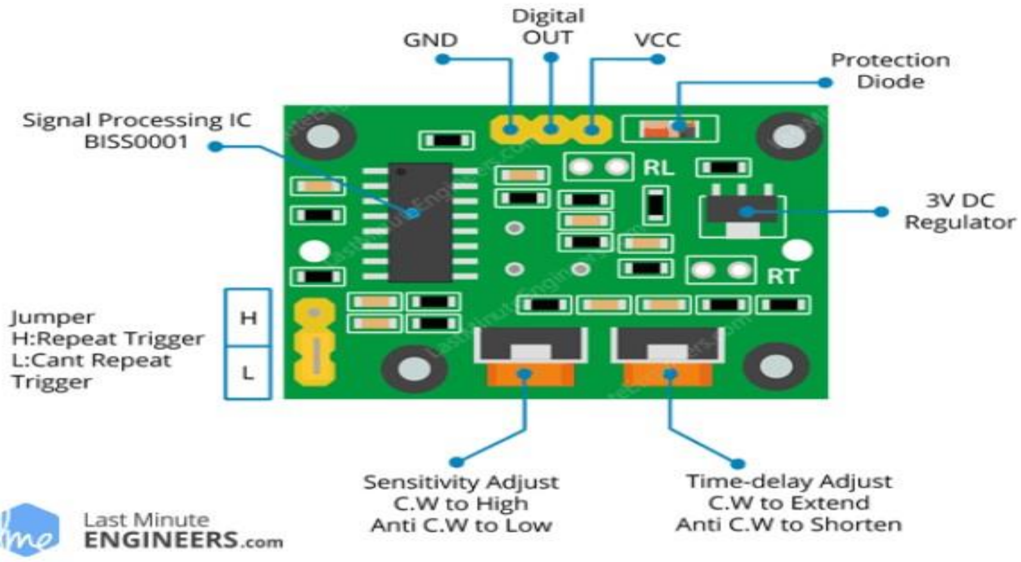
PIR SENSOR MODULE HC-SR501

SPECIFICATIONS :

- Infrared Sensor with Control Circuit Board
- The Sensitivity and Holding Time is adjustable.
- Blockade time: 2.5s (Default)
- Sensitive Setting: Turn to Right, Distance Increases (**About 7M**); Turn to Left, Distance Reduce (**About 3M**)
- Time Setting: Turn to Right, Time Increases (**About 200S**); Turn to Left, Time Reduce (**About 5S).**

CIRCUIT DESCRIPTION:


GND
Digital OUT
VCC
Protection Diode
Signal Processing IC BISS0001
RL
3V DC Regulator
RT
Jumper H:Repeat Trigger L:Cant Repeat Trigger
H
L
Sensitivity Adjust C.W to High Anti C.W to Low
Time-delay Adjust C.W to Extend Anti C.W to Shorten
Last Minute ENGINEERS.com

- HC-SR501 PIR sensor has three output pins VCC, Output and Ground as shown in the diagram below.
- It has a built-in voltage regulator so it can be powered by any DC voltage from 4.5 to 12 volts, typically 5V is used.
- There are two potentiometers on the board to adjust a couple of parameters:

  Sensitivity– This sets the maximum distance that motion can be detected. It ranges from **3 meters to approximately 7 meters.** The topology of your room can affect the actual range you achieve.

  Time– This sets how long that the **output will remain HIGH after detection**. At minimum it is 3 seconds, at maximum it is **300 seconds or 5 minutes.**

- Finally the board has a jumper (on some models the jumper is not soldered in). It has two settings:
  H– This is the Hold/Repeat/Retriggering In this position the HC-SR501 will continue to output a HIGH signal as long as it continues to detect movement.

L– This is the Intermittent or No-Repeat/Non-Retriggering In this position the output stay HIGH for the period set by the TIME potentiometer adjustment.

- VCC - is the power supply for HC-SR501 PIR sensor which we connect the 5V pin on the Arduino.
- OUTPUT - pin is a 3.3V TTL logic output. LOW indicates no motion is detected, HIGH means some motion has been detected.
- GND - should be connected to the ground of Arduino.

- **Repeatable(H) mode**
  In Repeatable(H) mode the output pin Dout will go high (3.3V) when a person is detected within range and goes low after a particular time (time is set by "Off time control" potentiometer). In this mode the output pin will go high irrespective of whether the person is still present inside the range or has left the area. The sensitivity can be set using the "sensitivity control" potentiometer
- The PIR sensor module can be powered from voltage 4.5V to 20V but, typically 5V is used. Once the module is powered allow the module to calibrate itself for few minutes, 2 minutes is a well settled time. Then observe the output on the output pin. Before we analyse the output we need to know that there are two operating modes in this sensor such as Repeatable(H) and Non- Repeatable(L) and mode. The **Repeatable mode is the default mode.**

- **Non- Repeatable(L) mode**
  In "I" mode the output pin Dout will go high (3.3V) when a person is detected within range and will stay high as long as he/she stays within the limit of the Sensors range. Once the person has left the area the pin will go low after the particular time which can be set using the potentiometer. The sensitivity can be set using the "sensitivity control" potentiometer.

