Sensor Placement Guide

How to optimize the placement of Avi-on sensors

The maximum range of Avi-on ceiling mount sensors with 360° coverage is 1200ft^2 (0 40ft) for PIR detection and 1000ft^2 (0 35ft) for ultrasonic detection.

The detection area may be more or less than that depending on mounting height, sensitivity setting, and/or obstacles such as furniture or partitions. Other factors such as proximity to lighting fixtures, windows, doorways, and HVAC ducts, may also affect sensor operation. It is important that these issues be considered when planning how many sensors to use and where to place them.

It is also important to consider what type of motion will be detected: minor motion (e.g., a person sitting at a desk typing on a computer) or major motion (e.g., a person walking around or entering a room).

PIR Sensor Placement

Optimal mounting height is 8-10ft. Mounting outside this range will affect the sensor's detection pattern. As you decrease mounting height, you decrease the sensor range and increase the sensitivity to minor motion. Conversely, when you increase the mounting height, you increase the range and decrease the sensitivity to minor motion. At heights greater than 12-24 ft. you will start to see significantly reduced sensitivity.

In large or open areas, it is best to install multiple sensors so that there is some overlap with each sensor's coverage area (Figure 1). This will help eliminate blind spots. Sensitivity should be set to 100%.

In small or closed areas, avoid placing the sensor where it will have a clear view through an open door, as the sensor may detect people walking by (Figure 2). Sensitivity can be set to 50%, which decreases range by half, but increases sensitivity to minor motion.
As a general rule, especially in areas with partitions such as open offices, each occupant

should be able to clearly view the sensor. If the occupant can't see the sensor there is a good chance the sensor can't see the occupant.

PIR sensors should be mounted at least 4-6 ft. away from HVAC ducts as rapid-moving air currents or temperature differences may cause false triggering.

Sensors with daylight sensing capability should be mounted away from windows and lighting fixtures as the extra ambient light may interfere with sensor operation.

PIR sensors are typically best for detecting major motion for two reasons:
1. PIR sensors divide the detection area into zones using a Fresnel lens. Major motion will typically trigger an event because occupants cross into multiple zones, whereas minor motion may or may not cross zones.
2. PIR sensors compare the infrared (heat) energy emitted by moving objects with the background space. An occupant sitting relatively motionless may, after a short while, start to blend into the background.

Ultrasonic Sensor Placement

Avi-on does not currently manufacture a stand-alone ultrasonic sensor; ultrasonic and PIR sensors are integrated into a single sensor unit. This being the case, all of the guidelines for PIR sensor placement are equally applicable here (Figure 3).

Keep in mind, however, ultrasonic and PIR sensors operate on completely different principles. Instead of dividing the room into zones and passively looking at infrared (heat) energy, ultrasonic sensors actively emit high frequency sound waves (32KHz) and rely on the Doppler Effect to detect motion. Simply put, ultrasonic sensors analyze the frequency shift between the emitted and reflected sound waves. A motion event changes the frequency of the sound waves and triggers the sensor.

One detection method is not absolutely superior to or preferable to another, but each sensor type will perform better in different applications. Ultrasonic detection is included in the dual tech sensor as a supplement, to avoid false triggering, in those applications where PIR is inadequate.

Ultrasonic technology can supplement PIR sensors in three ways:
1. Ultrasonic sensors can "see" around obstacles that would normally block PIR sensors.
2. Ultrasonic sensors are not affected by temperature. So, in areas with limited air flow or in situations where occupants start to blend into the background, the sensor's accuracy is greatly improved.
3. Ultrasonic sensors are better at detecting minor motion than PIR since they do not need to divide the room into zones.

Mounting Options
- Sensor mounted to wallboard or drop ceiling using screws
- Sensor mounted to octagonal J-box installed flush to wallboard ceiling
- Power pack installed above ceiling attached to J-box

See "The Avi-on Installation Guide" for more information.

Low Voltage Power Pack Placement

The AVI-PSR-277-24-150 is a Class 2 Output Power Supply, suitable for parallel interconnection of up to 6 sensor units. It is UL Listed for interconnection of Power Sources in accordance with National Electric Code. It is designed to attach to existing or new electrical enclosures.

Most applications require UL listed, 18-22 AWG, 3-conductor, Class 2 cable for low voltage wiring. Low voltage wiring should use at least 22 AWG wire. High voltage wiring should use at least 14 AWG wire.

For plenum return ceilings, use UL listed plenum-approved cables with 1/2" knockouts.
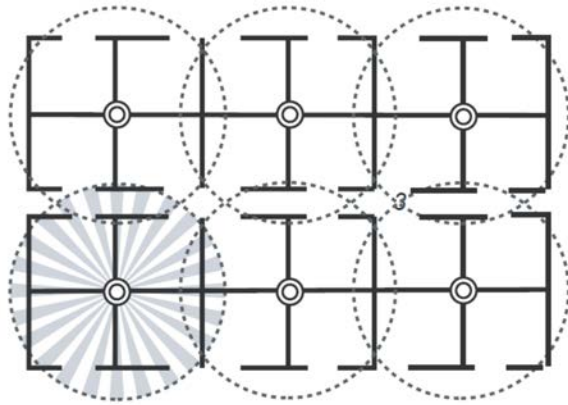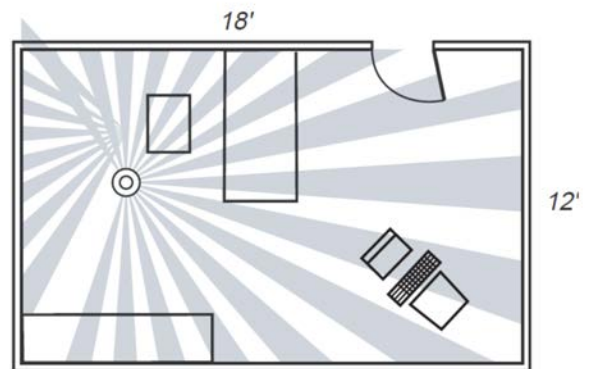
Placement Diagrams

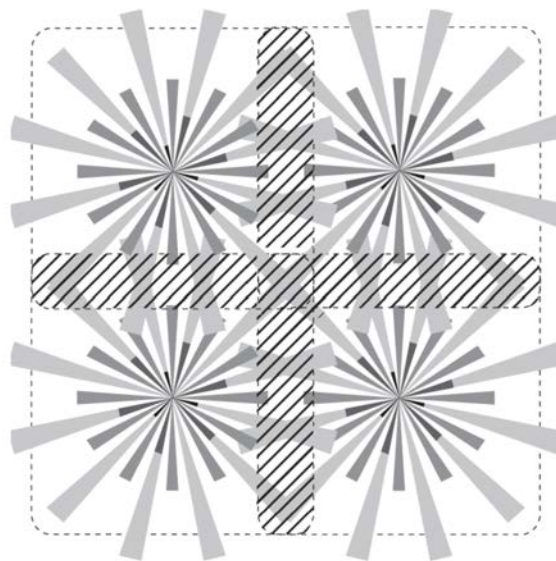**Figure 1. Open Office PIR Sensor**

Figure 2. Private Office

Figure 3. Open Office Dual-tech