

DT-300

v3

360° Dual Technology • Low Voltage Occupancy Sensor

with Light Level, Isolated Relay and Manual On feature



Specifications

Voltage	18-28VDC/VAC, half wave rectified AC
Current Consumption	25 mA
Power Supply.....	WattStopper Power Packs
Isolated Relay Rating	1A @30VDC/VAC
Operating Temperature	32° to 131°F (0° to 55°C)
Light Level One-Step Adjustment	10FC—300FC
Time Delay Adjustment.....	30 seconds to 30 minutes
Walk-Through Mode	3 minutes if no activity after 30 sec
Test Mode.....	5 sec. upon DIP switch reset
PIR Coverage (Typical)	1300 ft ²
Sensitivity Adjustment	High or Low (DIP switch setting)
Ultrasonic Coverage (Typical).....	1300 ft ²
Sensitivity Adjustment	Min. to Max. (trimpot)
Frequency.....	40kHz
UL & CUL Listed for use with WattStopper Power Packs	

WattStopper®

U.S. Patent: 7,277,012
Santa Clara, CA 95050

Installation Instructions

UNIT DESCRIPTION

The WattStopper DT-300 360° Dual Technology occupancy sensors combine advanced passive infrared (PIR) and ultrasonic technologies into one unit. The combination of these technologies helps to eliminate false triggering problems even in difficult applications.

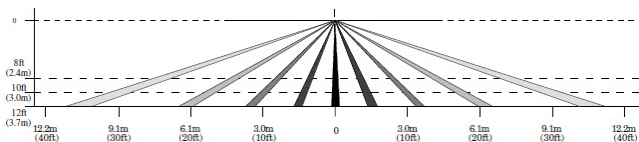
The DT-300 turns lighting systems on and off based on occupancy. The DT-300 provides numerous operating modes that can be combined to create the ideal custom control. The sensors can be configured to turn lighting on, and hold it on as long as either or both technologies detect occupancy. After no movement is detected for a user specified time (30 seconds to 30 minutes) the lights are switched off. A "walk-through" mode can turn lights off after only 3 minutes, if no activity is detected after 30 seconds of an occupancy detection.

The DT-300 operates on 24V supplied by WattStopper Power Packs. DT-300 sensors also have an isolated relay with Normally Open and Normally Closed contacts for interfacing with HVAC or EMS.

COVERAGE PATTERN

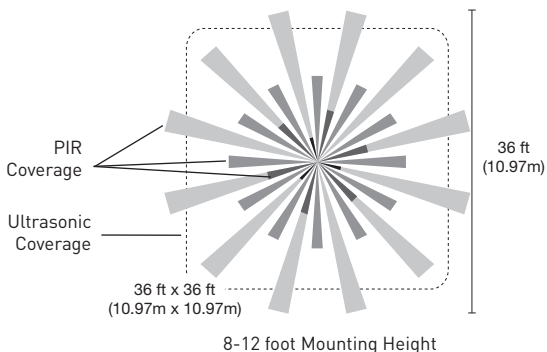
The DT-300 provides a 360° coverage pattern. The coverage shown represents walking motion at a mounting height of 8-12 feet. For building spaces with lower levels of activity or with obstacles and barriers, coverage size may decrease. The coverage for PIR ONLY trigger mode varies with mount height. Refer to pattern below for details. Ultrasonic coverage is roughly the same for 8-12 foot mount heights. Refer to PIR and Ultrasonic trigger mode coverage for details.

Side View



PIR ONLY Coverage

Top View



Drawings not to scale, representative of PIR and Ultrasonic Trigger Mode major motion coverage

PLACEMENT GUIDELINES

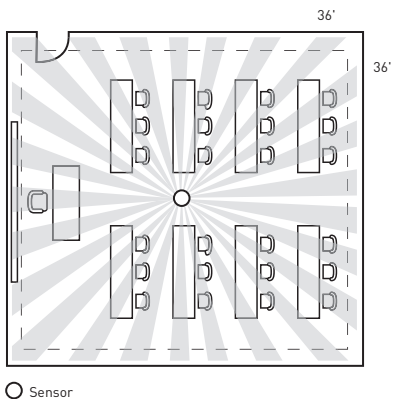
Depending upon obstacles such as furniture or room layout, the area of coverage may be less or more than the sensing distances shown in the coverage pattern. This must be considered when planning the number of sensors and their placement. It is also recommended to place the sensor **at least 4 to 6 feet away from air supply vents**.

