ENERGY EFFICIENT LIGHTING & CONTROLS

Good Lighting:

- **Is Efficient** and **Lowers Energy Costs**
- **Raises Productivity**
- **Improves the Work Area**
- **Is Easy to Maintain**

INFORMATION

Technology Moved Forward

1.5” T12

1.0” T8

0.625” T5

T12 Vs T8

	T12	T8
Watts	40	32
Initial Lumens	3350	2950
Mean Lumens	3050	2800
Mean LPW	76.3	87.5
Lumen Maintenance	78%	90%
CRI	80	86

The T8 gave us a 15% improvement in efficacy while improving on lumen maintenance and color rendering.

	T8	T5	T5HO
Watts	32	28	54
Initial Lumens	2950	2900	5000
LPW	92.2	103.6	92.6
Lumen Maintenance	90%	97%	95%
CRI	86	>80	>80

The T5 gave us continued improvement in efficacy and lumen maintenance.

T8 Vs T5/T5HO

T8 Applications

- Retrofitting T12 fixtures
- New direct fixtures

T5 / T5HO Applications

- New indirect fixtures
- Multi-lamp high bay fixtures
- Not really a retrofit

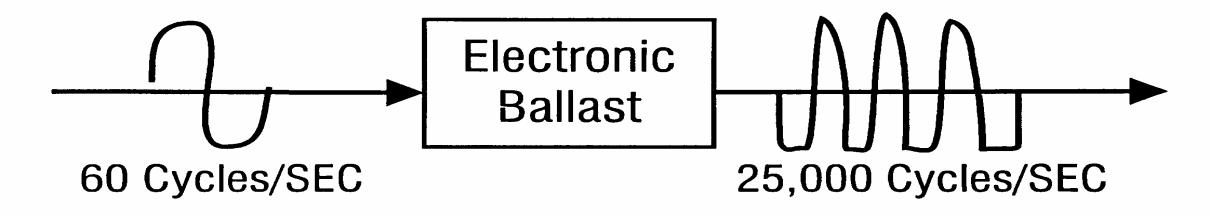
T5HO – Indirect

T5HO Vs High HID

Lamp	Maintained Lumens at 8000 hrs	System Wattage*
4 - T5/HO lamps	18,600 lm	234 W
1 - M250/U	13, 500 lm	295 W
1 - M250/PS	17,000 lm	288 W
6 - T5/HO lamps	27,900 lm	351 W
1 - M400/U	23,500 lm	460 W
1 - M400/PS	31,000 lm	452W

