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PIR Sensor (#555-28027)

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by sensing changes in the infrared (radiant heat) levels emitted by surrounding objects. This motion can be detected by checking for a sudden change in the surrounding IR pattern. When motion is detected the PIR sensor outputs a high signal on its output pin. This logic signal can be read by a microcontroller or used to drive an external load; see the source current limits in the features list below.

NOTE: Rev B of this sensor provides many updates and improvements from Rev A. If your PIR Sensor's PCB does not read "Rev B," please use the information found in the Revision History section on page 5. For the Wide Angle PIR Sensor, search for product "28032" at www.parallax.com.

Features

- Detect a person up to approximately 30 ft away, or up to 15 ft away in reduced sensitivity mode
- Jumper selects normal operation or reduced sensitivity
- Source current up to 12 mA @ 3 V, 23 mA @ 5 V
- Onboard LEDs light up the lens for fast visual feedback when movement is detected
- Mounting holes for #2 sized screws
- 3-pin SIP header ready for breadboard or through-hole projects
- Small size makes it easy to conceal
- Easy interface to any microcontroller

Key Specifications

- Power Requirements: 3 to 6 VDC; 130 µA idle, 3 mA active (no load)
- Communication: Single bit high/low output
- Operating temperature: 32 to 122 °F (0 to 50 °C)
- Dimensions: 1.41 x 1.0 x 0.8 in (35.8 x 25.4 x 20.3 cm)

Application Ideas

- Motion-activated nightlight
- Alarm systems
- Holiday animated props

Theory of Operation

Pyroelectric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared energy. The changes in the amount of infrared energy striking the element change the voltages generated, which are measured by an on-board amplifier. The device contains a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion.

The onboard jumper allows the user to select between normal operation and reduced sensitivity. The sensitivity of the PIR Sensor varies with temperature and other environmental conditions. Generally, when in reduced sensitivity mode, the PIR sensor will detect an object at up to half the distance it would in normal operating mode. For more information, see the Range section below.
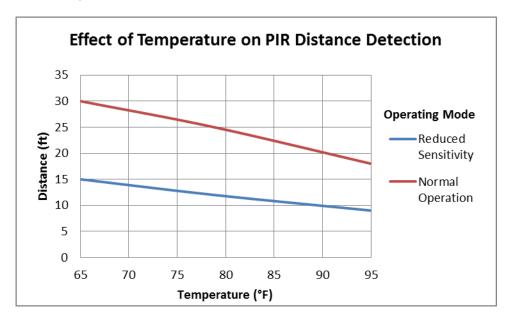
Range

The PIR Sensor's range is affected by:

- The sensitivity jumper setting
- The size and thermal properties of nearby objects
- Environmental conditions including ambient temperature and light sources

The graph below depicts the approximate effects of known ambient temperatures on the PIR Sensor's detection range of an average adult.

The graph below depicts the approximate effects of known temperatures on the PIR Sensor's detection range of an adult. *Note: This device is designed for indoor use. Operation outside or in extreme temperatures may negatively affect stability. Direct exposure to sunlight or other forms of radiant heating may cause undesired operation.*
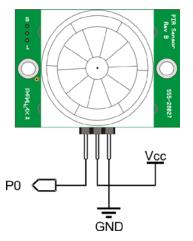
Pin Definitions and Ratings

Pin	Name	Type	Function
1	GND	G	Ground: 0 V
2	Vcc	P	Supply Voltage: 3 to 6 VDC
3	OUT	O	PIR signaling; HIGH = movement/LOW = no movement

Pin Type: P = Power, G = Ground, I = Input, O = Output

Jumper Settings

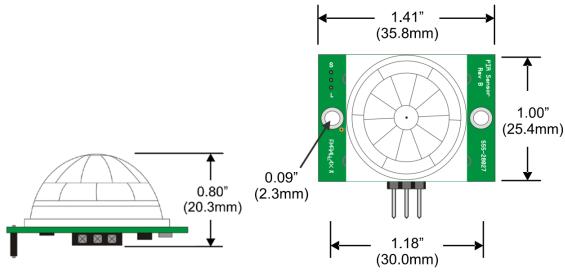| Symbol	Description
S	Reduced sensitivity mode, for a shorter range, about 15 feet maximum
L	Normal operation, for a longer range, about 30 feet maximum

Quick-Start Circuit

Calibration

The PIR Sensor requires a warm-up time in order to function properly. This is due to the settling time involved in "learning" its environment. This could be up to 40 seconds. During this time, the LEDs under the lens will be on and there should be as little motion as possible in the sensors field of view.

