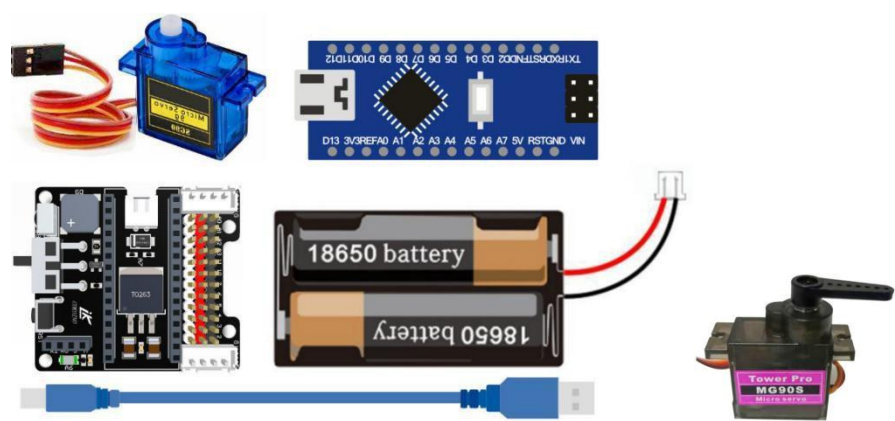# Lesson 5 - Test The Servo

Need to prepare:

- Three SG90 servos, one MG90S servo
- A LK COKOINO Shield
- A LK COKOINO Nano Board
- A USB Cable
- A Battery Case and Two 18650 batteries(Batteries are not included in the kit)

Goal: Test if each servo is working properly and understand how it works

Table of Content

1. Overview:

A Servo is a small device that incorporates a two-wire DC motor, a gear train, a potentiometer, an integrated circuit, and an output shaft. Of the three wires that stick out from the motor casing, one is for power, one is for ground, and one is a control input line. The shaft of the servo can be positioned to specific angular positions by sending a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. If the coded signal changes, then the angular position of the shaft changes.

Servos are constructed from three basic pieces; a motor, a potentiometer (variable resistor) that is connected to the output shaft, and a control board. The potentiometer allows the control circuitry to monitor the current angle of the servo motor. The motor, through a series of gears, turns the output shaft and the potentiometer simultaneously. The potentiometer is fed into the servo control circuit and when the control circuit detects that the position is correct, it stops the motor. If the control circuit detects that the angle is not correct, it will turn the motor the correct direction until the angle is correct. Normally a servo is used to control an angular motion of between 0 and 180 degrees.
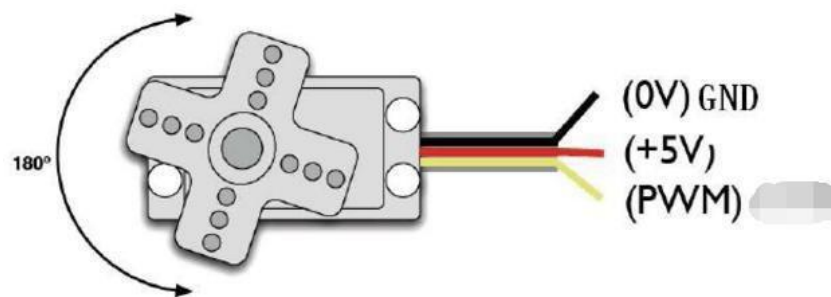
The angle of rotation of the steering gear is achieved by adjusting the duty cycle of the PWM (Pulse Width Modulation) signal. The period of the standard PWM (Pulse Width Modulation) signal is fixed at 20ms (50Hz). Theoretically, the pulse width distribution should be 1ms to Between 2ms.
However, in fact, the pulse width can be between 0.5ms and 2.5ms, and the pulse width corresponds to the rotation angle of the steering gear from 0° to 180°.
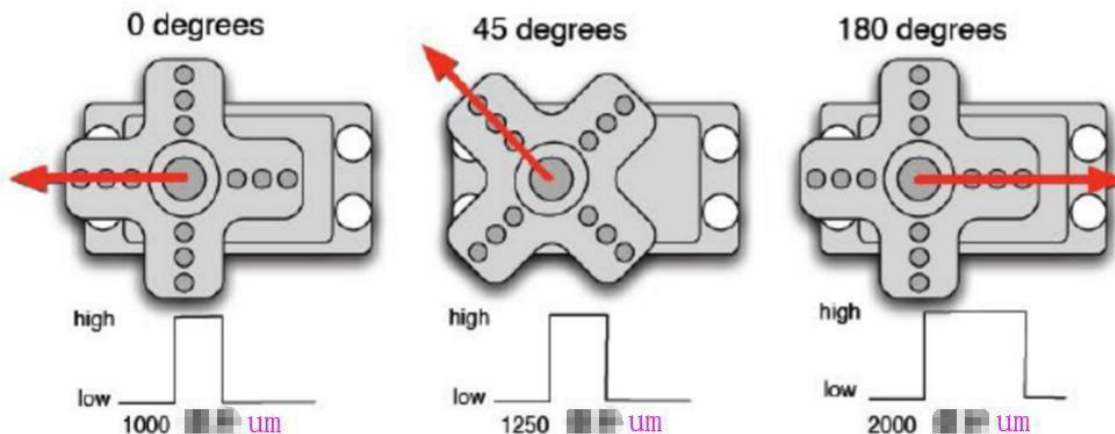
2. The ways to control the servo

