C&K SYSTEMS, INC.

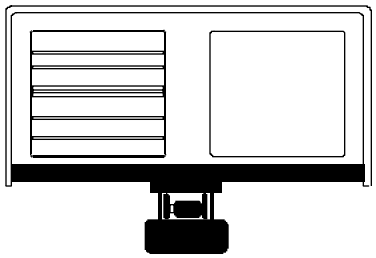
# Installation Instructions

# 8100S Series

## INFORMER Series Motion Sensors

### MODELS

| | |
|---|---|
| 8100S | 50' x 40' (15 m x 12 m) |
| 8140S | 90' x 70' (27 m x 21 m) |
| 8110S | 120' x 10' (37 m x 3 m) |
| 8120S | 200' x 15' (61 m x 5 m) |



DUAL TEC motion sensors combine microwave and passive infrared (PIR) technologies to provide maximum catch performance, while virtually *eliminating false alarms*.

In addition, DUAL TEC motion sensors are truly supervised. 8100S series sensors are equipped with the INFORMER™ circuit, which constantly monitors the performance of both the microwave and PIR technologies. If a problem is detected, the INFORMER circuit will visually indicate trouble at the sensor (flashing alarm LED), and can electronically signal trouble to the control panel.

What's more, all DUAL TEC INFORMER sensors have a built-in Dualplex® transponder. The transponder transmits addresses and zone status data over the two power wires to almost any control panel (equipped with a Dualplex interface module).

**Note:** Use of the Dualplex Signaling System in UL listed installations will void the listing. For installations requiring a ULC certificate, the Dualplex transponder requires a listed, compatible subscriber's control unit that is equipped with a compatible interface module.

### FEATURES

- Microwave/PIR technology
- INFORMER circuit
- Microwave supervision
- Alarm LED disable with trouble override
- Remote latching
- Built-in Dualplex transponder
- Low 35 mA current draw at 10 VDC
- Low voltage requirements
- High-security mounting bracket with optional NC tamper switches
- Energized Form C alarm relay
- RF immunity
- Unique "open edge" infrared detection logic
- Automatic temperature compensation
- Form C trouble relay (optional)

### APPLICATION

Sensors in the 8100S series are designed for industrial and commercial applications.

### MOUNTING PROCEDURE

#### *Mounting Location*

If possible, aim the unit toward the room's interior and away from windows, moving machinery, and heating or cooling sources. For more information, see the *Environmental Hazards* chart on page 3, and the *Difficult Applications* section on page 4.

#### *Mounting the TWB-3 Bracket*

**Note:** If you plan to install KM-11 tamper switches in the bracket, install the bracket cover tamper switch BEFORE mounting the bracket. Refer to *Assembling the TWB-3 Bracket*, Step 2.

Mount the high-security wall bracket (see Figure 1, item 6) on a solid surface, preferably a load-bearing stud, and attach it with four #10 1-3/4" screws.

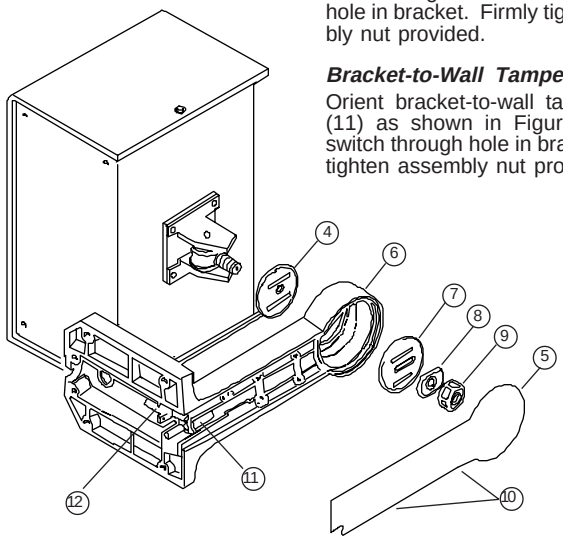
If it is necessary to attach the bracket directly to a wall, use four 3/16" x 3" toggle bolts.