Module Dimensions

BASIC Stamp® Example Code

This program will display the current state of the output pin from the PIR Sensor connected to P0 using the Debug Terminal. The Debug Terminal is built into the BASIC Stamp Editor software. The software is a free download from www.parallax.com/basicstampsoftware.

```
' PIR_Simple.bs2
' Displays the current state of the PIR Sensor connected to P0

' {$STAMP BS2}
' {$PBASIC 2.5}

PAUSE 40000                      ' PIR warm-up time

DO
  DEBUG HOME, BIN1 IN0           ' Display state of P0
  PAUSE 100                      ' Small Delay
LOOP                             ' Repeat Forever
```

Propeller™ P8X32A Example Code

Note: This application uses the Parallax Serial Terminal to display the device output. The object and the Parallax Serial Terminal itself are included with the Propeller Tool v1.2.7 or higher, which is available from the Downloads link at www.parallax.com/Propeller.

```
'' PIR_Simple.spin
'' Displays the current state of the PIR Sensor connected to P0

CON

_clkmode = xtal1 + pll16x          ' Setting Clock Mode to Crystal 1 with 16 multiplier
_xinfreq = 5_000_000               ' Propeller set to run at 80MHz

VAR

  byte state                       ' Declare variable state to store PIR output

OBJ

  pst : "Parallax Serial Terminal"

PUB PIR                            ' Public Method name PIR

  dira[0]~                         ' Set pin 0 to input

  pst.start(115200)                ' Start Parallax Serial Terminal at 115200 baud
  waitcnt(clkfreq * 40 + cnt)      ' PIR "warm-up" time
  pst.clear                        ' Clear the screen

  repeat
    state := ina[0]                ' Save state of PIR Sensor
    pst.home                       ' Move cursor to position(0,0)
    pst.str(string("IN0 = "))
    pst.bin(state, 1)              ' Display state
    waitcnt(clkfreq/200 + cnt)     ' Small delay
```

Other Examples

For example code and projects in other programming languages look for additional resources links on the 555-28027 product page at www.parallax.com.

Revision History

V 2.0: PIR Sensor Rev A
Both revisions of this sensor use the same Fresnel lens, and basic functionality remains the same between the two (for example you can use the same test programs). However, there were a number of improvements and updates made to Revision B, and if using Revision A in your project the following information should be noted and used.

Features
- Detection range up to 20 feet away
- Single bit output
- Jumper selects single or continuous trigger output mode
- 3-pin SIP header ready for breadboard or through-hole project
- Small size makes it easy to conceal
- Compatible with BASIC Stamp, Propeller, and many other microcontrollers

Key Specifications
- Power Requirements: 3.3 to 5 VDC; >3 mA **(may vary)**
- Communication: Single bit high/low output
- Operating temperature: 32 to 122 °F (0 to 50 °C)
- Dimensions: 1.27 x 0.96 x 1.0 in (32.2 x 24.3 x 25.4 mm)

Key Differences
- Jumper setting controls triggering and not distance
- Driving an external load requires a transistor or MOSFET
- Detection range up to 20 ft away

Pin Definitions and Ratings

Pin	Name	Function
-	GND	Ground: 0 V
+	Vin	Supply Voltage: 3 to 6 VDC
OUT	Output	Connect to I/O pin set to INPUT mode (or transistor/MOSFET).

Jumper Settings

Symbol	Description
H	Output remains HIGH when sensor is retriggered repeatedly. Output is LOW when idle (not triggered).
L	Output goes HIGH then LOW when triggered. Continues motion results in repeated HIGH/LOW pulses. Output is LOW when idle.

V 2.1: The explanation of the sensitivity jumper setting have been updated throughout, and the Range section, including a temperature vs. range graph, were added.
V 2.2: Added information for load current to Features and Specifications.
V 2.3: Updated product images to show placement of shunt jumper on reverse.