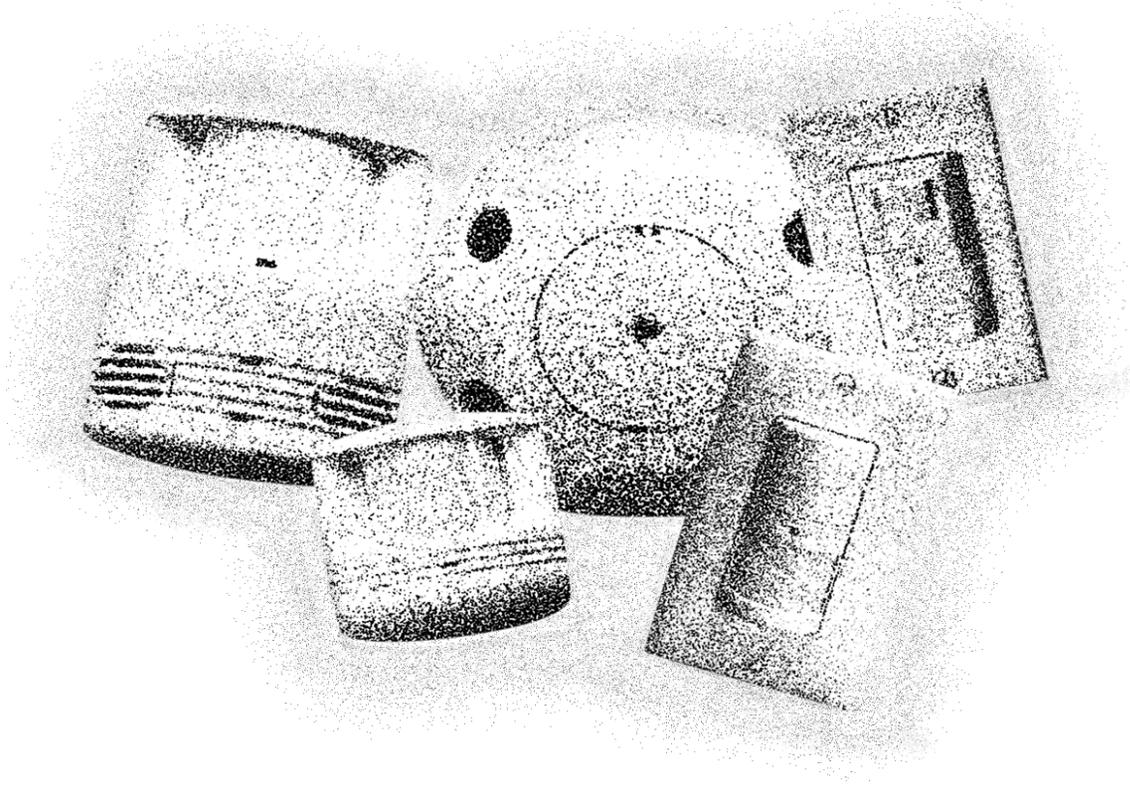




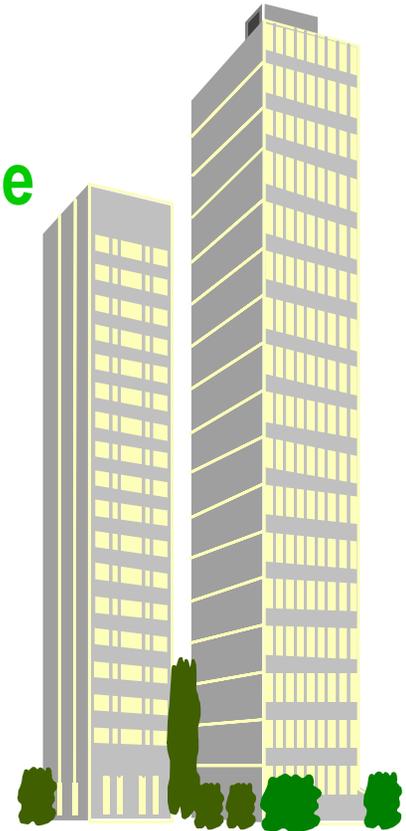
Occupancy Sensors





Facility Lighting Issues

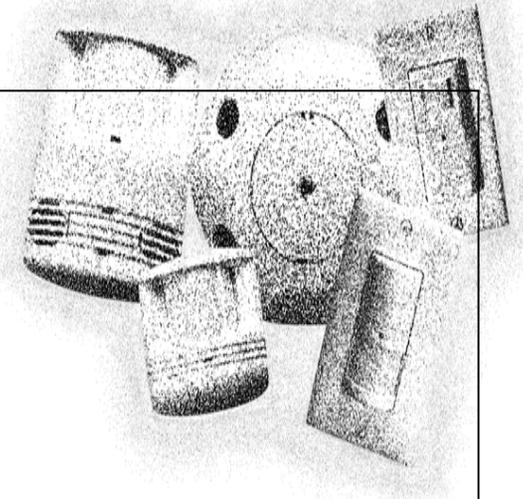
- **Lighting accounts for 40% of electricity usage and costs**
- **Lighting & HVAC at full output when building at low or no occupancy**
- **Uncontrolled lighting results in substantial energy waste**





