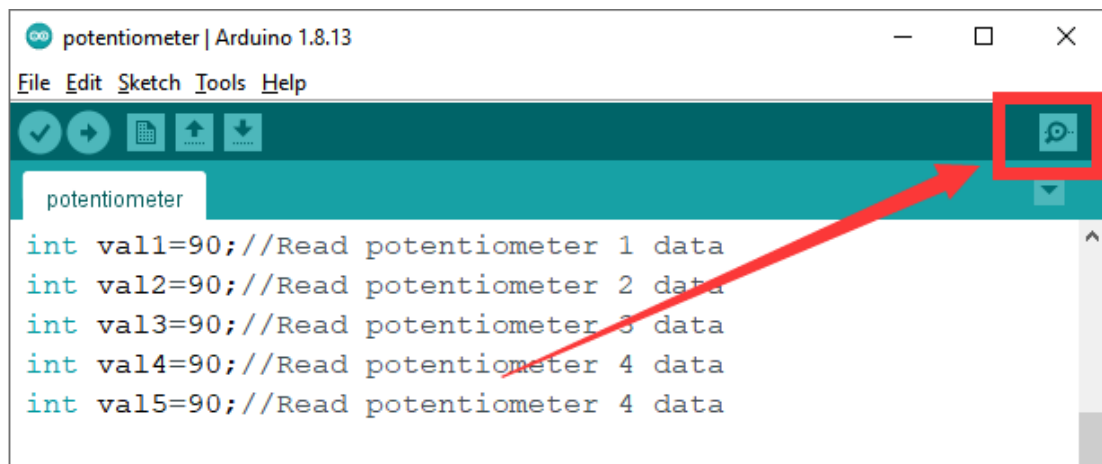
4. Find the folder AdeeptRoboticArmforArduinoV3\_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 1 potentiometer directory. Select potentiometer.ino. This file is the code program we need in this course. Then click Open.



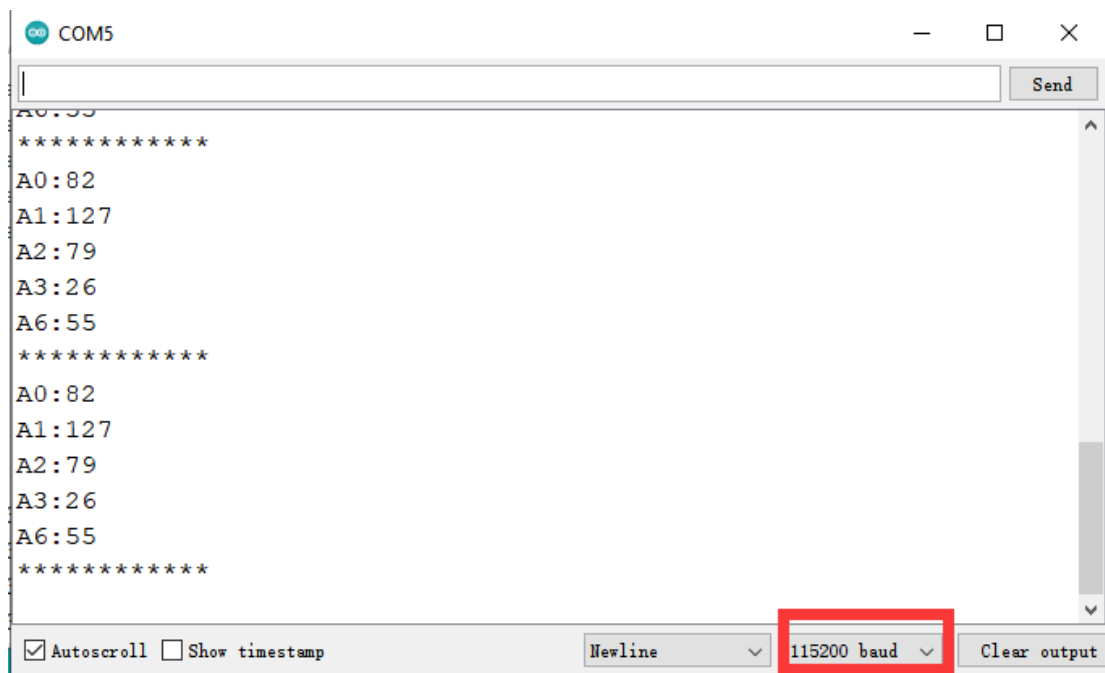
5. After opening, click  to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.



6. After successfully running the program, we need to observe the value of the potentiometer by opening the serial monitor and click , as shown in the figure below:



Then open the serial monitor, you need to modify the displayed bit rate and the bit rate set in the code to 115200, so that the display will not appear garbled. You can observe the data changes corresponding to each button by rotating the buttons of A0, A1, A2, A3, and A6. When the buttons of A0, A1, A2, and A3 are rotated, the data change range is from 0 to 180. The data becomes smaller when rotating clockwise, and the data becomes larger when rotating counterclockwise. When the A6 button is rotated, the data change range is 35~90. When it is rotated clockwise, the data becomes smaller, and when it is rotated counterclockwise, the data becomes larger.



## 1.4.2 Learning the code program of this lesson

Initialize potentiometers A0, A1, A2, A3, A6.

```
int val1=90;//Read potentiometer 0 data
int val2=90;//Read potentiometer 1 data
int val3=90;//Read potentiometer 2 data
int val4=90;//Read potentiometer 3 data
int val5=90;//Read potentiometer 6 data
```

Initialize the serial monitor.

```
void setup()
{
  Serial.begin(115200);
}
```

Convert the value of 1023 to 180 proportionally, and then print out the converted data to the serial monitor.

```
void loop()
{
  val1 = map(analogRead(0), 0, 1023, 0, 180);
  val2 = map(analogRead(1), 0, 1023, 0, 180);
  val3 = map(analogRead(2), 0, 1023, 0, 180);
  val4 = map(analogRead(3), 0, 1023, 0, 180);
  val5 = map(analogRead(6), 0, 1023, 35, 90);
  Serial.print("A0:");Serial.println(val1);
  Serial.print("A1:");Serial.println(val2);
  Serial.print("A2:");Serial.println(val3);
  Serial.print("A3:");Serial.println(val4);
  Serial.print("A6:");Serial.println(val5);
  Serial.println("*****");
  delay(2000);
}
```