Advantages: No color shift, compatible with occupancy sensors, and instant on

FLUORESCENT ELECTRONIC BALLAST

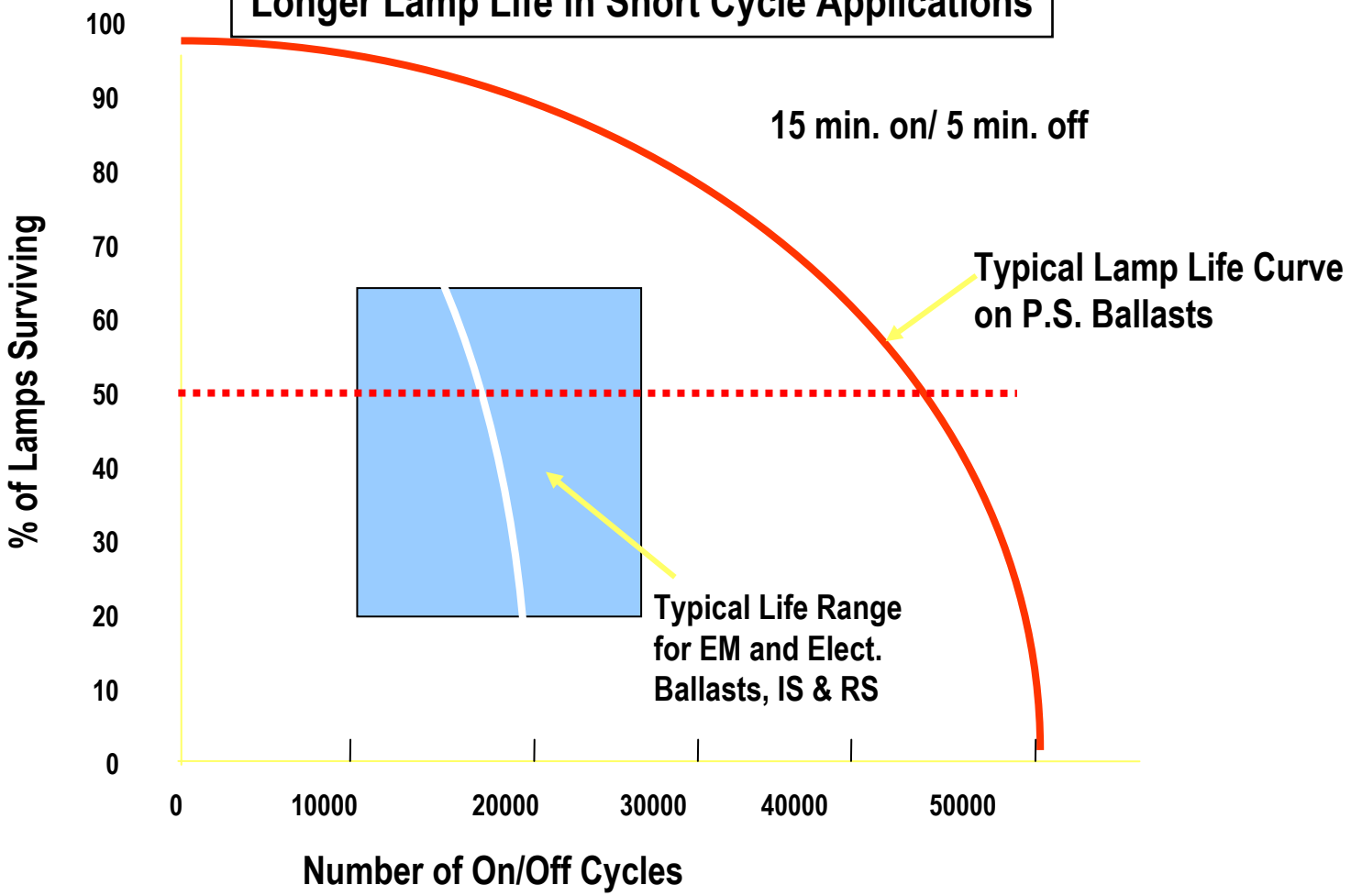


- Up to 40% efficiency improvement over electromagnetic ballasts
- No ballast "hum"
- Cooler operation for reduced air conditioning load
- Can drive up to 4 lamps/ballasts
- Low temperature operation

- High Power Factor
- Low THD
- Light weight
- Instant on
- No flicker
- Universal Input Voltage

Programmed Start Ballasts

Longer Lamp Life in Short Cycle Applications

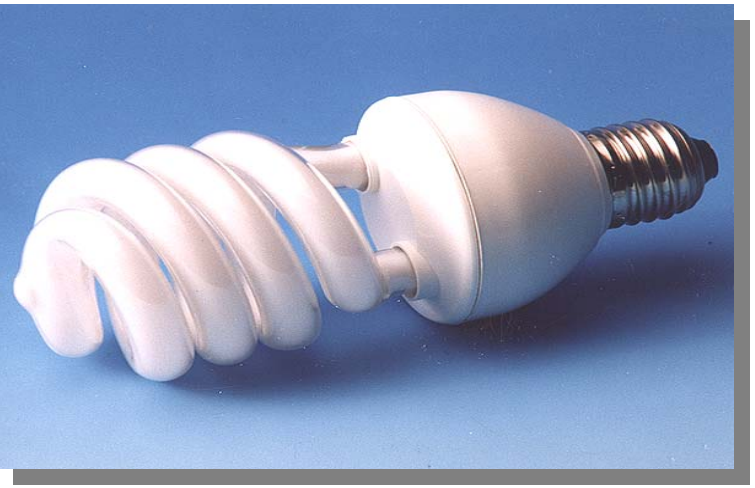


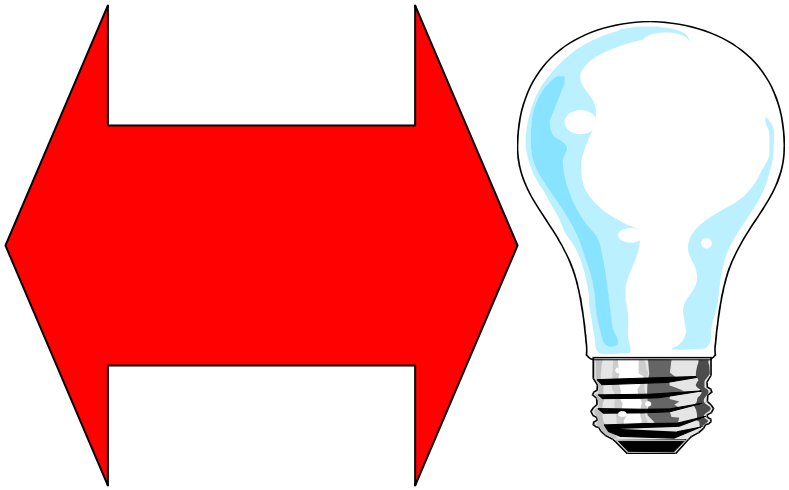
Compact fluorescent lamps, They are all the same...