#### *Assembling the TWB-3 Bracket*

**Step 1:** Remove the bracket hardware from the plastic bag.

**Step 2: TAMPER SWITCH OPTION.** Follow this step if you plan to install KM-11 tamper switches in the TWB-3 bracket. If not, proceed to Step 3.

*Figure 1 High-Security Mounting Bracket*




#### *Bracket Cover Tamper Switch*

Orient cover tamper switch (12) as shown in Figure 1. Insert switch through hole in bracket. Firmly tighten assembly nut provided.

#### *Bracket-to-Wall Tamper Switch*

Orient bracket-to-wall tamper switch (11) as shown in Figure 1. Insert switch through hole in bracket. Firmly tighten assembly nut provided.

**Step 3:** Connect the sensor to the bracket (6) using the bracket adaptor plug (4), bracket retainer plate (7), bracket washer (8), and 3/8-16 hex nut (9) in the sequence and orientation shown in Figure 1.

**Step 4:** Put the cover (10) on the bracket and attach it with the four screws provided.

### WIRING

Remove the sensor's cover by removing the screws on its sides.

Feed the wires into the sensor through the hole in the bottom of the housing.

The terminal strip is located on the left side of the printed circuit board (PCB). Connect the wires to the terminal strip as shown in Figure 2 (use 22 to 14 AWG).

**Note:** This sensor is DC powered. If the proper polarity is not observed (when wiring), the fuse on the PCB will blow.

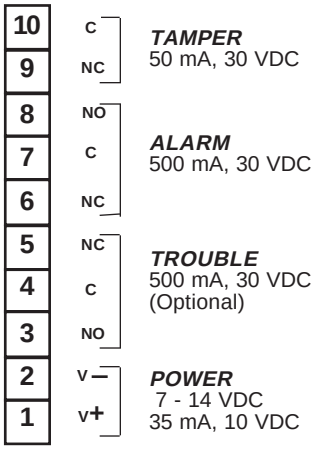



*Figure 2 8100S Series Terminal Strip*

### ACTIVATING THE TRANSPONDER

**Note:** For the Dualplex transponder to operate, it must be connected to the Dualplex interface module (Model DP8 or DP8-L).

Each model in the 8100S series has a built-in Dualplex transponder. The transponder eliminates the need for separate relays and extra wires by using the two power wires from the Dualplex interface module to transmit zone status data to the control panel. With the addition of the Dualplex interface module, almost any conventional panel can be turned into a Dualplex control.

The Dualplex transponder has eight address settings, and can signal both alarm and trouble to the control panel. The transponder will signal trouble when activated by the INFORMER circuit, microwave supervisory circuit, or a violation of the cover tamper switch.

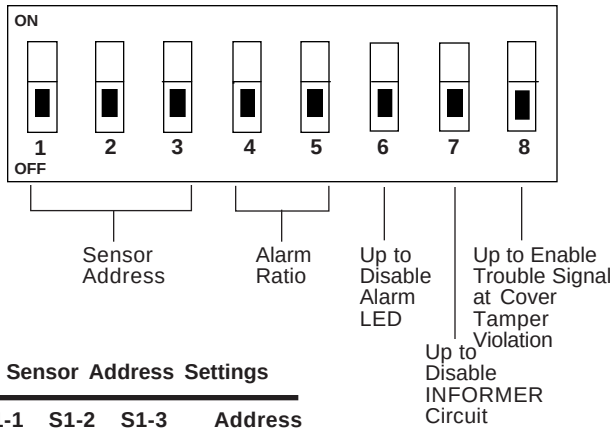
### *Wiring the Transponder*

Observing the proper polarity, connect the wires from the Dualplex interface module to terminals #1 (V+) and #2 (V-) of each sensor.

### *Setting a Sensor's Address*

The S1 DIP switch is located at the top center of the PCB. To set the address of a sensor, use positions #1, #2, and #3 on the S1 DIP switch (refer to Figure 3).

