WHITE PAPER

Intrusion **Professional Series Detectors**

Sensor Data Fusion **February 2008**

Introduction

Bosch Security Systems, Inc. Professional Series detectors use a completely new form of processing called Sensor Data Fusion technology.

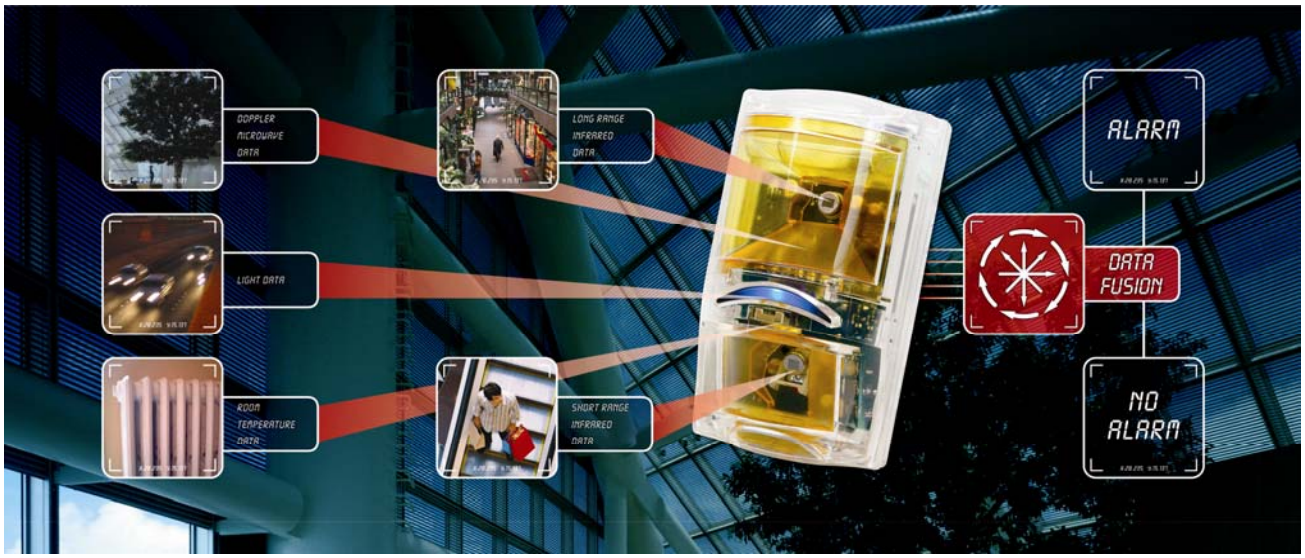
For information on the new anti-mask technologies used in the Professional Series with Anti-Mask detectors, refer to the *Professional Series Detectors Anti-Mask White Paper* (P/N: F01U075615), which you can download from the Professional Series Detectors section of the Bosch web site (http://www.boschsecurity.us).

The following is an explanation of Sensor Data Fusion technology, including specific examples and scenarios that demonstrate how this technology improves the Professional Series detectors' performance.

What Is Sensor Data Fusion?

Professional Series detectors incorporate up to five sensors in a single detector:

- Long-range passive infrared (PIR) sensor
- Short-range PIR sensor
- Microwave sensor
- White light sensor
- Temperature sensor



The concept of gathering data from multiple sensors isn't new. Many detectors – from other manufacturers as well as Bosch – combine various sensor technologies to amass data. What makes Professional Series detectors different is the way this data is used. All the information collected by the sensors is fed into a microprocessor that analyzes the data using a complex algorithm. This algorithm is the key to Sensor Data Fusion. It enables the detector to balance sensors and adjust sensitivities in order to make truly intelligent decisions regarding whether or not the data indicates a valid alarm condition.

What Advantages Does Sensor Data Fusion Provide?

Sensor Data Fusion allows Professional Series detectors to provide an unprecedented combination of improved catch performance and higher false alarm immunity.

Simply building multiple sensors into a detector does not increase its effectiveness. Using multiple sensors as checks and balances increases a detector's false alarm immunity, but does so at the cost of catch performance. With Professional Series detectors, the microprocessor's algorithm intelligently analyzes the sensor data to increase false alarm immunity without sacrificing catch performance.

The following performance scenarios provide a brief overview of how the microprocessor integrates the sensor data when making alarm decisions.