Osram calls them CF lamps
Philips calls them PL lamps
GE calls them Biax™ lamps

Compact Fluorescent

Light Output Equivalency

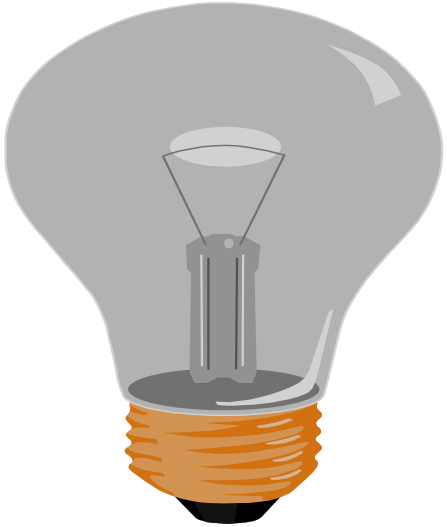




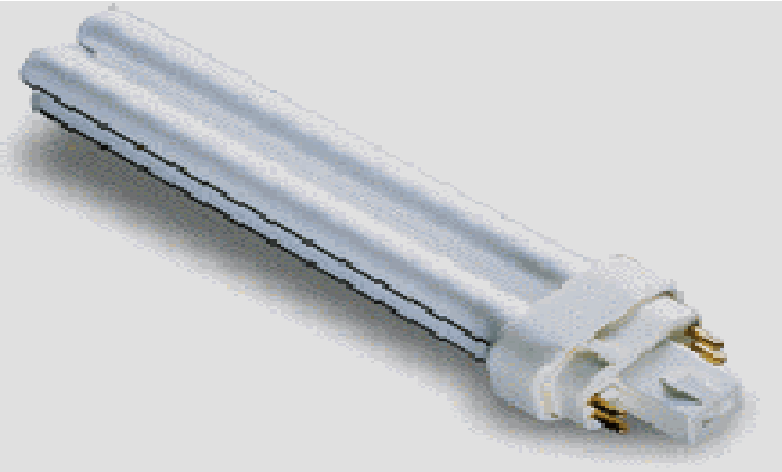
15 - watts	60 - watts
20 - watts	75 - watts
23 - watts	90 - watts

CFL Lamps

- High efficacy
  - **75% energy savings over standard incandescents**
- Long 10,000 hour life
  - **Reduced maintenance costs**

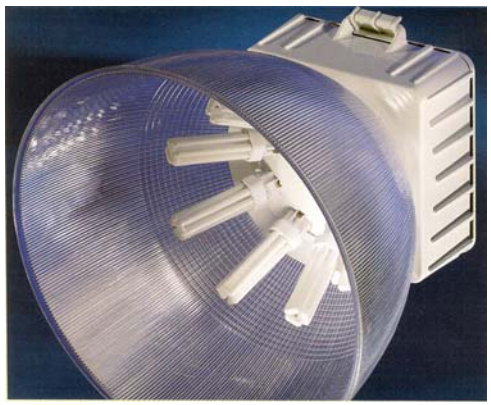


VS.