Lighting Control Solution: Occupancy Sensors

- Control lighting based on space occupancy
 - **ON** when space is occupied
 - **OFF** when space is vacant
- Vital component of energy efficient buildings





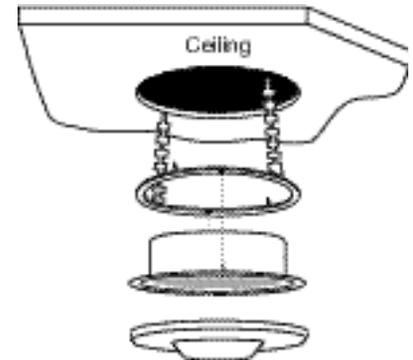
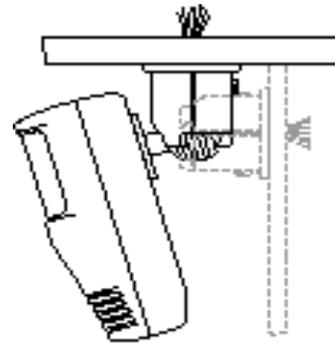
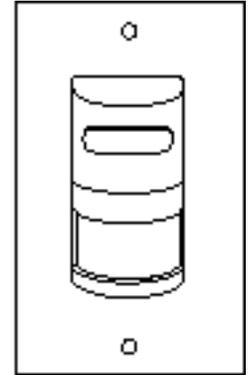
Choosing the Right Sensor

- **Critical for effective lighting control**
- **Match sensor with application**



Sensor Types

- Automatic wall switch sensors
 - Replace standard wall switches
- Wall/ceiling mount sensors
 - Low voltage devices that use power packs





Occupancy Sensor Technologies

- Different sensor technologies to fit different applications
 - Passive Infrared (PIR)
 - Ultrasonic
 - Dual technology



PIR Technology

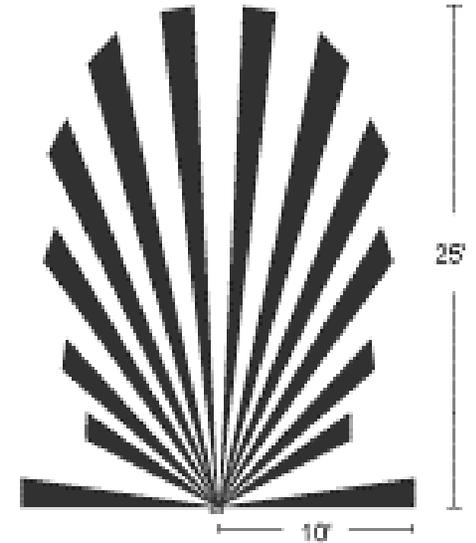
- PIR detects differences between human body in motion and background space
- PIR sensing reacts only to energy sources (i.e., humans)
- Multi-element pyroelectric sensing device





Fresnel Lens

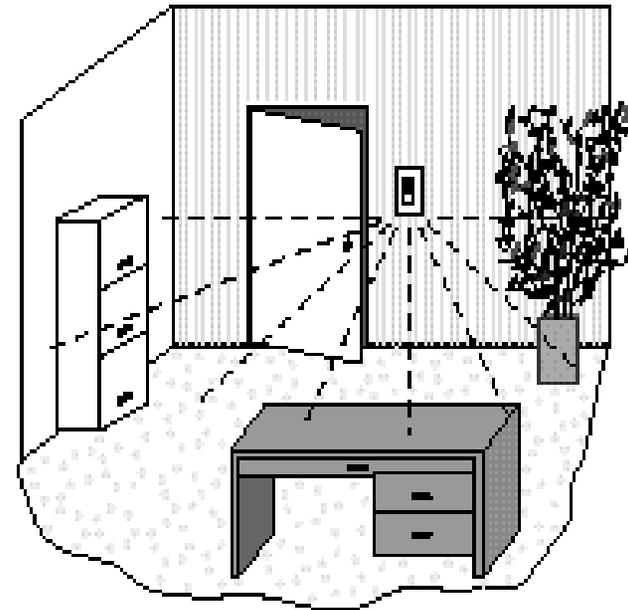
- Unique, multi-level Fresnel lens
 - Multiple intersecting levels to detect greater range of motion
 - Reliable detection at desktop
- Line of sight coverage
- 100% cut-off capability