***Figure 3 Using the S1 DIP Switch***




**Sensor Address Settings**

| S1-1 | S1-2 | S1-3 | Address |
|---|---|---|---|
| On | On | On | 1 |
| Off | On | On | 2 |
| On | Off | On | 3 |
| Off | Off | On | 4 |
| On | On | Off | 5 |
| Off | On | Off | 6 |
| On | Off | Off | 7 |
| Off | Off | Off | 8 |

**Alarm Ratio Settings**

| Ratio | S1-4 | S1-5 |
|---|---|---|
| 16 to 1 | On | On |
| 64 to 1 | Off | On |
| 128 to 1 | On | Off |
| 256 to 1 | Off | Off |

## TRUE SUPERVISION OF THE MICROWAVE AND PIR

Each DUAL TEC INFORMER sensor is equipped with traditional microwave supervision, and a second fail-safe system called the INFORMER circuit.

### *Traditional Microwave Supervision*

If the microwave detector stops transmitting or receiving signals, it locks into an alarm condition and the sensor signals trouble. The sensor then continues to operate as PIR only.

If the microwave detector is blocked or masked, the resulting feedback will also cause the microwave supervisory circuit to signal trouble.

If the blockage or mask is removed, the sensor will return to dual technology operation, and the alarm LED will reset.

**Note**: Should the microwave detector be MASKED, it is possible that the sensor will not switch to PIR only, even though the INFORMER circuit will detect the masking and signal a trouble alert at the sensor (flashing alarm LED).

However, should the microwave detector FAIL, the failure will be detected by the microwave supervisory circuit. Trouble will be signaled visually at the sensor (flashing alarm LED), and the sensor will switch to PIR only.

**When any trouble alert occurs, be certain to walk-test the sensor before returning it to normal operation.**

### *The INFORMER Circuit*

The INFORMER circuit counts the number of events registered by both the microwave and PIR technologies, then uses the resulting ratio to determine if either technology is blocked, masked, misapplied, sleeping, or working properly.

### *INFORMER Ratios*

The INFORMER circuit can be set to use one of four alarm ratios: 16 to 1, 64 to 1, 128 to 1, or 256 to 1. Use higher ratios for high traffic areas, and lower ratios for low traffic areas.

An alarm ratio of 128 to 1 is suggested for most occupied environments. This means that before one technology registers 128 alarms, the other must register at least one. If it does not, trouble will be signaled.

Use switches #4 and #5 on the S1 DIP switch to set the alarm ratios (refer to Figure 3).

**Note:** If alarms register too rapidly on either technology, the INFORMER circuit will disable itself for eight minutes. This feature allows the INFORMER circuit to compensate for temporary environmental disturbances.

### *INFORMER Circuit Enable*

The INFORMER circuit is shipped from the factory **disabled**. To enable the INFORMER circuit, move position #7 on the S1 DIP switch to the down (Off) position.

**Note:** Disabling the INFORMER circuit will not disable the microwave supervision. The microwave supervisory circuit will continue to detect microwave masking or failure.

## TROUBLE SIGNALING

### *The Trouble Relay*

An optional Form C trouble relay (part # RY-0020) can be used with sensors in the 8100S series. The trouble relay can be activated by the microwave supervisory circuit, the INFORMER circuit, or a violation of the cover tamper switch.

### *Alarm LED Disable with Trouble Override*

The alarm LED can be disabled by moving position #6 on the S1 DIP switch to the up (On) position. Refer to Figure 3.

However, even if the alarm LED is disabled, a trouble alert will override the disable and make the alarm LED flash. As a result, you can disable the alarm LED so that potential intruders can't test the protection coverage, yet remain confident that your DUAL TEC INFORMER sensor is operational.

## FINAL ADJUSTMENT & WALK-TEST

DUAL TEC motion sensors are equipped with two diagnostic LEDs: green for PIR and yellow for MICROWAVE. The red LED is used to indicate an alarm condition and trouble alert.

**Note:** All the diagnostic LEDs of models in the 8100S series are located at the front of the sensor. *The diagnostic LEDs only operate when the sensor's cover is off.*

Apply power to the sensor and let it warm up for at least three minutes. Begin walk-testing when all three LEDs have gone out.