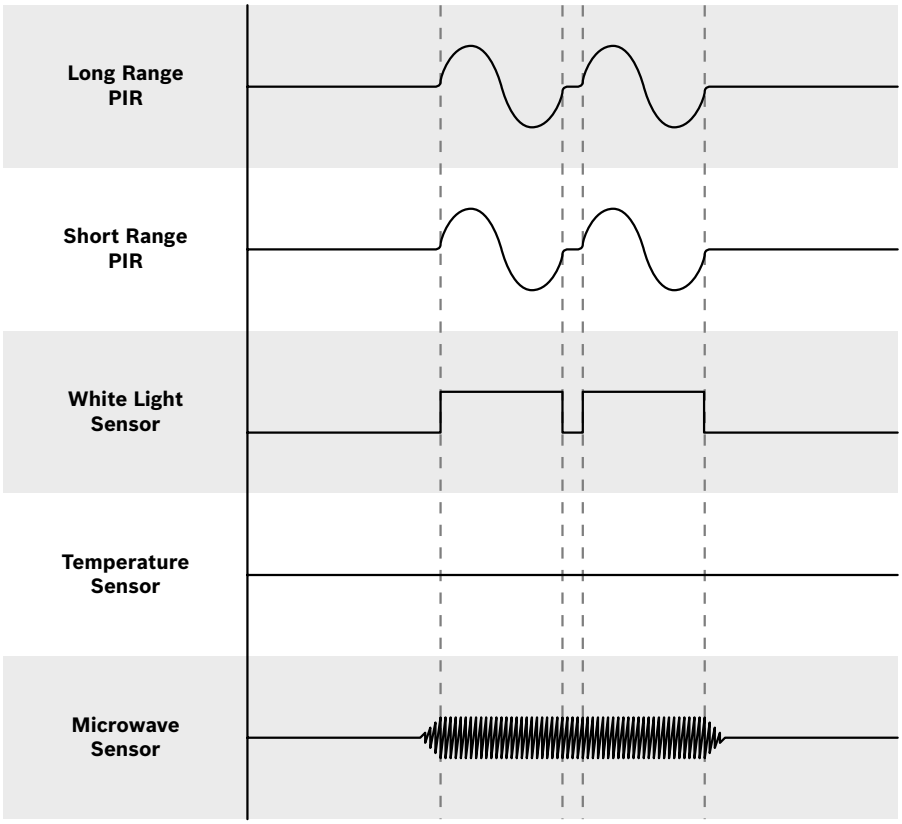
Performance Scenarios

Car Headlights Sweep Across Detector

As a car pulls into the parking lot at night, the headlights sweep across the detector's mounting location. Because the PIR sensors are sensitive to slight temperature changes, they detect the headlights at both short and long range. Of course, the white light sensor detects the headlights too.

They key to this scenario, as illustrated below, is the synchronization of the data from the PIR sensors and the white light sensor. The heat and light change in tandem each time the headlights sweep across the detector. The microprocessor algorithm is aware of this synchronization, and determines that this is not a valid alarm condition. The security system does not go into alarm.

Result: Improved false alarm immunity.

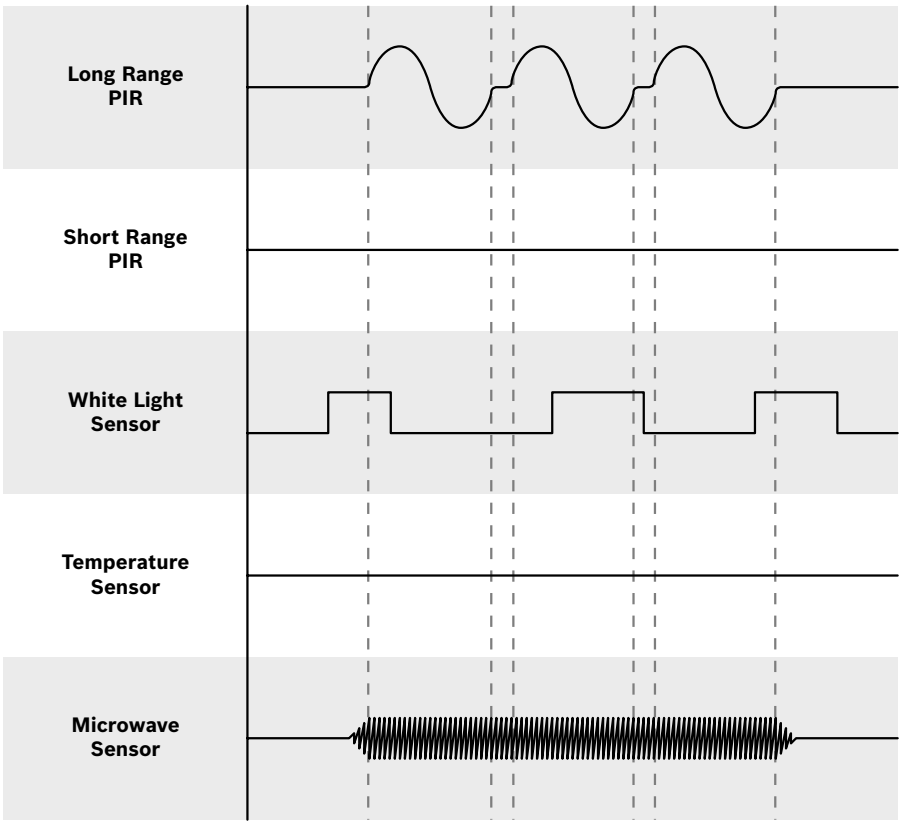


Burglar Tries to Trick Detector Using Flashlight

Aware of the white light sensor and its role in preventing false alarms, a burglar tries to trick the detector into not triggering an alarm by using a flashlight.