Mount the sensor to the ceiling. The DT-300 is designed for a ceiling heights of about 8-12 feet. Mounting above or below this range will significantly affect the coverage patterns. As a general rule, each occupant should be able to clearly view the sensor.

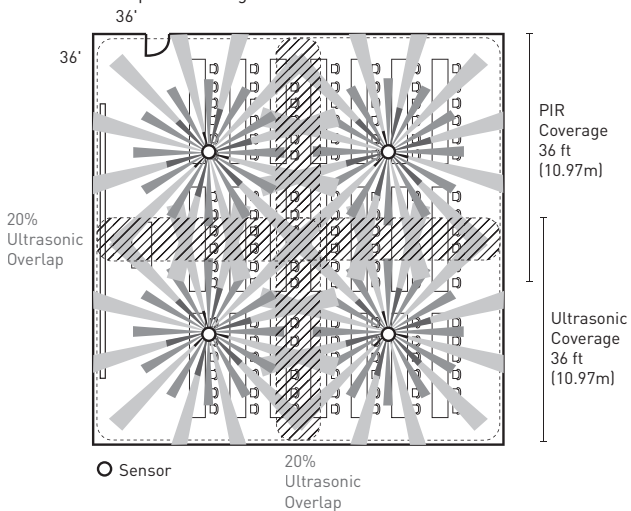
Masking the PIR Lens: Opaque adhesive tape is supplied so that sections of the PIR lens can be masked. This restricts the sensor's view and allows you to eliminate PIR coverage in unwanted areas such as hallways outside of the desired coverage area. Since masking removes bands of coverage, remember to take this into account when troubleshooting coverage problems. The Ultrasonic coverage cannot be masked, but you can adjust its sensitivity to reduce the coverage area.

Common application: Classroom: Position the sensor so that the maximum coverage is achievable. Be sure that the sensor is not pointing out the door.

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If the space is larger than 30' x 30' it will be necessary to use more than one sensor to ensure complete coverage.



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WIRING DIRECTIONS



CAUTION



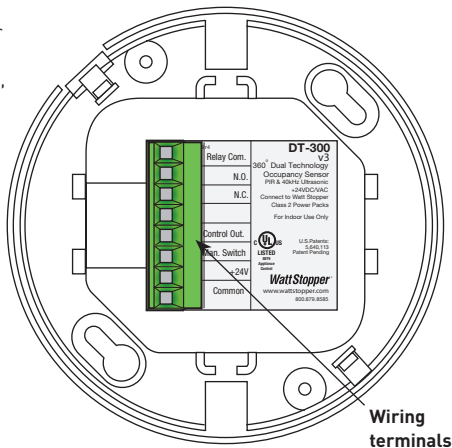
TURN POWER OFF AT THE CIRCUIT BREAKER BEFORE INSTALLING POWER PACKS, SWITCHES OR SENSORS.

Each WattStopper BZ series power pack can supply power for 5 DT-300 sensors. When using more sensors than this, multiple power packs are required.

Refer to the wiring diagram on the next page for the following procedures:

Connect the **low voltage**:

- RED wire (+24VDC) from power pack to the **+24V** terminal on the sensor.
- BLACK wire (Return) from power pack to **Common** terminal on the sensor.
- BLUE wire from power pack to **Control Out** terminal on sensor.



To add a MANUAL SWITCH such as the LVS-1 Momentary Toggle Switch, or RS2-3 Low Voltage Momentary Switch to the above applications (see wiring diagram “Manual-On wiring with low voltage momentary switch”) – connect:

- Wire from one side of switch to **+24V** terminal on sensor.
- Wire from other side of switch to **Man Switch** terminal on sensor.