CONNECTION :

- Connecting PIR sensors to a microcontroller is really simple. The PIR acts as a digital output so all you need to do is listen for the output pin to flip HIGH (Motion Detected) or LOW (Not Detected). Power the **PIR with 5V and connect ground to ground.** Then connect the **output to a digital pin #2.**
- set the **jumper on the HC-SR501 to the H** (Retriggering) position for this to work correctly.
- You'll also need to set the **TIME to the minimum of 3 seconds,** turn the TIME potentiometer as far counterclockwise as it will go. Set the sensitivity anywhere you like, set it to midpoint if you are not sure.
- When the motion is detected**, output pin of the sensor** is connnected with **pin no 8** of **arduino** board, and when the object is detected, **pin 7 of arduino** will activate the **relay module** and **high voltage device** will turn on

WORKING :

- All objects with a temperature above Absolute Zero (0 Kelvin / -273.15 °C) emit heat energy in the form of infrared radiation, including human bodies. The hotter an object is, the more radiation it emits.
- PIR sensor is specially designed to detect such levels of infrared radiation. It basically consists of two main parts: A Pyroelectric Sensor and A special lens called Fresnel lens which focuses the infrared signals onto the pyroelectric sensor.
- When the sensor is idle, i.e. there is no movement around the sensor; both slots detect the same amount of infrared radiation, resulting in a zero output signal.
- But when a warm body like a human or animal passes by; it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. The corresponding pulse of signals results in the sensor setting its output pin high.

CODES:

01

```
int ledPin = 13;                // choose the pin for the LED
int inputPin = 8;               // choose the input pin (for PIR sensor)
int pirState = LOW;             // we start, assuming no motion detected
int val = 0;                    // variable for reading the pin status

void setup()
{
  pinMode(ledPin, OUTPUT);      // declare LED as output
  pinMode(inputPin, INPUT);     // declare sensor as input

  Serial.begin(9600);
}

void loop()
{
  val = digitalRead(inputPin);  // read input value
  if (val == HIGH)     // check if the input is HIGH
  {
    digitalWrite(ledPin, HIGH);  // turn LED ON
    if (pirState == LOW)
{
      Serial.println("Motion detected!");          // print on output change
      pirState = HIGH;
    }
  }
  else
  {
    digitalWrite(ledPin, LOW); // turn LED OFF
    if (pirState == HIGH)
    {
      Serial.println("Motion ended!");     // print on output change
      pirState = LOW;
    }
  }
}
```

# 02

```
/void setup()
{
  Serial.begin(9600);// setup Serial Monitor to display information
  pinMode(2, INPUT);// Input from sensor
  pinMode(8, OUTPUT);// OUTPUT to alarm or LED
}

void loop()
{
            int motion =digitalRead(2);
            if(motion){
              Serial.println("Motion detected");
              digitalWrite(8,HIGH);
  }
Else
{
     Serial.println("===nothing moves");
     digitalWrite(8,LOW);
  }
  delay(500);

}
```

# 03

```
/*****PIR sensor tester*****/
int ledPin = 13;                // choose the pin for the LED
int inputPin = 2;               // choose the input pin (for PIR sensor)
int pirState = LOW;             // we start, assuming no motion detected
int val = 0;                    // variable for reading the pin status

void setup()
 {
            pinMode(ledPin, OUTPUT);      // declare LED as output
            pinMode(inputPin, INPUT);     // declare sensor as input
           //based on input, output will be shown on led light
            Serial.begin(9600);
}

void loop()
{
            val = digitalRead(inputPin);  // read input value
            if (val == HIGH) {            // check if the input is HIGH
              digitalWrite(ledPin, HIGH);  // turn LED ON
              if (pirState == LOW) {
                // we have just turned on
                Serial.println("Motion detected!");
                // We only want to print on the output change, not state
                pirState = HIGH;
    }
  }
else
{
    digitalWrite(ledPin, LOW); // turn LED OFF
    if (pirState == HIGH){
      // we have just turned of
      Serial.println("Motion ended!");
      // We only want to print on the output change, not state
      pirState = LOW;
    }
  }
}
```

# 04

```
int pirsensor=0;
void setup()
{
  // put your setup code here, to run once:
  pinMode(13, OUTPUT);
  pinMode(2, INPUT);
}
void loop()
{
  pirsensor = digitalRead(2);
  if(pirsensor == HIGH)
  {
    digitalWrite(13, HIGH);
  }
  else
```

```
 {
   digitalWrite(13, LOW);
 }
 delay(10);
}
```

TO Remember:

- Most PIR sensors the HC-SR501 requires some time to acclimatize to the infrared energy in the room. This takes from 30 to 60 seconds when the sensor is first powered up.
- In addition the sensor has a “reset” period of about 5 or 6 seconds after making a reading. During this time it will not detect any motion.