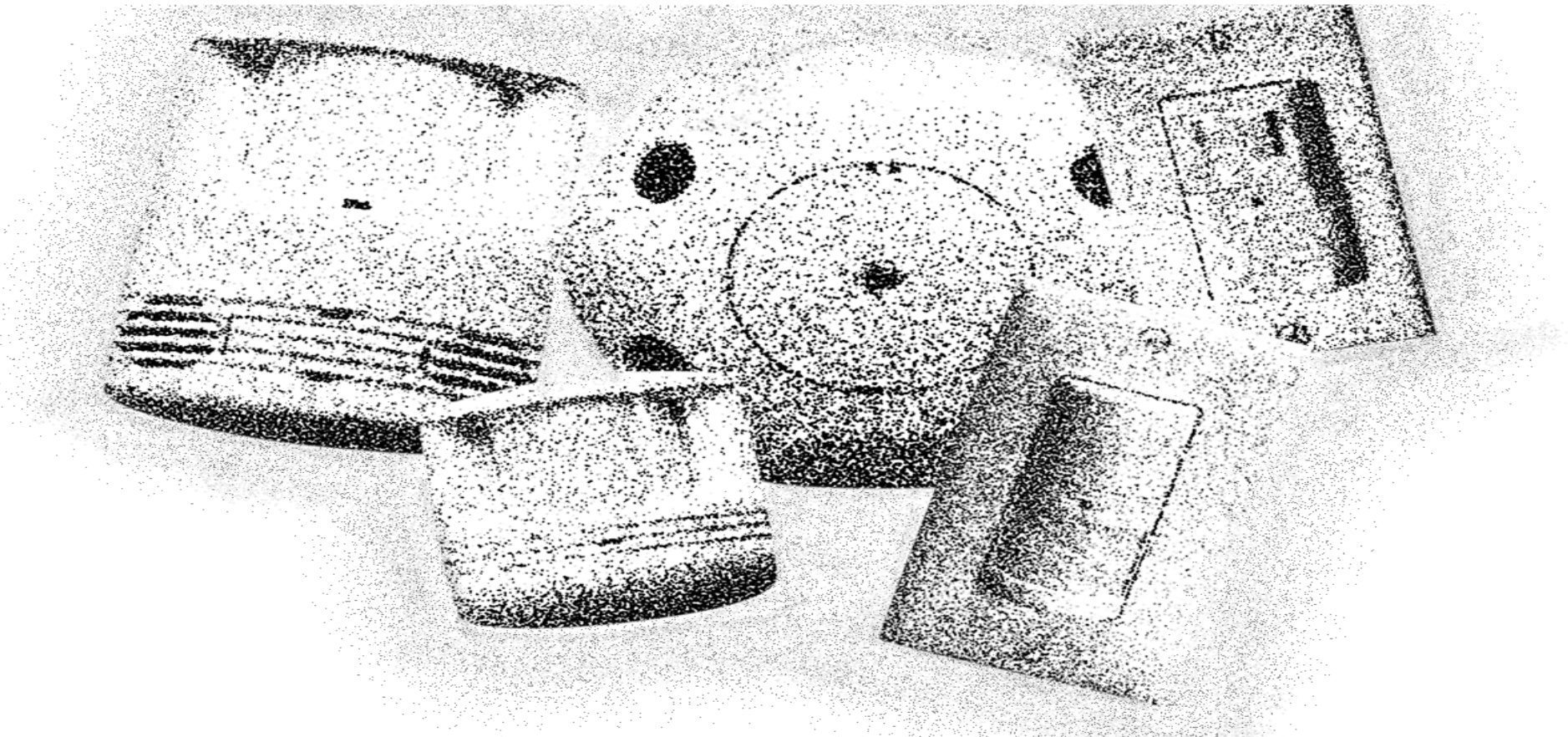


CFL Systems

- Applications: downlights, wall washers, wall sconces, table lamps, floor lamps, pendants, low and high-bay industrial/sports lighting