Wiring the ISOLATED RELAY: The Isolated Relay is rated for 1A@30VAC/VDC. Connect the wires necessary to the application that requires this output:

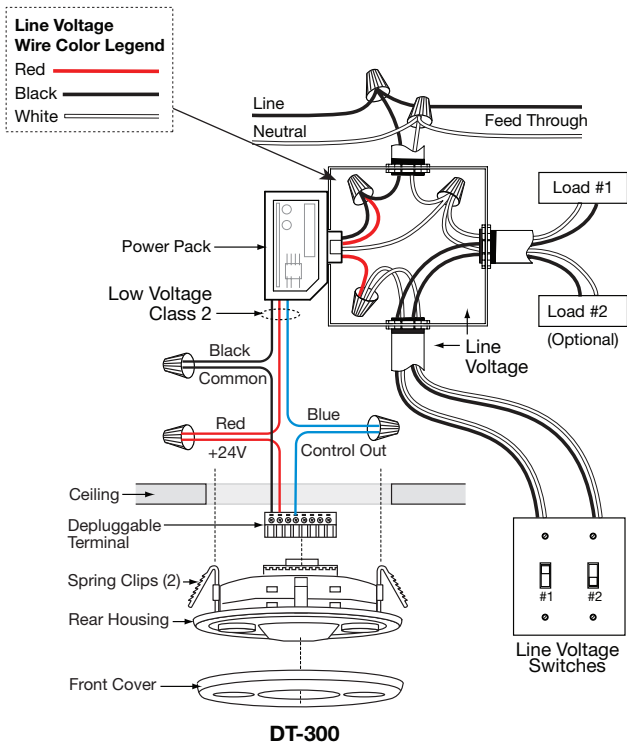
- **Relay Common** (must be used for proper operation)
- **N.O.** (Normally Open)–Closed when occupancy is detected
- **N.C.** (Normally Closed)–Open when occupancy is detected

CONNECTING WIRES

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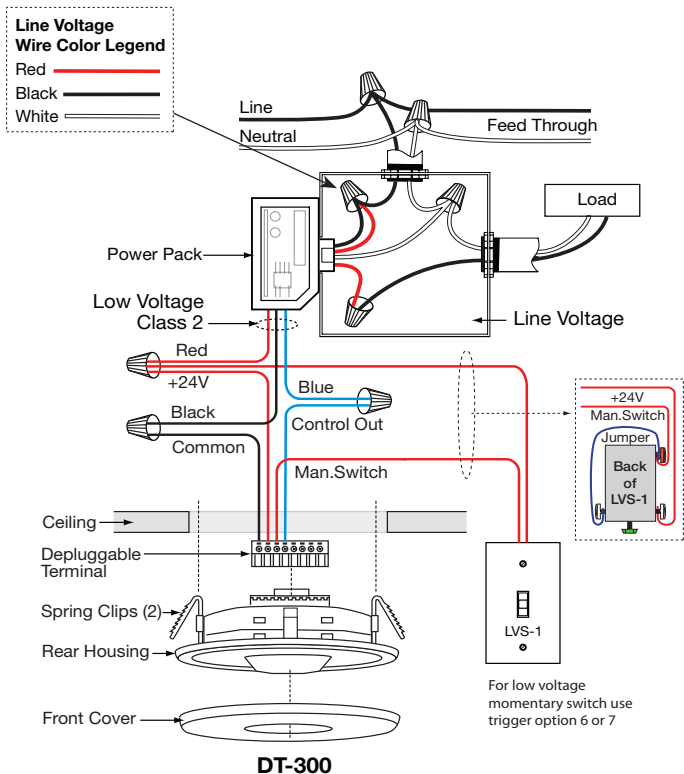
- Care should be taken to separate high voltage power from low voltage (Class 2) control wiring.
- All connections to sensor are low voltage, Class 2.