### *Aiming*

To provide maximum area coverage, the sensor must be aimed properly and have a clear line of sight to all areas you wish to protect. PIR energy cannot penetrate solid objects. If the sensor is blocked, it will not alarm.

The angle at which the sensor's head is set is critical to obtaining desired range. Refer to Figure 4 to determine the proper angle for your application.

***Figure 4 Mounting Angle of Declination***

| Model | Range | Mounting Height | | | |
|---|---|---|---|---|---|
| | | 12' | 10' | 8' | 6' |
| 8100S | 50' | 9° | 6° | 4° | 2° |
| 8140S | 90' | 5° | 3° | 2° | 1° |
| 8110S | 120' | 3° | 2° | 1° | 0° |
| 8120S | 200' | 2° | 1° | 1° | 0° |

### *Range Adjustment*

A range potentiometer for the microwave is located at the upper right corner of the PCB. Turning the thumbwheel from right to left INCREASES the range.

Before walk-testing the sensor, set the microwave potentiometer at minimum by turning it all the way to the right. (The potentiometer is factory-set at maximum.) Then, as you perform the walk-test, gradually increase the sensitivity of the microwave until the desired range is obtained.

The range of the PIR is determined by height, angle, and aiming. Refer to the *Aiming* section and the *Angle of Declination* chart for more information.

### *Walk-Test*

Walk across the protected area at the ranges to be covered. Two to four normal steps should make the diagnostic LEDs light. The red LED should indicate an alarm condition.

When there is no motion in the protected area, all three LEDs should be off.

Replace the sensor's front cover and repeat the walk-test. Two to four normal steps should make the red alarm LED light (unless it has been disabled).

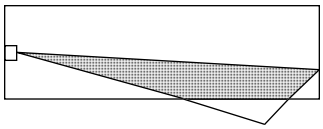
## INSTALLATION HINT FOR MODEL 8120S

Like other models in the 8100S series, the 8120S is equipped with single edge PIR triggering. Crossing just one edge of any zone will put the PIR in alarm.

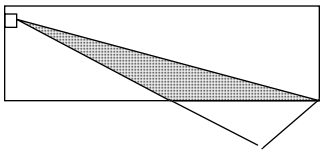
At a distance of 200', the edges of the main zone are 15' apart. To insure that an intruder will cross one edge of the zone, the unit must be carefully aimed.

When mounting the 8120S in a long, narrow corridor, aim one edge of the main zone at the most distant point to be covered.

**CENTER MOUNTING:** Aim the 8120S 2.25° to the side to send one edge of the main zone down the middle. Do not aim straight.



**CORNER MOUNTING:** Aim the 8120S 4.5° to 5° to the side to send one edge of the main zone diagonally across the distance.



## THE INFORMER TROUBLE ALERT

If the microwave and PIR register enough events to satisfy the preset ratio (16 to 1, 64 to 1, etc.), the INFORMER circuit will reset and begin the counting process again. However, if the alarm ratio is not met, the INFORMER circuit will signal trouble.

### *Diagnostic LEDs*

A flashing alarm LED can indicate three types of trouble: ratio imbalance, microwave failure (masking included), or tampering.

If the trouble is a ratio imbalance, the diagnostic LED of the technology *that reached the full count of alarms* will also flash (when the sensor's cover is off).

### *INFORMER Circuit Reset*

The INFORMER circuit automatically resets when the technology that triggered the trouble condition resumes detection and is working properly.

### *The Troubleshooting Matrix*

The troubleshooting matrix describes three trouble alerts: two reported by the INFORMER circuit, one by the microwave supervision circuit. Refer to Figure 5.

