



## Overview

The following is a description of Sensor Switch's patented Microphonics™ occupancy detection technology followed by a summary comparison to Ultrasonic occupancy detection technology.

## Sensor Switch Occupancy Detection Technologies

### Passive Infrared Occupancy Detection:

All Sensor Switch sensors utilize Passive Infrared (PIR) technology to detect changes in the infrared energy given off by occupants as they move within a sensor's field-of-view.

### Microphonics™ Occupancy Detection:

Microphonics™ technology uses a microphone inside the sensor in order to "hear" sounds indicating occupancy in rooms with obstructions, such as bathrooms with stalls or open office cubicle areas. By using Automatic Gain Control (AGC), the sensor can dynamically self-adapt to its environment by filtering out constant background noise and detecting only leading edge noises typical of human activity. Microphonics is only used in Dual Technology sensors where it is paired with PIR (see next paragraph). Microphonics is not used by itself in sensors.

### Dual Technology (PIR + Microphonics):

Sensor Switch's Passive Dual Technology (PDT) combines both of these detection technologies. It requires sensors to first "see" motion using Passive Infrared and then engages the Microphonics™ to "hear" sounds that indicate continued occupancy. For example, when an occupant enters a room the PIR detection signals the sensor to turn the lights on. Now that the PIR has been initially triggered, either another PIR detection or a Microphonics detection can keep the lights on. Patented by Sensor Switch, Passive Dual Technology using PIR and Microphonics provides a more reliable and completely passive alternative to active ultrasonic methods of detection.

## Comparison vs. Ultrasonic Technology

### False Tripping:

False tripping occurs when a sensor turns on the lights when no occupant is actually present. False tripping causes increased lighting run-time (therefore less energy savings) and also increases the number of lamp cycles which in turn can lead to decreased lamp life. Sensors that use Ultrasonic technology can not distinguish between occupant and non-human motion therefore they can be prone to false tripping from air currents, hanging mobiles, or other building-type movements. An example of this type of situation is where Ultrasonic sensors turn on a building's lights regularly during the night whenever the air conditioning system kicks on. This and other similar occurrences have been observed in the field and are an example why Ultrasonic technology is not used in security sensors.



### **False Tripping cont:**

False tripping also results from Ultrasonic sound waves leaving the intended space and detecting unwanted motion. For example an Ultrasonic sensor in a classroom may sense occupants in an adjacent hallway. In an attempt to reduce this problem, sensitivity adjustments are present on Ultrasonic sensors in order to reduce their range as needed. Proper sensor operation then relies more heavily on the installer as the sensors require adjustment to function properly. Further, turning down the outer large motion detection range of a sensor often will turn also down the inner small motion detection range of a sensor as well; an effect that is not desired.

Sensor Switch's occupancy sensors eliminate the potential for this type of false tripping. First, Microphonics technology can not cause a false trip since a detected sound can only keep the lights on and not turn the lights on from an off state. An occupant must be detected by the PIR for the lights to turn on and the Microphonics to engage. Second, because PIR requires line of sight in order to detect motion, occupant movement that is adjacent to the sensors field of view can not cause the lights to turn on. Finally, Microphonics is tuned to only hear the type of noises humans create (typing, talking, rustling papers) and ignore building noises (such as air conditioning turning on).

### **Potential Interference:**

Ultrasonic technology is based on high intensity sound waves being transmitted into a space. Therefore there is a potential for causing interference with devices like wipe-board readers (for example the Mimio brand) or even hearing aids (if sensors are outside of appropriate frequency band). While studies and product modifications have been done to try and ensure that Ultrasonic frequencies used in sensors do not interfere with hearing aids, the fact that these sensors are emitting high intensity sound waves prevents the potential for interference from ever fully be eliminated.

Sensor Switch's Dual Technology Sensors are completely passive meaning nothing is emitted into a space. This eliminates all possibility for interference with other devices.

### **Summary**

As the summary above illustrates, the drawbacks of using Ultrasonic technology for occupancy detection are great. Sensor Switch's PIR/Microphonics dual technology eliminates all of these drawbacks and is more effective at detecting continued occupancy. This claim is validated by over 10 years worth of market application and customer experiences.