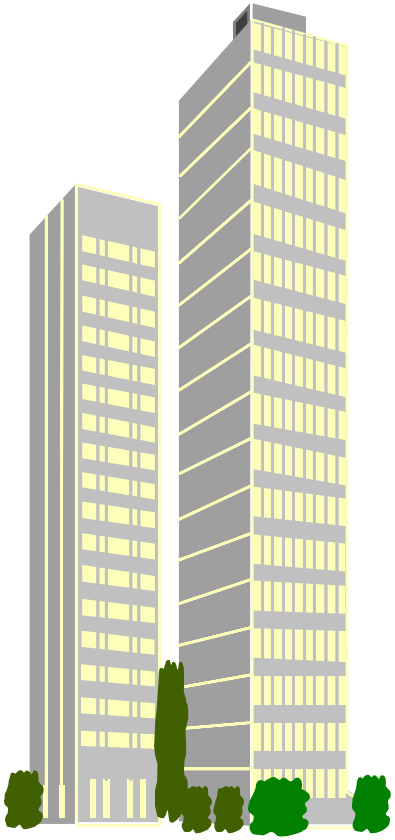


LIGHTING CONTROLS



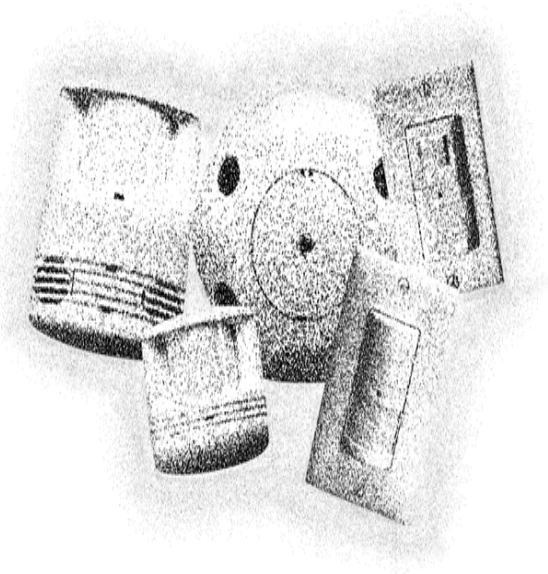
Facility Lighting Issues

- 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 occupancy
  - ON when space is occupied
  - OFF when space is vacant
- Vital component in energy efficient buildings

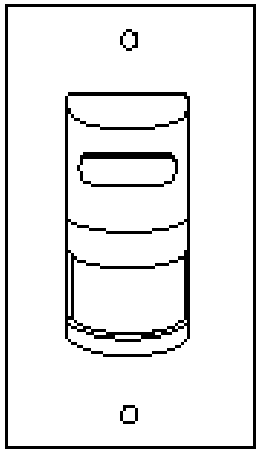


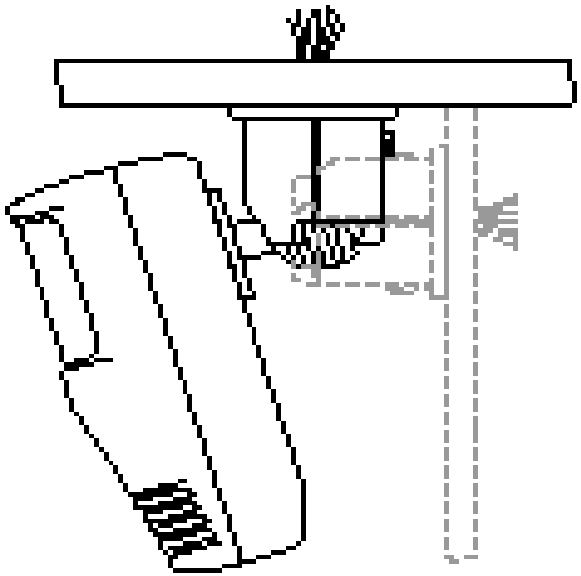
Choosing the Right Sensor

- 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



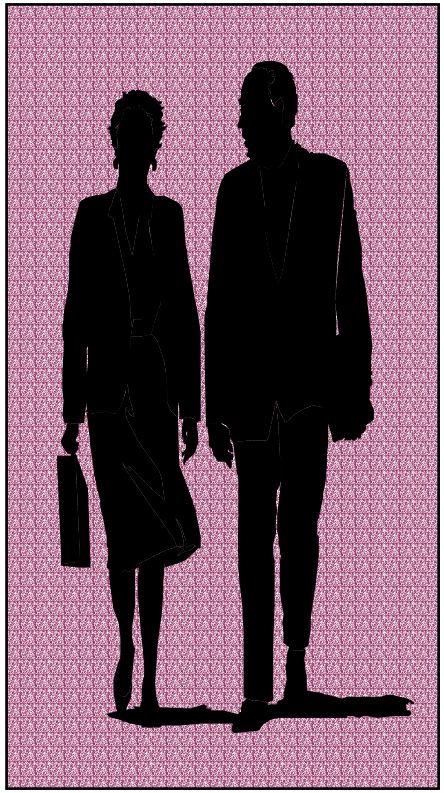


Occupancy Sensor Technologies

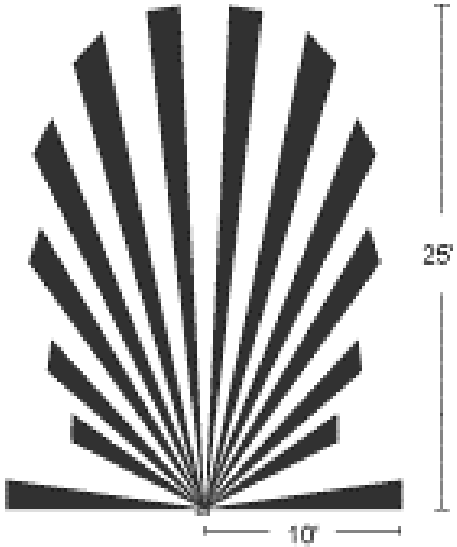
- Different sensor technologies to fit different applications
  - Passive Infrared (PIR)
  - Ultrasonic
  - Dual technology

