#### **ESP32 AND L298N CONNECTIONS**

#### **1. Power Connections:**

* **6V Battery**:
  + Connect the **positive terminal** of the 6V battery to the **Vcc pin** (Pin 4) of the L298N. This will power the motors.
  + Connect the **negative terminal** of the 6V battery to the **GND pin** (Pin 5 and 8) on the L298N, and also to the **ground of the ESP32** for a common ground.
* **Vss Pin (Logic Supply)**:
  + Use a **5V regulator** to step down the 6V from the battery to **5V**, and connect this **5V output** to the **Vss pin** of the L298N (Pin 9).
  + Connect a **100nF capacitor** between the **Vss pin and GND** (Pin 9 to ground). This capacitor stabilizes the logic voltage for the L298N's internal circuit.

#### **2. Control Signals from the ESP32:**

Since the ESP32 operates at **3.3V logic** and the L298N's logic is **5V**, you will need **level shifters** to convert the 3.3V signals to 5V.

* **IN1 and IN2** (Motor 1 Control):
  + Connect **GPIO13 (ESP32)** to the **LV (low voltage) side** of a level shifter.
  + Connect the **HV (high voltage) side** of the level shifter to **IN1 (Pin 1)** on the L298N.
  + Connect **GPIO12 (ESP32)** to another **LV side** pin of the level shifter, and the **HV side** to **IN2 (Pin 2)** of the L298N.
* **IN3 and IN4** (Motor 2 Control):
  + Connect **GPIO14 (ESP32)** to another **LV side** pin of the level shifter, and the **HV side** to **IN3 (Pin 3)** of the L298N.
  + Connect **GPIO27 (ESP32)** to another **LV side** pin of the level shifter, and the **HV side** to **IN4 (Pin 6)** of the L298N.

#### **3. Enable Pins:**

Since you don’t need to control motor speed, you can connect the **Enable A (Pin 7)** and **Enable B (Pin 10)** to **5V** (from the regulator or a 5V source) to keep the motors enabled at full speed.

#### **4. Motor Outputs:**

* **OUT1 (Pin 13)** and **OUT2 (Pin 14)**: Connect to the terminals of the first N20 gear motor.
* **OUT3 (Pin 11)** and **OUT4 (Pin 12)**: Connect to the terminals of the second N20 gear motor.

**N20 GEAR MOTORS CONNECTIONS**

#### **1. L298N Motor Output to Motor Terminals:**

* **OUT1 (Pin 13 on L298N)** → **Black wire (Motor -)** of the N20 gear motor.
* **OUT2 (Pin 14 on L298N)** → **Red wire (Motor +)** of the N20 gear motor.

#### **2. Hall Effect Encoder Connections:**

* **Brown wire (Hall Sensor Vcc)** → **5V supply** (step-up converter or external 5V).
* **Green wire (Hall Sensor GND)** → **GND** (shared ground with ESP32, L298N, etc.).
* **Blue wire (Channel A output)** → **ESP32 GPIO pin** (e.g., GPIO 32).
* **Purple wire (Channel B output)** → **ESP32 GPIO pin** (e.g., GPIO 33).

### **How It Works:**

* The **L298N** controls the **power and direction** of the N20 motor through **OUT1 and OUT2**.
* The **encoder** provides feedback to the **ESP32** via the **Blue (Channel A)** and **Purple (Channel B)** wires, which send pulses based on motor rotation. This allows the ESP32 to track motor speed and direction.

### **Important Notes:**

* **Vcc for the Encoder**: The Hall sensor encoder operates on **3.5V to 20V**. You can use a **5V power supply** for the Hall sensor Vcc, and ensure you have a common ground for all components.
* **Monitoring Speed/Position**: The **ESP32** can read the pulses from the **Channel A and B outputs** to calculate the motor’s speed and direction.

### **Logic for Controlling the Motors:**

* To **move Motor 1 forward**:
  + Set **IN1 = HIGH** and **IN2 = LOW**.
* To **move Motor 1 backward**:
  + Set **IN1 = LOW** and **IN2 = HIGH**.
* To **move Motor 2 forward**:
  + Set **IN3 = HIGH** and **IN4 = LOW**.
* To **move Motor 2 backward**:
  + Set **IN3 = LOW** and **IN4 = HIGH**.