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## How Motion Sensors Work

### *Passive infrared motion detectors*

There are two types of motion sensors currently commercially available, the active sensors and passive sensors. A motion sensor is classified as being active only when it emits some kind of energy into the surrounding medium to make an accurate reading, whether it is infrared light, microwave radiation or sound waves. Passive motion sensors do not emit energy, but can identify possible burglars by reading relative changes in the energy in the surrounding medium. Passive motion sensing detectors work by measuring the incoming infrared energy. They are widely known as PIR (passive infrared) sensors, or pyroelectric detectors. Heat can be transmitted by contact, convection or radiation. Infrared light is responsible for transmitting heat through radiation, and because the human body is a heat source it also emits infrared radiation. The outside skin temperature of a human body is usually about 34 degrees Celsius, meaning it is radiating energy in the infrared spectrum between 9 to 10 micrometers. The PIR sensors have in fact a much wider range, between 8 to 12 micrometers. The detector itself is a photodetector able to convert light in these specific wavelengths into a small electrical current that is then amplified and processed through a small computer. The alarm will only trigger when the motion detector observes rapid variations in infrared energy distribution, such as those associated with the normal movement of a human. Any smaller variations in energy reading are being filtered out, so that the sensor is not being triggered accidentally by natural events such as the slow heat variations in the supervised area. Infrared light emitted by the objects is focused with the help of a plastic lens, since glass is opaque to infrared light. This is why PIR detectors cannot be triggered by events taking place on the other side of a window. The fact that glass is opaque to infrared light is also the reason why heat accumulates inside greenhouses. Light that is able to penetrate the glass would enter the greenhouse and heat the objects inside, which start emitting infrared radiation. However this energy cannot be radiated outside the greenhouse and further accumulates in the form of heat.