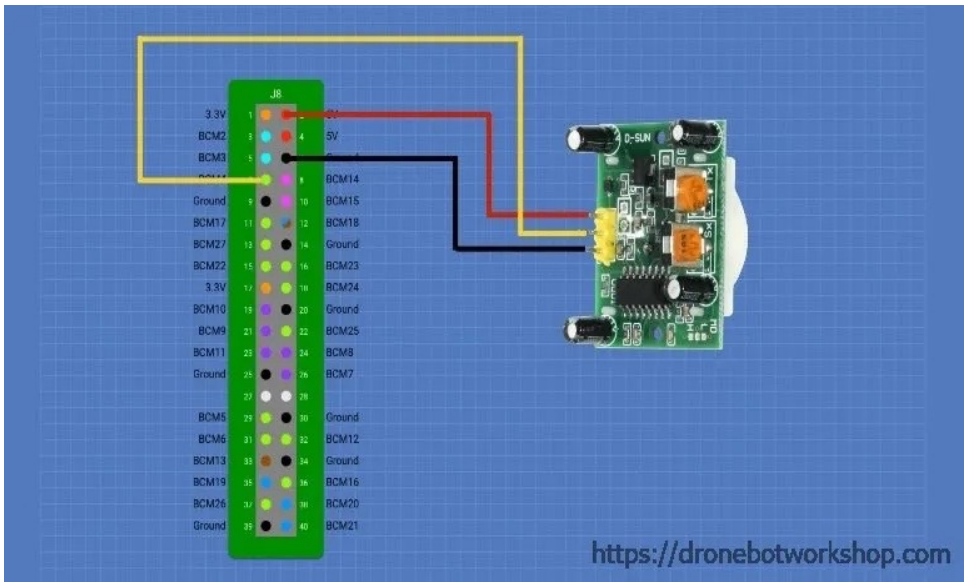
Using the HC-SR501 PIR Motion Sensor with Raspberry Pi

This guide explains how to use the HC-SR501 Passive Infrared (PIR) motion sensor with a Raspberry Pi. You'll learn how the sensor works, how to wire it to your Raspberry Pi, and how to run Python code to detect motion.

Wiring Diagram



1. Introduction to PIR Sensors

The HC-SR501 is an inexpensive PIR sensor that detects changes in infrared energy caused by human or animal movement. It's commonly used in motion-activated lights and security alarms.

2. Hardware You Need

- Raspberry Pi (any model with GPIO header)
- HC-SR501 PIR sensor
- 3 female-to-female jumper wires
- Breadboard (optional)

3. HC-SR501 Pinout

Looking at the pins with the dome facing you:
- VCC → Power (3.3V or 5V, use 5V on the Pi)
- OUT → Signal pin (goes HIGH when motion is detected)
- GND → Ground

4. Wiring to Raspberry Pi

Use jumper wires to connect:
- PIR VCC → Raspberry Pi Pin 2 (5V)
- PIR GND → Raspberry Pi Pin 6 (GND)
- PIR OUT → Raspberry Pi Pin 11 (GPIO17)

5. Python Test Code

Save this as **test_sensor.py** and run with **python3 test_sensor.py**

```
from gpiozero import MotionSensor

pir = MotionSensor(4)
count = 0
print("Start program")

while True:
    print("Enter loop")
    count += 1
    print(f"count is {count}")
    pir.wait_for_motion()
    if pir.motion_detected:
        print("Good Looking Person Detected")
```

6. Adjustments & Settings

- Sensitivity knob: Adjusts range (3–7m)
- Time knob: Adjusts delay (3s–5min)
- Jumper H/L: Repeat vs one-shot trigger
- Warm-up: Requires 30–60s stabilization after power-up

7. Optional Enhancements

The sensor board has solder pads for:
- Thermistor (RT): Increases accuracy in extreme temperatures
- LDR (RL): Makes the sensor light-sensitive for dark-only operation

Conclusion

With just a Raspberry Pi, the HC-SR501 sensor, and a few lines of Python code, you can build a motion detection system suitable for home automation, alarms, or energy-saving projects.