PIR Technology

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



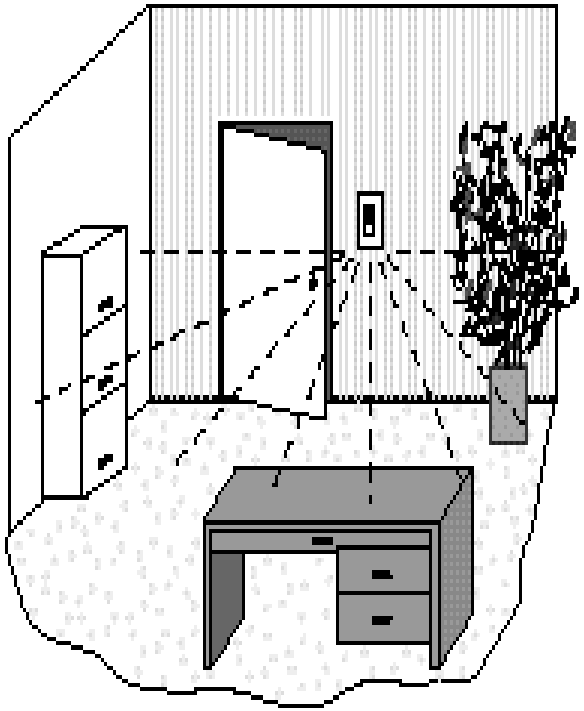
Fresnel Lens



- 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

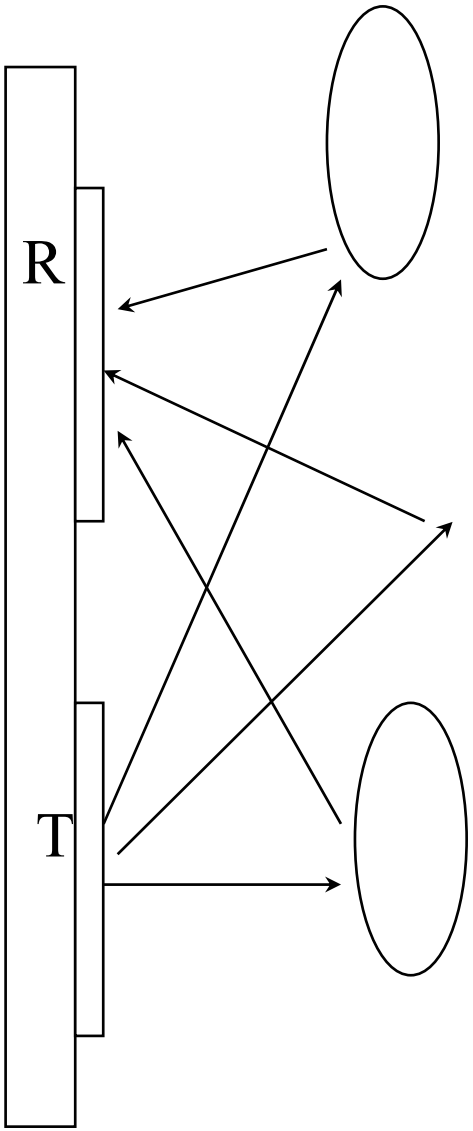


PIR Best Applications

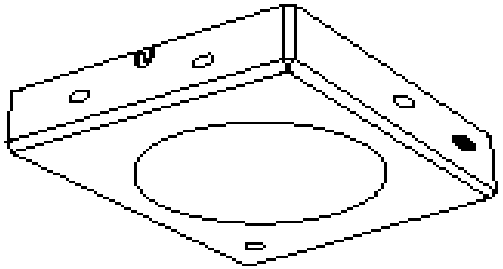
- Enclosed offices
- Hallways
- Areas with high airflow: Computer rooms, labs
- Warehouses and high ceiling mounts
- Areas requiring 100% coverage cut-off
- Wall switch replacements
- Workstation desktops for task lighting & office power control