PIR Sensor Placement

- **Sensor must be able to see the coverage area**
- Partitions and bookshelves will prevent detection in blocked area
- Should be placed so as not to have a view out the door
- Better motion sensing for movement across field of coverage





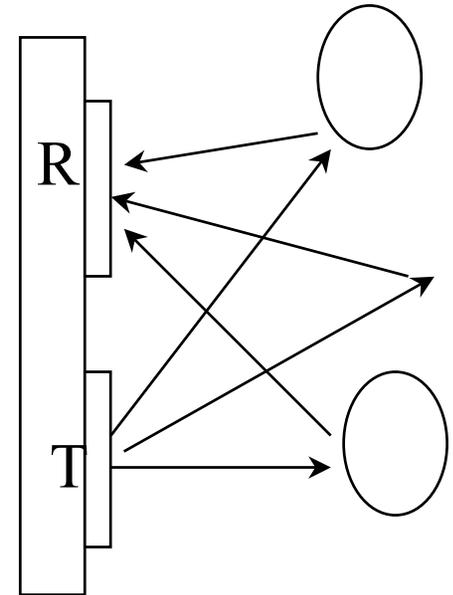
PIR Best Applications

- Enclosed offices
- Hallways
- Areas with high airflow: Computer rooms, labs
- Warehouses and high ceiling mounts
- Areas requiring 100% coverage cut-off
- Wall switch replacements
- Workstation desktops for task lighting & office power control



Ultrasonic Technology

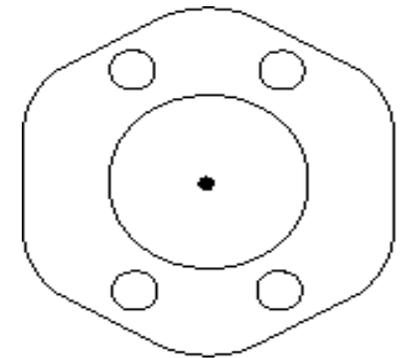
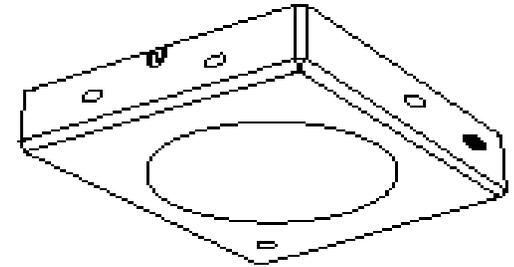
- Volumetric motion detection
- Doppler Principle
- Advanced Signal Processing Circuitry
- Measure amount of time it takes for the high frequency signal to return to sensor
- Movement by a person causes a change in the return time of the signal





Ultrasonic Technology Advantages

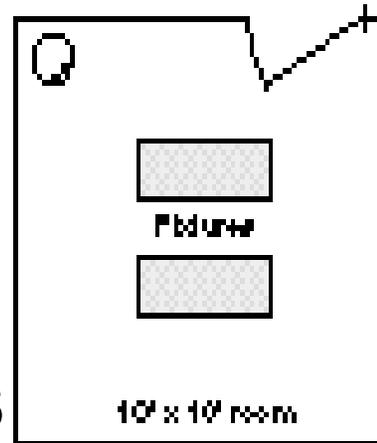
- **Capable of detecting occupancy in low-activity settings**
- Temperature and humidity resistant receivers
- Omni-directional coverage



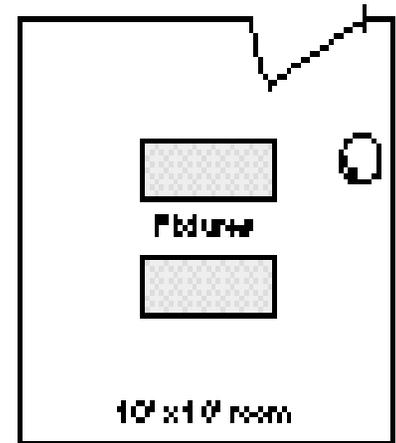


Ultrasonic Sensor Placement

- Room surfaces affect coverage range and sensitivity
- Relationship to HVAC ducts and fans
- Relationship to doorways