To use the troubleshooting matrix:

- Find the trouble alert that describes the condition of the walk-test LEDs (with no motion in the protected area).
- Walk-test the sensor, carefully watching the reaction of the diagnostic LEDs.
- Refer to the *Possible Causes* column of the matrix for an explanation of the way in which the diagnostic LEDs reacted to the walk-test.
- The alarm LED will continually flash regardless of motion in the protected area.
- Only the diagnostic LEDs will react to the walk-test (when the sensor's cover is off).

| Condition of LEDs with No Motion | | | Reaction of LEDs to Walk-Test | | | Type of Problem | Possible Causes |
|---|---|---|---|---|---|---|---|
| PIR (Green) | ALARM (Red) | MW (Yellow) | PIR (Green) | ALARM (Red) | MW (Yellow) | | |
| Off | Flash | Flash | On | Flash | On | RATIO IMBALANCE | MW environmental problem<br>MW unstable<br>MW range too long<br>PIR was blocked |
| | | | Off | Flash | On | RATIO IMBALANCE | PIR range too short<br>PIR aimed wrong<br>PIR asleep |
| Flash | Flash | Off | On | Flash | On | RATIO IMBALANCE | PIR environmental problem<br>PIR unstable<br>MW range too short |
| | | | On | Flash | Off | RATIO IMBALANCE | MW range too short<br>MW asleep |
| Off | Flash | Off | On | Flash | On | MICROWAVE SUPERVISION | MW is masked |
| | | | On | Flash | Off | MICROWAVE SUPERVISION | MW asleep |

***Figure 5 INFORMER Troubleshooting Matrix***

## INFORMER EXAMPLES

***Misapplied Sensor**:* Suppose that the motion sensor is improperly aimed or adjusted. If one technology is too sensitive, it can register the full count of alarms before the other technology registers even one.

***Blocked PIR**:* Suppose that boxes are stacked in front of the motion sensor. Since the PIR can't see through solid objects, it won't be able to register alarms.

But the microwave can see through (or around) most non-metallic objects and should be able to register alarms. As a result, when it reaches the set alarm ratio, trouble will be signaled.

***Sleeping Technology**:* Suppose one technology is sleeping. The other technology will continue to register events until the set ratio is reached (unless the microwave has stopped transmitting and receiving signals).

***Masked Microwave**:* Suppose that the motion sensor is masked with metal foil. Like the PIR, the microwave can't see through metal and won't be able to register alarms.

However, even if the microwave is masked by metal, the resulting feedback will cause the microwave supervision circuit to signal trouble.

## ENVIRONMENTAL HAZARDS

In order for the INFORMER circuit to work properly, each technology must be set up so that it will not be regularly tripped by environmental disturbances.

Use the *Environmental Hazards* chart (Figure 6) to verify that all environmental hazards have been considered in the location and set-up of the motion sensor.

| | PIR | MICROWAVE |
|---|---|---|
| *Vibration* | Very few problems | Can be major problem |
| *Reflection in pattern by large metal objects* | No problem unless metal highly polished | Can be major problem |
| *Sensitivity to movement of overhead doors* | Very few problems | Can be major problem |
| *Sensitivity to small animals* | Problem if animal close, but aim can be changed or mask used | Problem if animal close |
| *Water movement in plastic pipes* | No problem | Can be problem if close |
| *Movement through thin walls or glass* | No problem | Needs careful placement |
| *Drafts, air movement* | Needs careful placement | No problem |
| *Sun, car headlights* | Needs careful placement | No problem |
| *Heaters* | Needs careful placement | No problem |
| *Moving machinery* | Very few problems | Needs careful placement |
| *Radar interference* | Very few problems | Can be problem if close |
| *Fluorescent lights* | No problem | Can be problem if close |

***Figure 6 Environmental Hazards and Other Variables***

## AMPLIFIER OUTPUT VOLTAGE

The amplifier output is a valuable diagnostic tool. It enables you to see what the microwave signal processing circuit is seeing.

To use the amplifier output, connect one wire to the **TP5 pin (+)** at the center of the right side of the PCB. Connect a second wire to the **TP2 pin (-)** at the upper right corner of the PCB.

Run the two wires to a convenient location **outside** the protected area, then connect them to the 10 VDC scale of your multimeter. You should read approximately 5.0 VDC* with no motion in the protected area.