Standard wiring with local off switch



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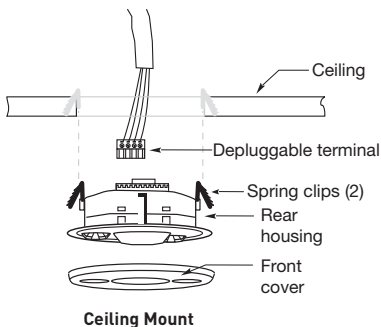
Manual-On wiring with low voltage momentary switch



MOUNTING THE SENSOR

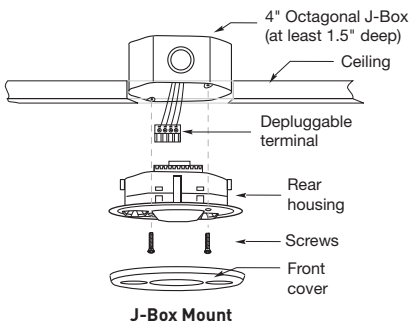
Directly to Ceiling

1. Attach the plastic spring clips to the edge of the sensor in the slots provided.
2. Cut a 3.5" to 4" round hole in the acoustic ceiling tile at the mounting location. A 3.5" hole is recommended for a secure fit.
3. Pull the low voltage wire from the power pack to the sensor through the hole.
4. Connect the low voltage wires to the appropriate terminals on the sensor.
5. Push the sensor up through the hole until the Spring Clips hold the sensor securely in place.
6. Snap the front cover onto the sensor.



Using an Octagonal J-Box

1. Pull the low voltage wires from the power pack into the J-Box through the conduit knockout.
2. Connect the low voltage wires to the appropriate terminals on the sensor.
3. Loosen the appliance mounting screws attached to the J-Box.
4. Align the sensor in the J-Box so that the mounting screws on the box match the key holes on the sensor's rear housing.
5. Push the sensor up into the J-Box and twist it so that the mounting screws are seated in the keyhole slots.
6. Tighten the two screws to secure the sensor to the J-Box.
7. Snap the front cover onto the sensor.



SENSOR ADJUSTMENT

This unit is pre-set for basic operation as described in this guide. Adjustment is optional.

The sensors are factory preset to allow for quick installation in most applications. Verification of proper wiring or coverage, or customizing the sensor's settings can be done using the following procedures. To make adjustments, open the Front Cover by pulling on the cover tab.

There is a 30 second warm-up period when power is first applied.

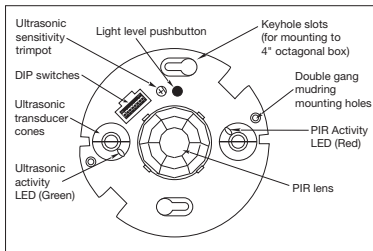
Before making adjustments, make sure the office furniture is installed, lighting circuits are turned on, and the HVAC systems are in the overridden/on position. VAV systems should be set to their highest airflow. Set the Logic Configuration and Time Delay to the desired settings. See "Logic Configuration Chart".

To Test Occupancy Sensors

1. Ensure the Time Delay is set for **Test Mode*** using the "Test Mode/20 minutes" setting. (DIP switches 1, 2, & 3 are **OFF**).
2. Ensure that the Light Level is at default (maximum). Press and hold the pushbutton for 5 seconds or until the Green LED flashes rapidly. Wait 10 seconds for the flashing to stop.
3. Ensure that the Ultrasonic Sensitivity trimpot is set to about 70%, clockwise.
4. Remain still. The red and green LEDs should not flash. The lights should turn off after 5 seconds. (If not, see "Troubleshooting.")
5. Move around within the coverage area. The lights should come on. Adjust the Ultrasonic Sensitivity as necessary to provide the desired coverage (Green LED indicates activation from the ultrasonic sensor).

When testing and adjustment is complete, reset DIP Switches and Light Level to the desired settings, and replace the cover on the sensor.

***Test Mode** is a temporary state that starts when you first set the sensor's DIP switches for the "Test Mode/20 minutes" (switches 1, 2, 3 **OFF**). If you need to invoke the **Test Mode** and the DIP switches are already set for Test Mode/20 minutes, toggle DIP switch 1 **ON** then back to the **OFF** position. This provides a 10 minute test period. During the test period, the Time Delay is only 5 seconds.