Correct

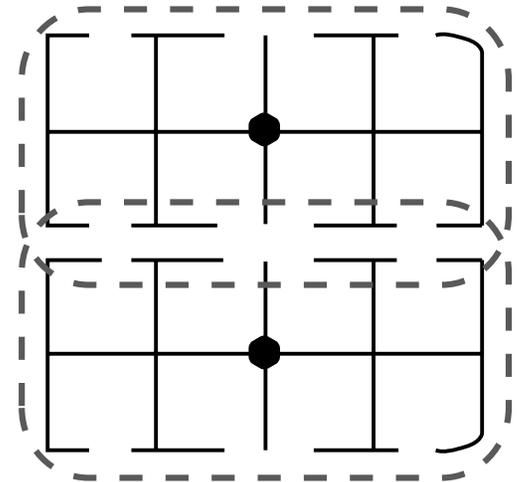


Incorrect



Ultrasonic Best Applications

- Open office spaces
- Conference rooms
- Restrooms
- Enclosed hallways
- Large areas controlled in zones





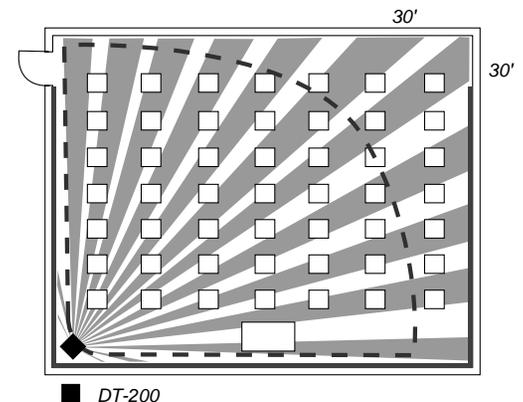
Dual Technology Sensors

- Combination of PIR and ultrasonic technologies
- Dual sensing verification principle
- Lighting control solution for difficult applications



Dual Technology Advantages

- **Effective occupancy detection capabilities in tough applications**
- **Maximal sensitivity without false ONs**
- Complete coverage definition
- Choice of logic configurations





Dual Technology Best Applications

- Classrooms
- Large conference rooms
- Computer rooms
- Open office spaces with defined aisles
- Areas requiring complete coverage cut off and small motion sensing





Occupancy Sensors at Work

Facility types

Offices

Schools

Warehouses

Health care

Retail

Government

Hotels

Athletic facilities

Financial services

Industrial buildings

Correctional facilities

Houses of worship

Hospitals



Occupancy Sensors at Work

Facility spaces

Lobbies

Classrooms

Utility rooms

Conference or meeting rooms

Gymnasiums

Banquet rooms

Restrooms

Offices

Hallways

Libraries

Lunch & break rooms

Computer rooms

Stockrooms & storage

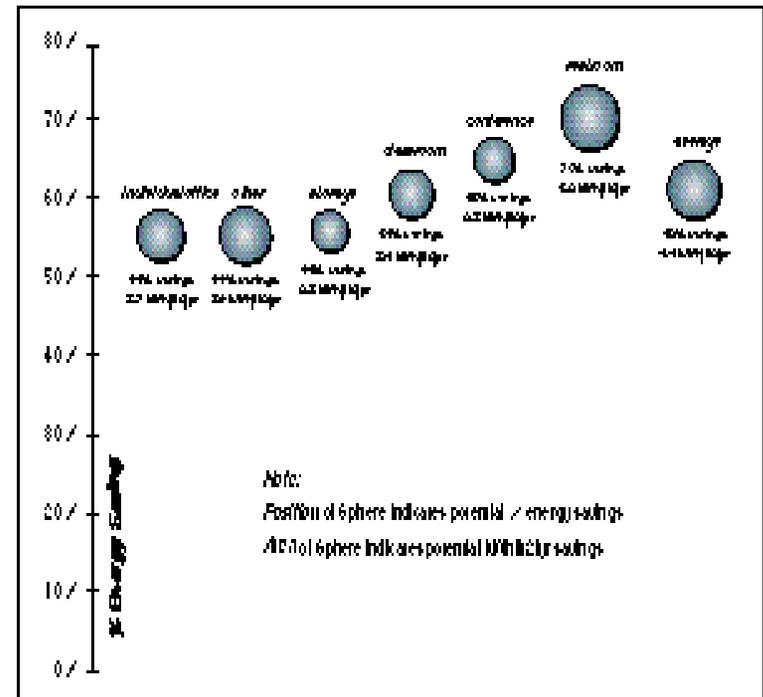
Warehouses

Open spaces



Energy Savings

- Offices 15-70%
- Conference rooms 5-24%
- Restrooms 30-75%
- Classrooms 20-75%
- Storage areas 45-65%
- Warehouses 25-75%
- Open office spaces 5-25%





Economic Benefits

- High energy savings (20-60%)
- Extended lamp life
- Low initial costs
- Reduced maintenance costs
- Paybacks under 2 years
- Reduced air conditioning costs by interfacing with HVAC





Operational Benefits

- Flexibility
- Ease of installation and maintenance
- Convenience to occupants
- Compatibility with most lighting systems
- Easily integrates with other building systems (i.e., HVAC, EMS)