Because of the location of the burglar, he appears only on the long-range PIR sensor, not the short-range. And since the disturbance is detected at long range, the sensitivity of the microwave sensor is increased and its alarm threshold lowered. Most importantly, the microprocessor algorithm is aware that the data from the PIR sensor, the white light sensor and the microwave sensor is not synchronized, and determines that this is a valid alarm condition. The security system goes into alarm.

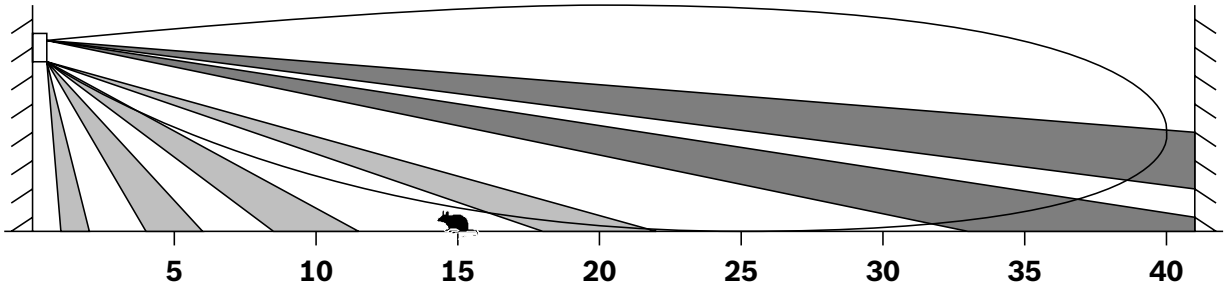
Result: Improved catch performance.



Mouse Crosses Room 4.5 m (15 ft) from Detector

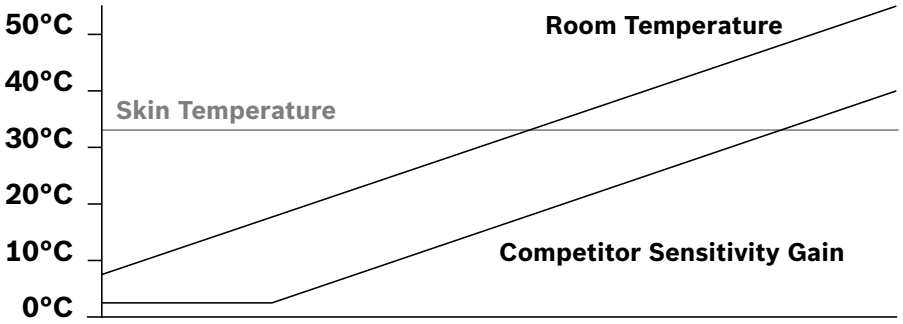
When a mouse is just 4.5 m (15 ft.) from the detector, only the short-range PIR sensor reacts. A human intruder that close to the detector would reflect a large area to the microwave sensor, so when only the short-range PIR detects a signal, the microprocessor raises the microwave sensor's threshold. The distance data provided by the two PIR sensors allows the microprocessor to vary the microwave sensor's threshold. And because the mouse reflects a small area to the microwave sensor, the newly elevated threshold is not reached, and the security system does not go into alarm.

Result: Improved false alarm immunity.



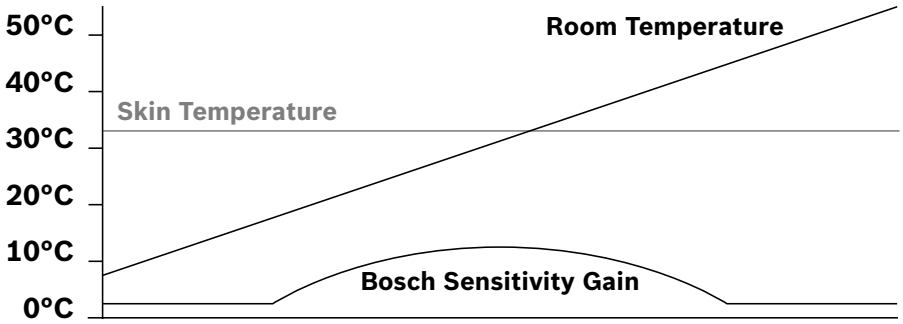
Detector Mounted in Room with 33.3°C (92°F) Ambient Temperature

Other detectors with temperature sensors simply increase sensor gain as room temperature increases. This gain increase continues linearly as the room temperature exceeds the expected surface temperature of an intruder (33.3°C or 92°F). Thus, the chance of false alarms climbs right along with the room temperature.



With Professional Series detectors, the sensor gain increases as expected – but only until the room temperature reaches 33.3°C (92°F). Using two PIR sensors with multiple high-quality lenses, Bosch increases the signal-to-noise ratio within that narrow temperature band. Once the room temperature exceeds the surface temperature of an intruder, the sensor gain decreases again, minimizing false alarms.

Result: Improved high-temperature catch performance without compromised false alarm immunity.



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