Ultrasonic Technology

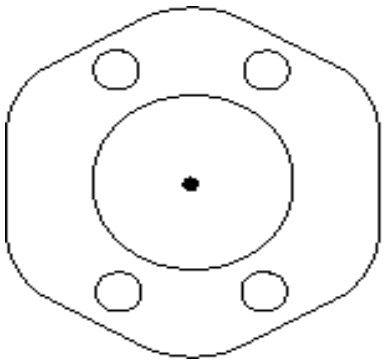
- Volumetric motion detection
- Doppler Principle
- Advanced Signal Processing Circuitry
- Measure amount of time it takes for the high frequency signal to return to sensor
- Movement by a person causes a change in the return time of the signal



Ultrasonic Technology Advantages

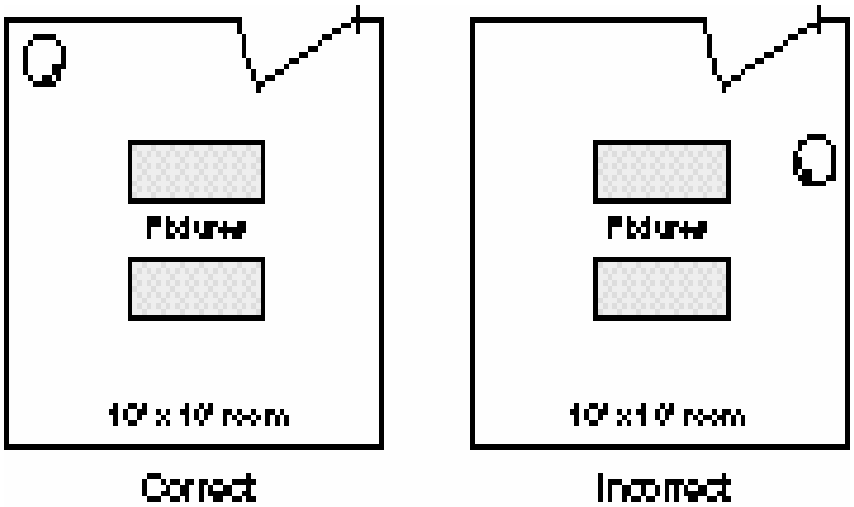


- Capable of detecting occupancy in low-activity settings
- Temperature and humidity resistant receivers
- Omni-directional coverage