LIGHT LEVEL FEATURE

The Light Level feature holds lights off upon initial occupancy if adequate ambient light exists. It will not turn the lights off if they are on. The default setting is for maximum, meaning that even the brightest ambient light will not hold the lights off.

Notes on Functionality

- Avoid mounting the sensor close to lighting fixtures
- Adjust during daylight hours when ambient light in the area is at desired level.
- Light Level cannot be enabled while Test Mode is active. Either wait for Test Mode to expire or select any of the other Time Delay settings before enabling the Light Level feature.
- Ultrasonic occupancy indicator from LED is disabled when the Light Level feature is enabled. PIR occupancy indicator LED may still respond when lights are being held off. LEDs will also flash periodically to indicate the sensor has Light Level enabled.
- Light Level settings are only saved in the event of a power loss. Disabling Light Level and then reenabling it will not return it to previous settings.
- If Test Mode is enabled after Light Level has been set, Light Level functionality will cease to function throughout the duration of Test Mode. When Test Mode period expires, the Light Level functionality will resume, even if the Dip Switches remain set to Test Mode.

Setting Light Level

1. Make sure Test Mode is not active.
2. Toggle the state of the sensor, by briefly pressing the Light Level button, to include or exclude the lighting load from the light level calibration. Open the Front Cover and locate the Light Level pushbutton. See Sensor Adjustment.
3. Press and hold the Light Level button for 2 or more seconds, or until the detection LEDs turn On. Do not exceed 5 seconds.* The sensor enters setup mode, as indicated by the rapidly flashing LEDs. The LEDs will flash throughout the setup process. Occupancy indications from the LEDs are disabled during setup.
4. Move away from the sensor to avoid interference with light level detection. The sensor measures the light level for a 10 second period, then averages the readings and automatically sets the level that will be used as the new setting. The sensor will hold lights off when the ambient light exceeds this setting.

5. When the two LEDs stop flashing, replace the Front Cover

***Disabling Light Level**

Pressing the pushbutton for 5 seconds or more resets the light to default (maximum).

Press and hold the Light Level button for 5 seconds or until the detection LED(s) turn ON and then OFF. the LEDs flash rapidly for 10 seconds after the setting has changed.

DIP SWITCH SETTING

TIME DELAY: SWITCHES 1, 2, 3

The sensor will hold the lights **ON** as long as occupancy is detected. The time delay countdown starts when no motion is detected. After no motion is detected for the length of the time delay, the sensor will turn the lights **OFF**.

WALK-THROUGH: SWITCH 4

Walk-through mode turns the lights **OFF** three minutes after the area is initially occupied, if no motion is detected after the first 30 seconds. If motion continues beyond the first 30 seconds, the selected time delay applies.

PIR SENSITIVITY: SWITCH 5

- Minimum forces a reduced detection range for the PIR.
- Maximum causes the DT-300 to monitor the controlled environment and automatically select the maximum sensitivity that will provide reliable operation without false detection. This setting is constantly updated.

OCCUPANCY LOGIC: SWITCHES: 6, 7, 8

The DT-300 has 8 logic configurations for occupancy triggers, set with DIP switches 6, 7 & 8. Determine the appropriate Occupancy Logic Option using the Trigger matrix, then set the DIP switches accordingly.

Initial Occupancy: The method that activates a change from "Standby" (area unoccupied and loads are **OFF**) to "Occupied" (area occupied and loads are **ON**).

- **Both** requires detection by PIR **and** Ultrasonic.
- **Either** requires detection by only one technology.
- **PIR** requires detection by the PIR.
- **Man.** requires activation of the Manual Switch. (See Manual **ON** functions" for further information.)

Maintain Occupancy: The method indicating that the area is still occupied and the lights should remain **ON**.

Re-trigger: After the time delay elapses and the lights turn **OFF**, detection by the selected technology within the number of seconds indicated turns the lights back **ON**.