Have an assistant walk into the protected area. If the motion is sufficient to keep the amplifier output voltage 0.6 V below the 5.0 VDC* threshold for two seconds, the microwave detector is seeing a disturbance sufficient enough to cause an alarm.

***Note:** 5.0 VDC is a nominal threshold voltage. DUAL TEC motion sensors are designed with a floating threshold. Thus, if slight motion or extensive fluorescent lighting is present within the pattern, the amplifier output voltage will stabilize below 5.0 VDC.

## DIFFICULT APPLICATIONS

**Cold** Extreme cold will not damage DUAL TEC motion sensors. They will remain operational at temperatures as low as 32º F (0º C).

**Aisles & Corridors** PIRs are usually not sensitive to direct into/away from motion. However, DUAL TEC sensors have a unique "open edge" infrared detection logic that allows for detection when only one of the elements has been violated. This gives you better "down the throat" catch performance, plus faster response at maximum range.

**Overhead Heaters** If possible, aim the sensor across or underneath an overhead heater.

If this is not possible, mask the heater with 1/4" chicken wire mesh (or a finer mesh metal screen) to prevent the microwave from seeing the motion of the fan blades.

**Heat** PIRs can lose range as room temperature nears body temperature. However, DUAL TEC motion sensors automatically compensate for temperature changes and do not lose range.

**Windows** DUAL TEC sensors should be aimed across or away from outside windows, not at them.

If this cannot be avoided, aim the sensor so that the top of the PIR zones hit the floor at the base of the windows.

**Drafts** PIR and ultrasonic devices can be tripped by air turbulence. But because the DUAL TEC sensor is a combination of microwave and PIR technologies, drafts cannot make it false alarm. Its microwave detector is not sensitive to air turbulence.

## PRODUCT SPECIFICATIONS

***Alarm relay & (optional) trouble relay:***
Form C
500 mA, 30 VDC

***Tamper switch:***
Form A
NC (when depressed)
50 mA, 30 VDC

***Circuit protection:***
Line fuse type 3 AG
0.250 A
1-1/4" x 1/4" glass tube

***Power requirements:***
7 to 14 VDC
35 mA, 10 VDC

***Frequencies:***
Center band 10.525 GHz
Multiple units can be used in same area without mutual interference

***RF immunity:***
Up to 100 watts at 10' (3 m) from all mobile bands 27-1000 MHz

***Sensitivity:***
2-4 normal steps within field of view

***Shipping weight:***
7 lbs (3 kg)

***Dimensions:***
8" x 5-1/2" x 4"
(20 cm x 14 cm x 10 cm)

***Operating temperature:***
32º to 120ºF (0º C to 49º C)

***Automatic temperature compensation:***
Range does not decrease as room temperature nears body temperature

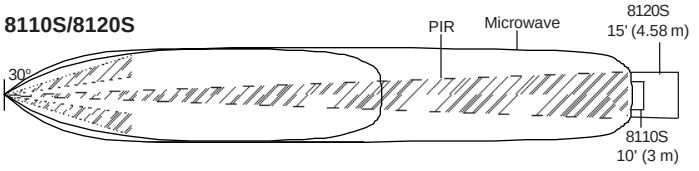
***Approvals:***
FCC certified DOC certified
UL/ULC* listed DTI approved

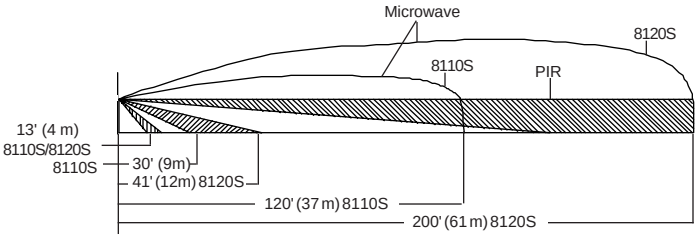
***Accessories***
*RY-0020* Form C trouble relay
*RY-0025* Package of five (5) Form C trouble relays
*DP8* or *DP8-L* Dualplex interface module
*KM-11* Tamper switches
*BD 81XXS* Environmental (outdoor) housing
*81XXS-OR* Or-gate board

***Note**: The ULC label or listed marking on a product is the only evidence provided by Underwriters Laboratories of Canada to identify products that have been produced under the Listing and Follow-up Service.