For the Arduino, there are two ways to control the servos.
One is that the Arduino's common digital pin generates square waves with different duty cycles to simulate PWM signals for servo positioning.
The second method is to directly control the steering gear by using the Arvoino's own Servo function. The advantage of this control method is programming. The Arduino has limited drive capability, so an external power supply is required when it is necessary to control more than one servo.

Explain the common functions of the Servo.h library file:
1, attach (interface) - set the interface of the servo.
2, write (angle) - set the steering angle of the servo, the range of angles that can be set is 0 ° to 180 ° . 3, read () - read the steering angle, can be understood as reading the value of the last write () command.
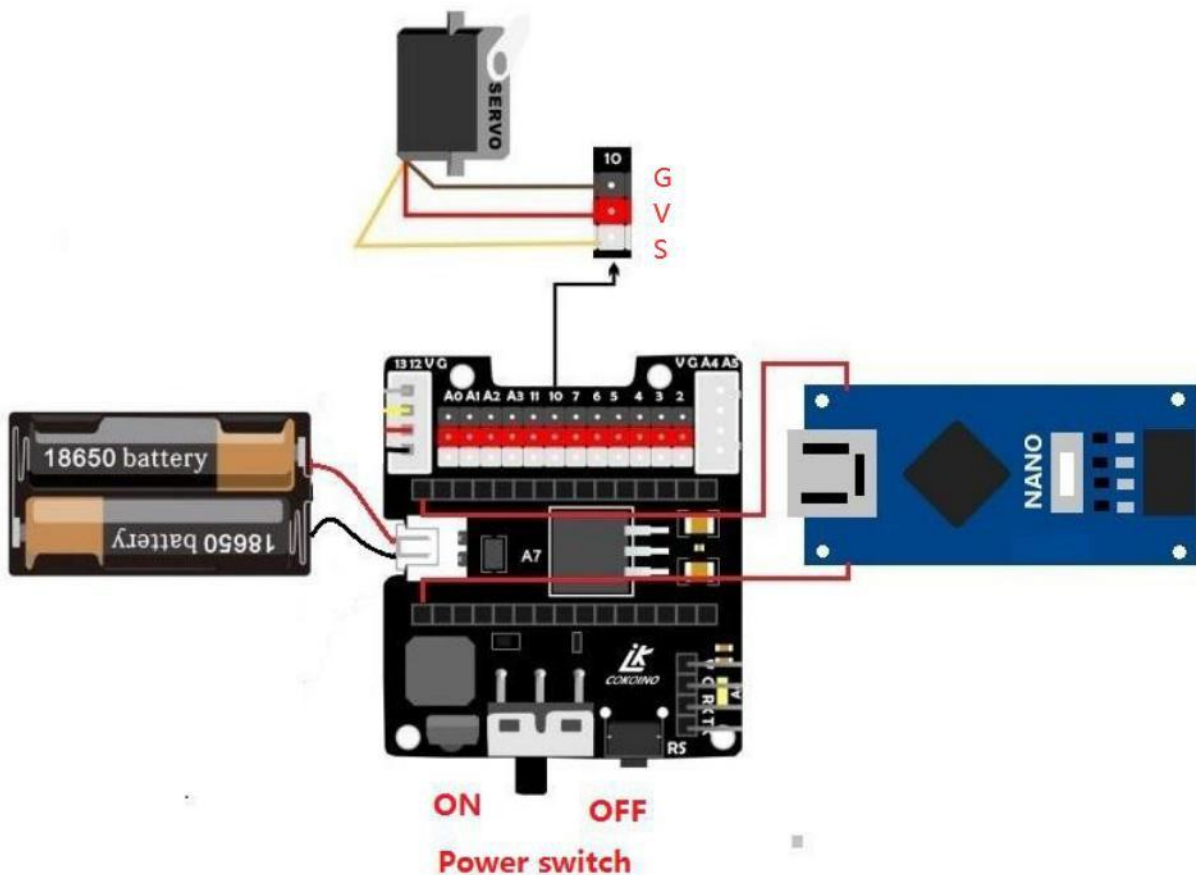4. attached() - Determines whether the servo parameters have been sent to the interface where the servo is located. 5, detach () - the servo is separated from the interface, the interface (9 or 10) can continue to be used as a PWM interface.
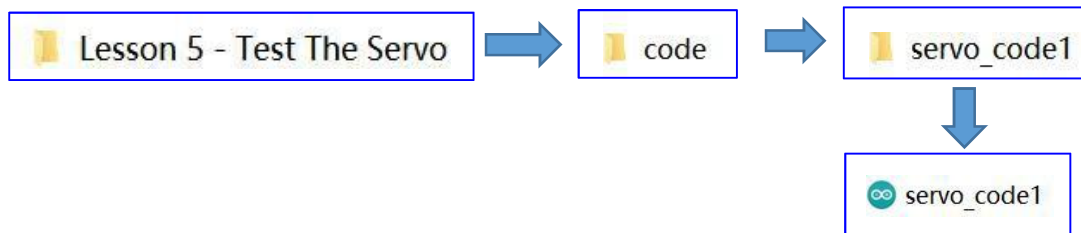
2.1 Wiring diagram

