Texecom New Product Profile

Impaq
SHOCK SENSOR

Product: ***Impaq*** Microcontrolled shock sensor, Texecom Ltd.

Launched: September 1998

Description of Use: A high quality shock sensor with microprocessor intelligence to reduce false alarms and provide perimeter protection. Featuring a unique sensitivity set-up method and signal processing to ensure maximum false alarm immunity.

Intended Market: Anywhere that needs high quality perimeter protection where false alarms cannot be tolerated.

Product Brief:

*"To design a high quality shock sensor that actually **prevents** false alarms by:*

1. *Forcing correct sensitivity adjustment,*
2. *Sensing only vibrations of interest and*
3. *Processing all signals digitally to reject unwanted false alarm sources.*

Unique Features

All three of the above challenges have lead to unique and innovative solutions:

1. **Self-calibrating sensitivity indication** – A unique method to ensure that the sensitivity of the unit is tuned to exactly the right setting for *each individual installation.*
2. **Proprietary sensor element** – A vibration transducer designed in-house specifically for shock detection.
3. **TASS™** – A complex DSP algorithm that analyses all aspects of a signal to discriminate between true intrusion and common false alarm sources.

Background to the Invention

Shock sensors are typically placed on lower floor door or window frames to detect an entry attempt. Vibrations in the frame are picked up and an alarm signal is generated. The main advantage of shock sensors compared with movement detectors is that the intruder is detected prior to gaining access to the property.

Until now the technology behind shock sensors has changed little over the past 20 years. Noise and vibrations from passing traffic, music, wind, fireworks and many other sources can give rise to false alarms. To further compound the problem most shock sensors are notoriously difficult to set up correctly. If a unit is set with too high a sensitivity, it will *appear to work correctly upon installation but will almost certainly suffer from false alarms at a later date*

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Technical Overview

Recent advances in semiconductor technology have made it possible to reduce the size of a microcontroller to that of a standard integrated circuit at an affordable cost. This has meant that for the first time we are able to build real intelligence into a product that a few years ago would have been impossible. It is this new technology that has helped the ***Impaq*** to become the first detector to overcome the three historical problems with shock sensors:

1. Self-Calibrating Sensitivity Indication

Typically an installer would set the sensitivity of a shock sensor by tapping the surface of the area to be protected and adjusting a potentiometer until all taps cause an alarm. We decided to look in detail at this method and found many installations had sensors that were set unnecessarily high. These installations are more prone to false alarms and in some cases had experienced them. It is usually fairly obvious if a shock sensor is set with *too low* a sensitivity – the LED does not light when the window is tapped. It is **not** normally obvious however if the sensitivity is set *too high* – the LED lights when the window is tapped but *the whole unit is more susceptible to all false alarm sources.*

The ***Impaq*** is the first intelligent shock sensor to actively warn if the sensitivity has been set ***too low*** **or** ***too high.***

The ***Impaq*** indicates its condition with a simple tri-colour LED. During installation an orange LED indicates that the device is too sensitive and would be prone to false alarms. Green indicates that the unit is under sensitive and may not respond to an attack. The installer is instructed to adjust the sensitivity for a red indication. When correctly adjusted the ***Impaq*** will provide trouble free operation. No special set-up mode or equipment is required. The installer simply taps the protected area and adjusts a potentiometer in the sensor.

During normal operation a flashing green comfort LED is seen, unless blanked either by the internal jumper or the latch line.

Setting the correct sensitivity is ***critical*** *in order to avoid false alarms while maintaining adequate detection.*

2. Proprietary Sensor Element

The transducer (or sensor) inside a shock detector is the device that actually picks up vibrations and converts them into electrical signals for processing. A good sensor design is essential for effective vibration monitoring. Most companies use "off-the-shelf" transducers that are usually designed for other applications (e.g. noise monitoring in industrial processes). These typically exhibit wide frequency responses and thus are sensitive to many causes of vibration (e.g. acoustic noise, traffic etc) and are therefore inherently sensitive to common false alarm sources.

After extensive investigations of forced entries using used specialised vibration monitoring equipment and computer analysis we were able to produce an "**idealised frequency response curve"**. A proprietary sensor design was then commissioned to our required characteristics. Signals from unwanted sources are almost entirely rejected. *All our tests have shown that a correctly designed transducer reduces the chances of false alarms occurring by several orders of magnitude.*

3. *TASS™*

***TASS*™** is the name given to the complex Digital Signal Processing (DSP) algorithms designed to discriminate between forced entries and common false alarm sources. Having examined the characteristics of a forced entry through extensive testing and FFT analysis we were able to derive several "signatures" through different building materials (e.g. steel, different types of wood, concrete, stone, brick etc). The ***TASS*™** algorithm continually monitors the relationship between the phase, amplitude, and frequency of the signal from the sensor searching for these signatures before generating an alarm condition.

A typical shock sensor simply looks to see if the sensor output crosses a fixed threshold – these are notoriously prone to false alarms. *Employing signature recognition significantly reduces the possibility of false alarms.*

Additional Issues

Although the above three points are truly innovative and inventive there are a host of other features found in the ***Impaq*** which are almost unique in a low cost shock sensor. All devices come with latch, first to alarm, remote LED disable and memory as standard. The unique Texecom housing designed using the latest 3-D CAD system is not just aesthetically pleasing but contains a host of features to aid installation such as cable entry knockouts and screw holes in both the base and the ends.

Summary

- *Warning the installer of over-sensitive setting is a unique concept that will reduce false alarms.*
- *The proprietary transducer design and the **TASS™** DSP algorithms have been developed exclusively by Texecom both can be considered innovative new technology.*
- *The **Impaq** is the first shock sensor that actively aids sensitivity adjustment, reduces false alarms providing a previously unsatisfied customer need.*