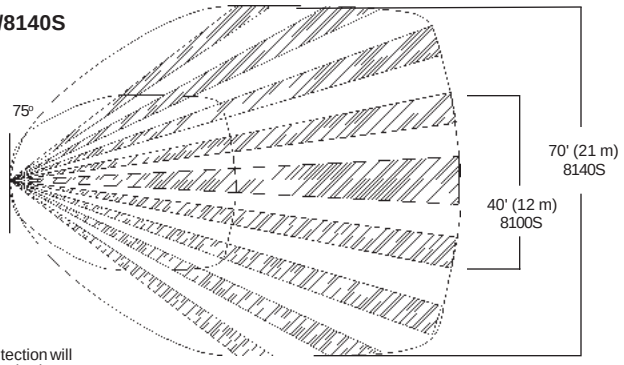
## DETECTION PATTERNS

**8110S/8120S**

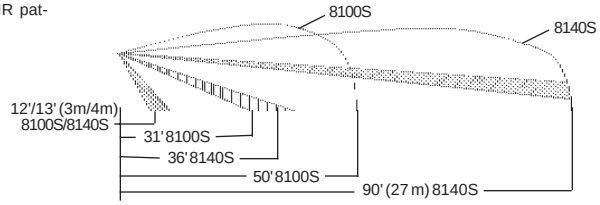



**8100S/8140S**




**Note:** Detection will only occur in those areas where microwave and PIR patterns overlap.




The 8100S series sensors should be tested **at least once each year** to ensure proper operation.

**Important:** The 8100S series sensors must be connected to a UL listed power supply or UL listed control unit capable of providing **a minumum of four hours** of standby power.

This equipment has been tested and found to comply with the limits for a field disturbance sensor, pursuant to Part 15 of the FCC Rules. The user is cautioned that changes or modifications not expressly approved by C&K Systems could void the user's authority to operate this equipment.

### LIMITED WARRANTY

Seller warrants its products to be in conformance with its own plans and specifications and to be free from defects in materials and workmanship under normal use and service for 18 months from the date stamp control on the product or for products not having a C&K Systems date stamp, for 12 months from the date of original purchase, unless the installation instructions or catalogue sets forth a shorter period, in which case the shorter period shall apply. Seller's obligation shall be limited to repairing or replacing, at its option, free of charge for materials or labor, any part which is proved not in compliance with Seller's specifications or proves defective in materials or workmanship under normal use and service. This warranty is void if the product is altered or improperly repaired or serviced by anyone other than C&K Systems factory service. For warranty service, return the product transportation prepaid to C&K Factory Service, 107 Woodmere Road, Folsom, California, 95630.

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Seller does not represent that its product may not be compromised or circumvented; that the product will prevent any personal injury or property loss by burglary, robbery, fire or otherwise; or that the product will in all cases provide adequate warning or protection. Buyer understands that a properly installed and maintained alarm may only reduce the risk of burglary, robbery, or fire without warning, but it is not insurance or a guarantee that such will not occur or that there will be no personal injury or property loss as a result. CONSEQUENTLY, SELLER SHALL HAVE NO LIABILITY FOR ANY PERSONAL INJURY, PROPERTY DAMAGE, OR OTHER LOSS BASED ON A CLAIM THAT THE PRODUCT FAILED TO GIVE WARNING. However, if Seller be held liable, whether directly or indirectly, for any loss or damage arising under this Limited Warranty or otherwise, regardless of cause or origin, Seller's maximum liability shall not in any case exceed the purchase price of the product, which shall be fixed as liquidated damages and not as a penalty, and shall be the complete and exclusive remedy against Seller.

This warranty replaces all previous warranties and is the only warranty made by C&K Systems on this product. No increase or alteration, written or verbal, of the obligation of this warranty is authorized.

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