



## Occupancy Sensors & Daylight Controller Product Specifications

### PART 1 - GENERAL

#### 1.1 OCCUPANCY DETECTION TECHNOLOGY REQUIREMENTS

- A. The occupancy sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
- B. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
- C. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional "dual" technology shall be used.
- D. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
- E. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.

#### 1.2 OCCUPANCY SENSOR OPERATION REQUIREMENTS

- A. Sensors shall offer a minimum on timer of at least 15 minutes, in order to prevent all cycling of lamps before they have burned for the lamp manufacturers minimum recommended time period. This timer shall be in addition to the regular occupancy time delay that keeps lights on after last detected occupancy. User shall be able to disable/enable and change the value of this timer.
- B. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 10 minutes. Sensors with a longer factory default setting shall not be permitted as they greatly restrict energy savings potential.
- C. Manual adjustment to the occupancy time delay so as to increase it shall be accommodated, but shall not be allowed unless a calculation showing the resulting energy savings loss is presented to the building owner and specifying engineer.
- D. Automatic adjustments to the occupancy time delay shall only be permitted if the controlling algorithm maximizes both lamp life and energy savings. For example a shorter more energy saving time delay setting shall only be allowed if the resulting lamp life is also improved.
- E. Installer, in accordance with manufacturer's recommendation, shall determine final sensor location. All sensors shall be factory calibrated for optimum performance for its



installed PIR lens, and shall not require initial or subsequent field adjustment of detection sensitivity.

- F. All sensor setting adjustments shall be digital and made using a push-button. Dip switches, analog dials, and/or the need for tools of any kind shall not be accepted.
- G. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

### 1.3 MISC REQUIREMENTS

- A. All steps in sensor manufacturing process shall occur in the USA; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing. Manufacturing facility must be ROHS compliant.
- B. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.
- C. All applicable products must be UL / CUL Listed or other acceptable national testing organization.
- D. Sensors shall have a 5 year warranty.

### 1.4 APPROVED MANUFACTURER AND SUBSTITUTIONS

- A. Approved manufacturer shall be Sensor Switch, Inc. (800) 727-7483 [www.sensorswitch.com](http://www.sensorswitch.com).
- B. Substitutions must be submitted no less than 5 days prior to bid date. An AutoCAD drawing of the facility showing coverage patterns and technical data must be provided with substitution request. All substitutions must clearly identify any and all exceptions to the specifications with a detailed explanation as to the exception. If substitution is approved, the contractor shall bear the responsibility of a fully functional system to the owner's and specifying engineer/architect's satisfaction.

## PART 2 – PRODUCTS

### 2.1 WALL SWITCH OCCUPANCY SENSORS – SMALL AREAS

- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 20 ft (6.10 m).
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, *Occupancy Sensor Technology Requirements*).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. A version capable of switching 347 VAC shall also be available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
- E. Sensor shall recess into single gang switch box and fit a standard GFI opening.



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- F. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- G. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- H. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology (only exception is versions with lighted push-buttons).
- I. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (off) condition. Sensor shall not require a minimum load to be connected in order to function.
- J. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, low temperature/high humidity operation.
- K. All sensor settings, including time delay and photocell settings shall be digital and accessible for adjustment via a push-button without requiring removal of cover plate or tools of any kind.
- L. Wall Switch sensors shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point as applicable.
- M. All models shall be capable of both Auto-On and Manual On operation.
- N. All models shall be capable of a "Reduced Turn On" operation where the initial PIR turn on level is higher in order to eliminate PIR from reflective surfaces from being detected. PIR shall be returned to normal levels upon initial PIR detection.
- O. All models shall have a "Predictive Off" mode where user can manually turn the lights off when leaving the room and still have them come on automatically when they return to space.
- P. All models shall be capable of disabling override switch.
- Q. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified on individual datasheet.
  - 1. **WSD** (PIR)
  - 2. **WSD 2P** (PIR, Dual Relays, Auto On Pole 1/Manual On Pole 2)
  - 3. **WSD PDT** (PIR/Microphonics)
  - 4. **WSD PDT 2P** (PIR/Microphonics, Dual Relays, On Pole 1/Manual On Pole 2)
  - 5. **WSD SA** (PIR, Manual On by default)
  - 6. **WSD PDT SA** (PIR/Microphonics, Manual On by default)
  - 7. **WSD NL** (PIR, lighted push-button, neutral required)
  - 8. **WSD PDT NL** (PIR/Microphonics, lighted push-button, neutral required)
  - 9. **WSD LV** (PIR, low voltage, power pack required)
  - 10. **WSD PDT LV** (PIR/Microphonics, low voltage, power pack required)