NOTE:
Turn on the power switch of the shield
The brown, red and orange wires of the servo are connected as shown below

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2.2 Method one for testing:

Find the "servo_code1" code from the following path, open it with the Arduino IDE and upload it.

connect the PC to the NANO motherboard with a USB cable, select the corresponding board type and port in the IDE, upload the code to the NANO board.
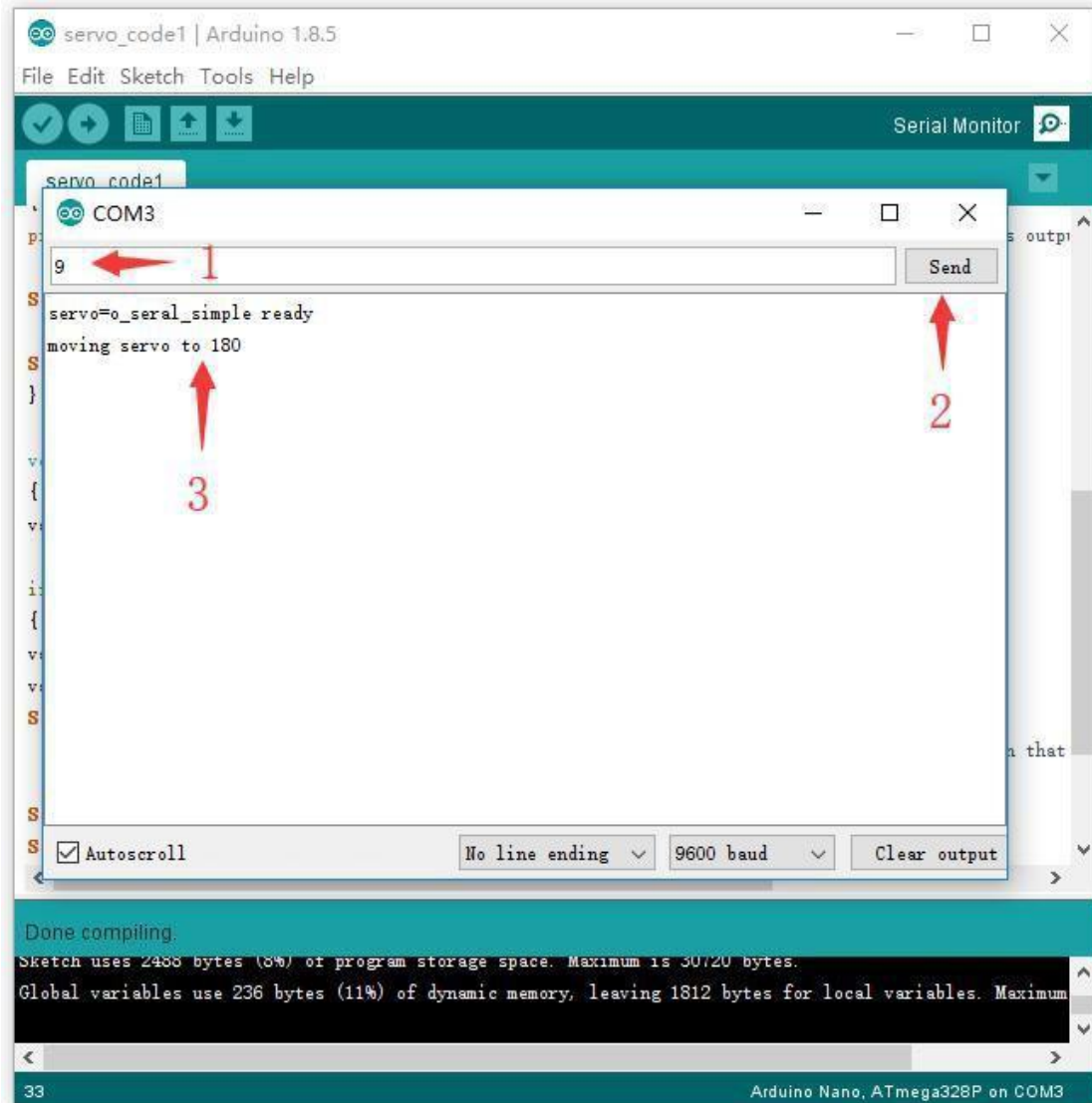
Open the serial monitor and set the baud rate