Logic Configuration Chart

Feature	Switch#	1	2	3
Time Delay		1	2	3
Test Mode/20 min		↓	↓	↓
30 seconds		↓	↓	↑
5 minutes		↓	↑	↓
10 minutes		↓	↑	↑
15 minutes		↑	↓	↓
20 minutes		↑	↓	↑
25 minutes		↑	↑	↓
30 minutes		↑	↑	↑

Walk-Through	4
Enabled	↑
Disabled	↓

PIR Sensitivity	5
Minimum	↑
Maximum	↓

Occupancy Logic	Settings	6	7	8
	Standard	↓	↓	↓
	Option 1	↑	↓	↓
	Option 2	↑	↑	↓
	Option 3	↑	↑	↓
	Option 4	↑	↓	↑
	Option 5	↑	↓	↑
	Option 6	↑	↑	↑
Option 7	↑	↑	↑	

Occupancy Logic	Trigger	Initial Occupancy	Maintain Occupancy	Re-trigger (seconds duration)
	Standard	Both	Either	Either(5)
	Option 1	Either	Either	Either(5)
	Option 2	PIR	Either	Either(5)
	Option 3	Both	PIR	Both(5)
	Option 4	PIR	PIR	PIR(5)
	Option 5	Either	PIR	Either(5)
	Option 6	Man.	Either	Either(30)
Option 7	Man.	PIR	Both(30)	

◀ = Factory Setting

↑ = ON

↓ = OFF

MANUAL ON FUNCTION

The Manual **ON** function is facilitated by installing a momentary switch such as Watt Stopper LVS-1 Momentary Toggle Switch, or RS2-3 Low Voltage Momentary Switch. The switch connects to the sensor's Manual (Man.) Switch and +24V terminals as shown in the wiring diagram. Each time the switch is pressed, the load changes state. The sensor's operation as related to the manually operated switch is determined by DIP switch settings for Occupancy Logic.

Manual Mode (Trigger Option 6 or 7): In this mode, the switch **is required** to turn on the load. The sensor keeps the load on, based on occupant activity. After the time delay ends, if there is no movement detected within the 30 second re-trigger period, the load turns **OFF** and the manual switch must be used to turn **ON** the load.

Automatic Mode (any Trigger Option except 6 or 7): These options use occupancy triggers as well as switch activation to turn the load **ON**. A manual switch provides the following additional functionality:

- a. The load can be turned **ON** using the manual switch and it stays on according to the occupancy logic setting. The time delay operates as programmed. When the load turns **OFF** due to lack of occupancy detection, it can be turned **ON** again by occupancy detection or the switch.
- b. Activating the manual switch while the load is **ON** turns the load **OFF**.
 - When the load is turned **OFF** manually, as long as the sensor continues to detect occupancy the load stays **OFF**. The length of the time delay after the last occupancy detection, the lights stay off and the sensor reverts to the automatic-on mode.
 - When the load is turned **OFF** manually, pressing the switch again turns the load **ON** and the sensor reverts to the automatic-on mode.
 - Once returning to automatic-on mode, either the switch or occupancy detection can turn the load **ON**.

OVERLOAD PROTECTION

The occupancy sensor has a built in overload protection function that will automatically turn off the control output when the load current exceeds 200mA. The sensor LEDs will then blink rapidly (~ 10Hz) to provide a visual indication of an overload condition. When the load current is corrected or returns to normal, the control output will turn back on.

TROUBLESHOOTING



CAUTION



**TURN POWER OFF AT THE CIRCUIT BREAKER
BEFORE WORKING WITH OR NEAR HIGH VOLTAGE.**

For any unexpected operation

1. Check DIP switch settings.
2. Make sure the switches are set according to the defined settings in the DIP Switch Setting chart.

Lights do not turn on when entering the room.