## 2.2 WALL SWITCH OCCUPANCY SENSORS – LARGE AREAS



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- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 40 ft (12.19 m).
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, *Occupancy Sensor Technology Requirements*).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz. A version capable of switching 347 VAC shall also be available. Load ratings shall be 13A each pole, ¼ HP motor load.
- E. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- F. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- G. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
- H. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (Off) condition. Sensor shall not require a minimum load to be connected in order to function.
- I. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified.
  - 1. **LWS(H)** (PIR)
  - 2. **LWS(H) 2P** (PIR, Dual Relays)
  - 3. **LWS(H) PDT** (PIR/Microphonics)
  - 4. **LWS(H) PDT 2P** (PIR/Microphonics, Dual Relays)

### 2.3 LOW VOLTAGE OCCUPANCY SENSORS

- A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, *Occupancy Sensor Technology Requirements*).
- C. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.
- D. Sensors shall interconnect with other sensors and power/relay packs with class 2, three-conductor wire.
- E. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.



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- F. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.
- G. Each designated zone shall contain one sensor with a SPDT class 2 auxiliary relay, providing an input to building automation system (BAS). All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that power pack must be installed on the Line side of the local toggle switch for auxiliary relay to work properly.
- H. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- I. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- J. Sensors shall be the following Sensor Switch model numbers.
  - 1. **CM 9** (PIR, Ceiling Mount, Standard Range)
  - 2. **CM PDT 9** (PIR/Microphonics, Ceiling Mount, Standard Range)
  - 3. **CM 10** (PIR, Ceiling Mount, Extended Range)
  - 4. **CM PDT 10** (PIR/Microphonics, Ceiling Mount, Extended Range)
  - 5. **WV 16** (PIR, Corner Mount, Wide View)
  - 6. **WV PDT 16** (PIR/Microphonics, Corner Mount, Wide View)
  - 7. **HW13** (PIR, Wall Mount, Hallway View)
  - 8. **HM 10** (PIR, Surface Mount Box, High Bay Aisle Way)
  - 9. **CM 6** (PIR, Ceiling Mount, High Bay 360°)
- K. Sensors with a recessed profile are acceptable substitutes for above ceiling mount sensors (e.g. **CM 9** => **RM 9**)
- L. Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors (e.g. **CM 9** => **CMB 9**)

## 2.4 POWER PACKS

- A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.
- B. Power pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
- C. When required by local code, power pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to



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pass through chase nipple into adjacent junction box without any exposure of wire leads.

- D. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for 400,000 cycles.
- E. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.
- F. Power packs shall be the following Sensor Switch model numbers.
  - 1. **PP20** (Single Pole)
  - 2. **PP20 2P** (Two Pole)
  - 3. **SP20** (Slave Pack)

## 2.5 LINE VOLTAGE OCCUPANCY SENSORS

- A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.
- B. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- C. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, *Occupancy Sensor Technology Requirements*).
- D. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.
- E. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- F. Multiple sensors controlling the same load shall be wired in parallel.
- G. For applications requiring independent control of two loads, a sensor with two dual relays shall be required. Each relay shall have independent programmable occupancy time delays.
- H. Dual relay sensors shall have an optional operational mode called "Alternating On" where when during unoccupied periods, one relay is always left closed (thus one load is always on). The particular relay that is left closed alternates each cycle so that the aging of the connected lamps is even.
- I. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. A version capable of switching 347 VAC shall also be available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.