Input the number 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 in the serial monitor in turn, you will find that the servo rotates 20°, 10°, 60°, 80°, 100°, 120 °, 140°, 160°, 180°

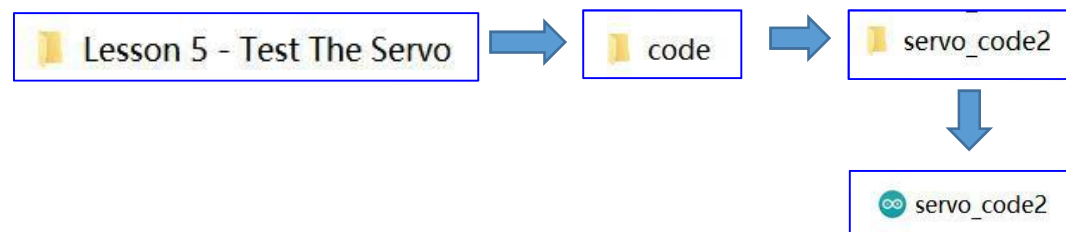For example, if you enter 9, the rudder turns 180 degrees, if you enter 3, the rudder turns 60 degrees

Install the servo arm on the servo to see its angle change more clearly

2.3 Method Two for testing:

Find the "servo_code2" code from the following path, open it with the Arduino IDE.

Upload the code：

Connect the PC to the NANO motherboard with a USB cable, select the corresponding board type and port in the IDE, upload the Code to the NANO board.

Results：

Turn on the power switch on the shield, you can see that the servo starts running from 0 to 180 degrees, and then from 180 degrees to 0 degrees.


3. Manual rotation detection MG90S Servo(Important)

Take a servo panel and install it on the MG90S Servo. Manually rotate the servo panel to check if it rotates smoothly. Due to the plastic gears inside the MG90S Servo, there is a phenomenon of thermal expansion and contraction. Some MG90S Servos rotate normally during power on testing, but when powered off, manual rotation feels significant resistance and cannot rotate. If this situation occurs, please do not continue to manually rotate the servo with increased force to avoid damaging the servo. The solution is as follows:

3.1Invert MG90S Servo with the line facing to the left, as shown in the following figure

3.2 Use an M1.5 Phillips screwdriver to rotate the screw two times counterclockwise
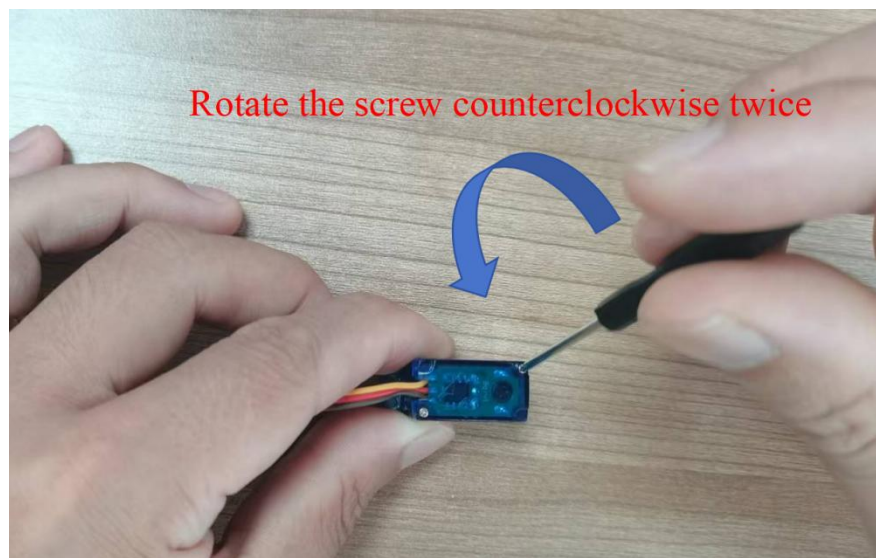
3.3 Rotate the MG90S servo panel manually again to confirm that the servo panel rotates smoothly on the MG90S Servo.If there is still a lot of resistance and difficulty when manually rotating the servo panel, you can continue to use a screwdriver to loosen the screws at the bottom of the servo counterclockwise for the third time.

3.4 You can proceed to the next step. Before assembly, we must first test the servo according to Lesson 3.