

Assembling the Hardware for Testing

This file contains instructions for connecting hardware for testing.

Required Hardware:

1. Arduino Uno board.
2. L298 Motor Driver
3. 2 DC Motors
4. 1 White line sensor
5. Buzzer Module
6. Servo Motor
7. XBee

Arduino Uno Development Board:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced with various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

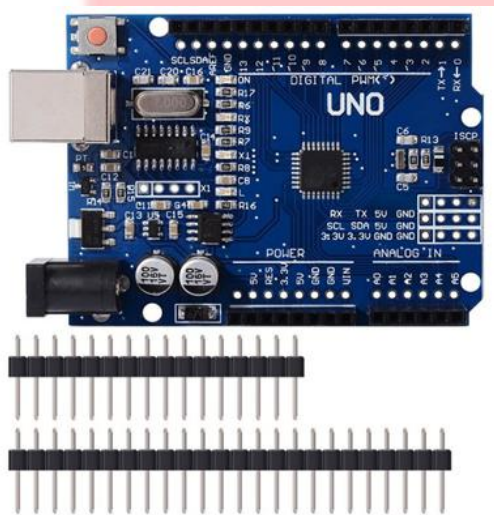


Figure 1: Arduino Uno Development Board

For further details regarding this Development board read the documentation on this [link](#).

L298N Motor Driver:

This motor controller is based on the L298N heavy-duty dual H-bridge controller, which can be used to drive two DC motors at up to 2A each, with a voltage between 5 and 35V DC. The controller has fast short-circuit protection diodes, and a heat sink to keep the motor driver safe.

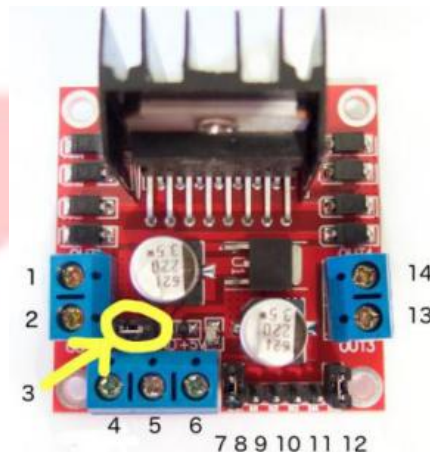


Figure 2: L298N Motor Driver

1. DC motor 1 - Out1 (DC motor wire-1)
2. DC motor 1 - Out2 (DC motor wire-2)
3. 12V jumper – This jumper has to be removed if the supply voltage is greater than 12V DC.
4. Motor supply voltage
5. GND
6. 5V output if 12V jumper is in place
7. DC motor 1 enable jumper. Connect to PWM output for DC motor speed control.
8. IN1 - Direction control pin for motor 1
9. IN2 - Direction control pin for motor 1
10. IN3 - Direction control pin for motor 2
11. IN4 - Direction control pin for motor 2
12. DC motor 2 enable jumper. Connect to PWM output for DC motor speed control.
13. DC motor 2 - Out1 (DC motor wire-1)
14. DC motor 2 - Out2 (DC motor wire-2)

Connection Instructions:

1. Make the following connections between Motor driver and Arduino Uno Development board.

Note: Make sure that the 12V jumper is in place and DC motor enable jumper 1 and 2 marked as 7 and 12 in Figure. 2 are removed.

L298N Motor Driver	Arduino Uno
ENA	Pin 6
IN1	Pin 7
IN2	Pin 8
IN3	Pin 9
IN4	Pin 10
ENB	Pin 11

2. Connect the motors to the following pins on the L298N motor driver.

Motor 1	L298N	Motor 2	L298N
M1	OUT1	M4	OUT4
M2	OUT2	M3	OUT3

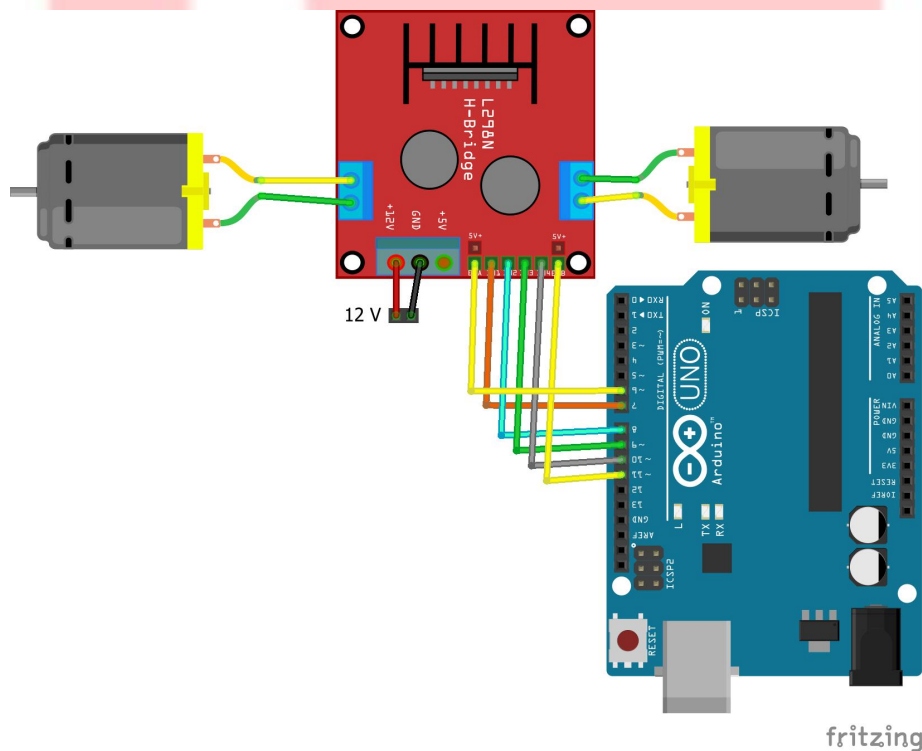


Figure 3: L298N, Motors with Uno

3. Connect the white-line sensor to 3 potentiometers and the following pins on the Arduino Uno development board as depicted in figures 4 and 5 and listed in the table below.