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- J. Specific sensors capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
- K. Wall mounted sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.
- L. High bay sensors controlling HID Bi-Level must incorporate a "Start to High" timer on initial power up to provide full light output for up to 20 minutes to prevent shortened lamp life.
- M. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- N. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- O. Sensors shall be the following Sensor Switch model numbers.
  - 1. **CMR 9 / CMR 9 2P** (Standard Range 360°, PIR, Ceiling Mount – Single / Two Pole)
  - 2. **CMR PDT 9 / CMR PDT 2P** (Standard Range 360°, PIR/Microphonics Dual Technology, Ceiling Mount – Single / Two Pole)
  - 3. **CMR 10 / CMR 10 2P** (Extended Range 360°, PIR, Ceiling Mount – Single / Two Pole)
  - 4. **CMR PDT 10 / CMR PDT 10 2P** (Extended Range 360°, PIR/Microphonics Dual Technology, Ceiling Mount – Single / Two Pole)
  - 5. **CMRB 10 / CMRB 10 2P** (Extended Range 360°, PIR, Fixture Mount Box – Single / Two Pole)
  - 6. **CMRB PDT 10 / CMRB PDT 10 2P** (Extended Range 360°, PIR/Microphonics Dual Technology, Fixture Mount Box – Single / Two Pole)
  - 7. **WVR 16 / WVR 16 2P** (Wide View, PIR, Wall Mount – Single / Two Pole)
  - 8. **WVR PDT 16 / WVR PDT 2P** (Wide View, PIR/Microphonics Dual Technology, Wall Mount – Single / Two Pole)
  - 9. **CMR 6 / CMR 6 2P** (High Bay 360°, PIR, Ceiling Mount – Single / Two Pole)
  - 10. **CMRB 6 / CMRB 6 2P** (High Bay 360°, PIR, Fixture Mount Box – Single / Two Pole)
  - 11. **CMRB 50 / CMRB 50 2P** (High Bay Aisleway, PIR, Fixture Mount Box – Single / Two Pole)
  - 12. **HMRB 10** (High Bay End-of-Aisle, PIR, Fixture Mount Box)
- O. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors (e.g. **CMR 9 => RMR 9**)

## 2.6 INDOOR PHOTOCELLS AND DAYLIGHT HARVESTING CONTROLS



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- A. Low voltage photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.
- B. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
- C. Photocell set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Further adjustment may be made manually if needed.
- D. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
- E. Low voltage dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
- F. Low voltage dimming sensor's set point shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
- G. Low voltage dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
- H. Combination photocell/dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the on/off function as well as the dimming function of 0 to 10 VDC dimmable ballasts.
- I. Combination photocell/dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set point may be manually entered.
- J. Combination photocell/dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
- K. Dual zone option shall be available for photocell, dimming, or combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.
- L. Stand alone ambient light sensors (CM ALC version only) shall interface directly with the 0 to 10 VDC, without any other power source connection, and control dimmable ballasts by sinking up to 20 milliamps of class 2 current. Sensor shall incorporate a photodiode viewing out of a ceiling enclosure at a 30 degree angle from horizontal to detect diffused light from the ambient and artificial sources. Sensor shall allow for removal of response delays for adjustment, however provide dampening delay for normal operation. Settings shall be made manually.
- M. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. A version capable of switching 347 VAC shall also be



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available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.

- N. Line voltage versions of the above described dimming sensors shall be capable of powering off 120/277 VAC.
- O. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
- P. Sensors shall be the following Sensor Switch model numbers.
  - 1. **CM PC** (Photocell, On/Off, Low Voltage, Ceiling Mount)
  - 2. **CM ADC** (Dimming Photocell, Low Voltage, Ceiling Mount)
  - 3. **CM PC ADC** (Combination Photocell/Dimming Sensor, Low Voltage, Ceiling Mount)
  - 4. **CM PC DZ, CM ADC DZ, or CM PC ADC DZ** (Dual Zone, Low Voltage)
  - 5. **CM ALC** (Stand Alone Ambient Light Sensor for Daylight Harvesting)
  - 6. **CMR PC** (Photocell, On/Off, Line Voltage, Ceiling Mount)
  - 7. **CMR ADC** (Dimming Photocell, Line Voltage, Ceiling Mount)
  - 8. **CMR PC ADC** (Combination Photocell/Dimming Sensor, Line Voltage, Ceiling Mount)
  - 9. **CMR PC DZ, CMR ADC DZ** (Dual Zone, Line Voltage)
- Q. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors (e.g. **CMR PC => RMR PC**)
- R. Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors (e.g. **CMR PC => CMRB PC**)