Neither LED Flashes

1. Check that the circuit breaker has been turned back on.
2. Check all sensor and power pack wire connections.
3. Check for 24VDC input to the sensor between the red and black low voltage wires.
 - If 24VDC is present, replace the sensor.
 - If 24VDC is not present, check the high voltage connections to the power pack.
 - If high voltage connections are good and high voltage is present, replace the power pack.

Red LED does not flash

1. When power is initially applied to the sensor, there is a warm-up period of 30 to 60 seconds before the LED becomes active.
2. Make sure PIR sensitivity is set to 100% (DIP switch #5 is in the "off" position).

Green LED does not flash

Ultrasonic sensitivity setting may need to be increased. Turn adjustment trimpot clockwise until the LED begins to flash when movement occurs.

Green LED is on steady

Check ultrasonic sensitivity trimpot. Fully counterclockwise position is the override for the sensor. Turn trimpot clockwise until LED flashes only when movement occurs in the desired coverage area.

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Red and Green LEDs flash

1. Check all sensor and power pack connections.
2. Check if Light Level is enabled.
 - If occupancy indicator LEDs blink together every few seconds, sensor is using Light Level feature.
 - If Light Level functionality is not desired, press and hold for 5 seconds to return sensor to the default setting (maximum).
3. Check for 24VDC at the power pack blue and black wire connections to sensor while sensor is active.
 - If there is no voltage, replace the sensor.
 - If there is voltage, check for 24VDC between the blue and black wire at the power pack. If 24VDC is present and the relay is not closing, replace it.
 - If 24VDC is not present, check for a break in the low voltage wiring.
4. If LEDs are flashing rapidly (~10Hz), an overload condition exists. When this is corrected, the sensor will return to normal operation. Check the blue wire connection. If necessary, replace the power pack.

Lights do not turn off automatically.

Green LED flashes

Reduce ultrasonic sensitivity by turning adjustment pot counter-clockwise until it only flashes when movement occurs.

Red LED flashes briefly and Green LED does not flash

Check to see if you have used the Manual Switch connection. Do not connect anything to this terminal if you are not using a low voltage momentary switch between the sensor and power pack.

Red LED randomly flashes

Set PIR sensitivity to minimum by turning DIP switch 5 to the "on" position.

Lights do not turn off

1. Check all sensor and power pack wire connections.
2. Disconnect power pack blue wire.
 - If lights do not turn off, check power pack wiring. Replace the power pack if necessary.
 - If lights turn off, the problem may be the sensor or wiring between the sensor and power pack.

3. Reconnect the blue wire.

- Turn sensitivity and time delay to minimum, and allow the sensor to time out.
- If lights turn off, the sensor is working properly – adjust sensitivity and time delay for the sensor.
- If lights do not turn off, check the wiring between the sensor and power pack.
- If wiring is correct, replace the sensor.

Service

To override all sensor functions, set the Ultrasonic Sensitivity trimpot to the fully counterclockwise (Service) position.

This bypasses the occupancy control functions of the sensor, but still allows the lights to be manually controlled with a light switch, if one is installed.

ORDERING INFORMATION

Catalog #	Description
DT-300	Dual Technology Occupancy Sensor, 360° Low Voltage w/Isolated Relay and light level sensor
DT-305	Dual Technology Occupancy Sensor, 360° Low Voltage
BZ-50	Power Pack: 120/277VAC, 50/60Hz, 225mA, 20A ballast or incandescent, 1HP@120/250VAC
BZ-150	Power Pack: 120/277VAC, 50/60Hz, 225mA, 20A ballast or incandescent, 1HP@120/250VAC
S120/277/347E-P	Auxiliary Relay Pack: 120/277VAC, 60Hz, 20A Ballast 347VAC, 60Hz, 15A Ballast

All sensors are white.

BZ series power packs supply power for up to 5 DT-300 sensors.

WARRANTY INFORMATION

WattStopper warrants its products to be free of defects in materials and workmanship for a period of five (5) years. There are no obligations or liabilities on the part of WattStopper for consequential damages arising out of, or in connection with, the use or performance of this product or other indirect damages with respect to loss of property, revenue or profit, or cost of removal, installation or reinstallation.

WattStopper[®]

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