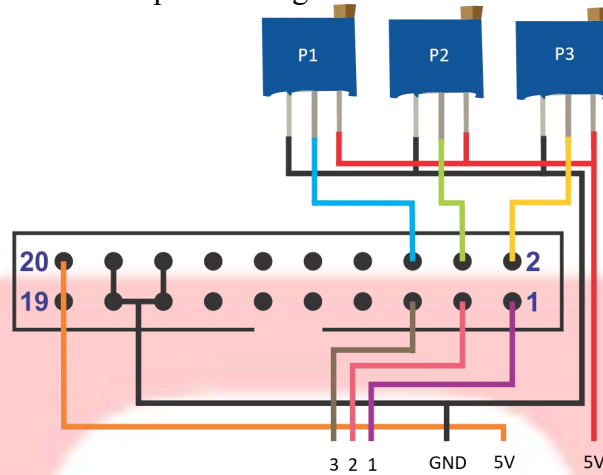


Figure 4: White-Line Sensor and Potentiometer's Connections

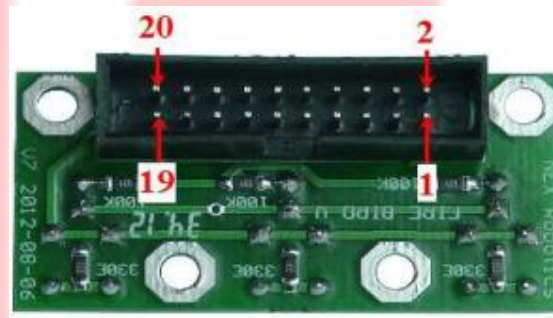


Figure 5: Pin Alignment for White-Line Sensor Module

White Line Sensor	Arduino Uno	Potentiometer
Pin 1	A0	
Pin 2		P1(Middle Terminal)
Pin 3	A1	
Pin 4		P2(Middle Terminal)
Pin 5	A2	
Pin 6		P3(Middle Terminal)
Pin 15, 16, 17 & 18	GND	
Pin 19 & 20	5V	

Note: The first and last terminals of each potentiometer will be connected to a 5V source and ground respectively.

4. Connect servo motors with Arduino Uno Development Board according to the following table.

Servo Motor	Arduino Uno Development Board
PWM (White wire)	Pin 2
Vcc (Red wire)	12V (Power distribution board)
GND (Black wire)	GND

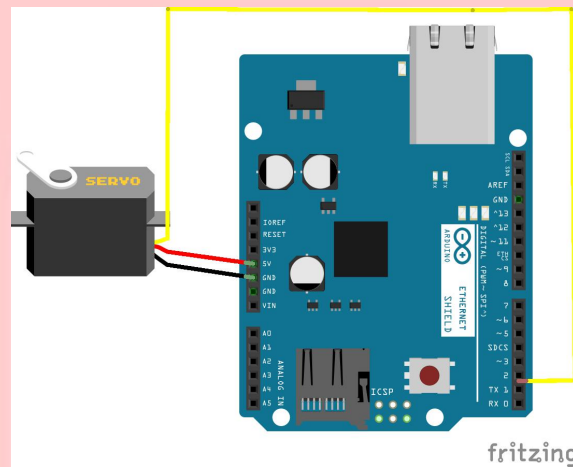


Figure 6: Servo motor connections

5. Connect the buzzer module to the following pins on the Arduino Uno development board.

Buzzer Module	Arduino Uno Development Board
GND	GND
5V	5V
I/O	Pin 3

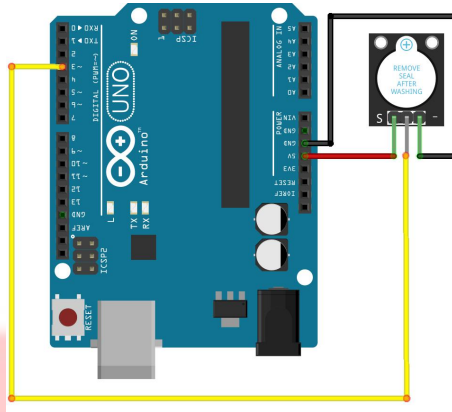


Figure 6: Buzzer module connections

6. Connect one XBee to the following pins on the Arduino Uno development board.

XBee Module	Arduino Uno Development Board
Pin 3	TX/D1
Pin 2	RX/D0
Pin 1/VCC	3.3 V
Pin 10/GND	GND

7. Before you switch on both the Power distribution circuit (as explained in [Preparing_Power_Distribution_Board.pdf](#)) and Arduino Uno Development Board, you will notice a red led both on the motor driver and the Arduino Uno Development Board.