

The **HC-SR501 PIR (Passive Infrared) Motion Detector** is a commonly used sensor that detects motion by sensing changes in infrared (IR) radiation levels. It is widely used in security systems, automatic lighting, and other motion-based applications. Here's an explanation of its components and how it works:

How the HC-SR501 Works

- **PIR Basics:** The sensor detects infrared radiation emitted by objects, such as human bodies. When a moving object with a heat signature (e.g., a person or animal) enters its field of view, it detects the change in infrared radiation levels and triggers an output signal.
- **Lens:** The Fresnel lens on the module focuses IR radiation from a wide area onto the sensor for increased sensitivity.
- **Digital Output:** The sensor outputs a HIGH (1) signal when motion is detected and LOW (0) when no motion is detected.

Components of the HC-SR501

1. **Pins:**
 - **VCC:** Power supply pin (usually 5V to 12V).
 - **GND:** Ground connection.
 - **OUT:** The digital output pin. It goes HIGH when motion is detected and LOW otherwise.
2. **Two Potentiometers:**
 - **Delay Time (marked "TIME"):**
 - Controls how long the output signal remains HIGH after motion is detected.
 - Can be adjusted between a few seconds to several minutes.
 - **Sensitivity/Distance (marked "SENS"):**
 - Controls the range or sensitivity of the sensor.
 - Determines how far the sensor can detect motion, typically up to **7 meters**.
3. **Jumper Settings (L and H):**
 - Determines the behavior of the sensor's output:
 - **L (Single Trigger Mode):** The output will remain HIGH for the set delay time, even if motion continues during that period. Once the delay time is over, the output will turn LOW.
 - **H (Repeatable Trigger Mode):** The output will remain HIGH as long as motion continues. The delay timer resets each time new motion is detected.

Key Specifications

- **Operating Voltage:** 5V to 12V.
- **Detection Range:** Adjustable, typically up to 7 meters.
- **Detection Angle:** About 120 degrees.
- **Delay Time Range:** Adjustable, usually from 3 seconds to 5 minutes.
- **Output Signal:** Digital (HIGH = motion detected, LOW = no motion).

Practical Use

1. **Connections:**
 - Connect **VCC** to 5V power.
 - Connect **GND** to ground.
 - Connect **OUT** to a digital input pin on your microcontroller.
2. **Adjustments:**
 - Use a screwdriver to adjust the potentiometers:
 - Turn the **TIME** potentiometer clockwise to increase delay time and counterclockwise to decrease it.
 - Turn the **SENS** potentiometer clockwise to increase the detection range and counterclockwise to decrease it.
3. **Modes:**
 - Choose **L** or **H** mode based on your application's requirements by adjusting the onboard jumper.

Use Case Examples

- Automatic lights in rooms or hallways.
- Security systems that alert when motion is detected.
- Devices that activate when a person is nearby, such as fans or appliances.

Let me know if you'd like more technical details or assistance with code examples!

[What is PIR Sensor? 2024 Ultimate Guide on How it Work and Key Considerations for Optimal Performance](#)

[Understanding PIR Sensor: A Comprehensive Guide](#)

[PIR sensor HC SR501](#)

[Motion Sensors Tested and Reviewed! Worst and Best Zigbee PIR](#)