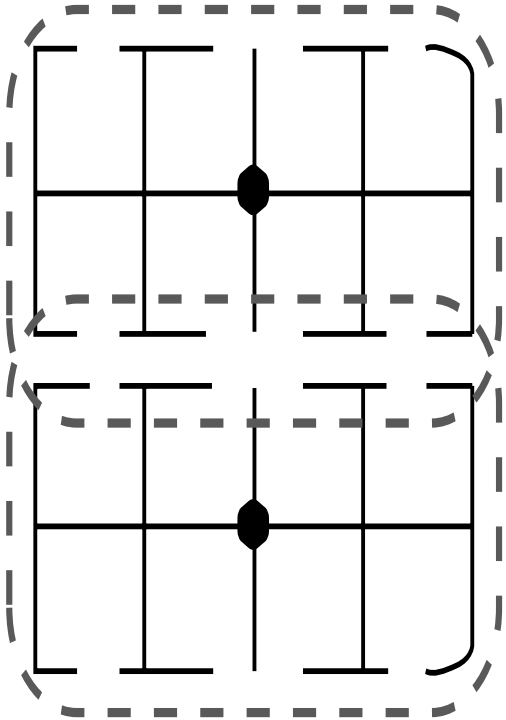
Ultrasonic Sensor Placement

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



Ultrasonic Best Applications

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

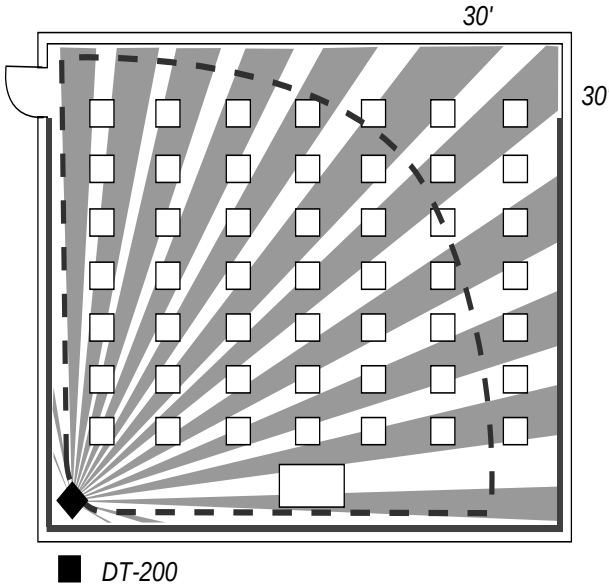


Dual Technology Sensors

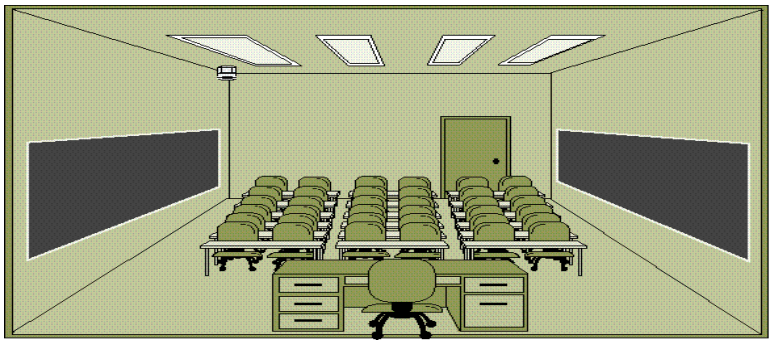
- Combination of PIR and Ultrasonic technologies
- Dual sensing verification principle
- Lighting control solution for difficult applications

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

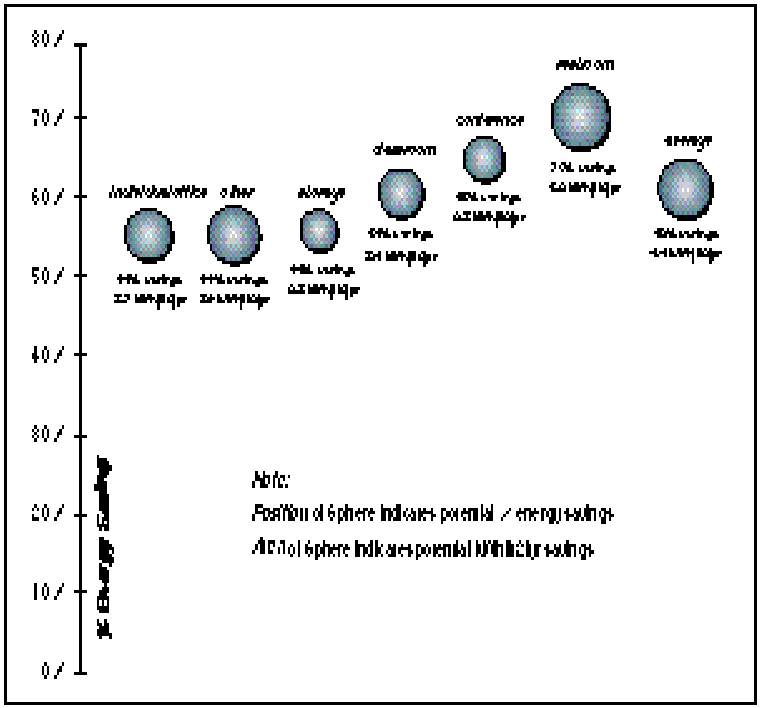
Occupancy Sensors at Work

Facility spaces

- Lobbies
- Classrooms
- Utility rooms
- Conference rooms
- Gymnasiums
- Banquet rooms
- Offices
- Hallways
- Libraries
- Restrooms
- Lunch & break rooms
- Computer rooms
- Stockrooms & storage
- Warehouses
- Open spaces

Energy Savings

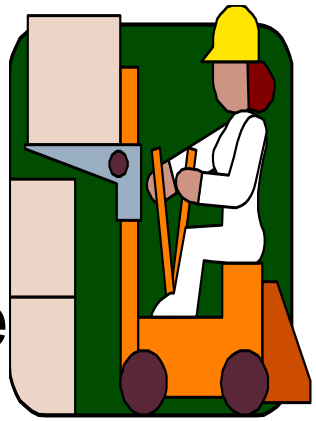
- Offices 15-70%
- Conference rooms 5-24%
- Restrooms 30-75%
- Classrooms 20-75%
- Storage areas 45-65%
- Warehouses 25-75%
- Open office spaces 5-25%

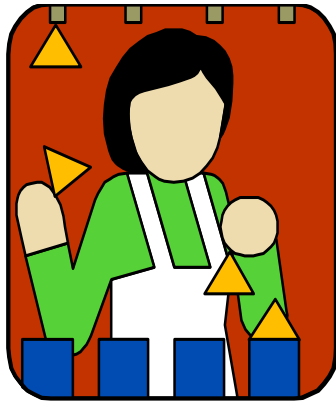


Economic Benefits

- 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)