RANGE-R® Theory of Operation

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RANGE-R is a handheld sensor capable of sending Radar signals through the walls and locating people inside buildings. It is powered by 4 AA batteries and weighs less than 1.5 lbs.

The basic RANGE-R concept of operations is shown in Figure 1. The sensor is held against the wall and activated via a pair of buttons (one hand operation). A series of Radar pulses is transmitted through the wall. The pulses are reflected from objects inside the structure. These returns are analyzed as Doppler radar returns, allowing detection of any moving objects in the structure. The sensitivity of the RANGE-R is sufficient to detect people breathing, making it difficult for individuals to hide from RANGE-R. The range to a target is displayed on the user-friendly graphic display. RANGE-R covers a conical field of view of 160 degrees, sufficient to cover an entire room (or small building) in a single scan. The entire scan/detect sequence takes only a few seconds.

Figure 1 – RANGE-R detects people through walls

Doppler radar

RANGE-R uses a form of Radar known as Doppler Radar. In Doppler Radar, a radio frequency (RF) signal is transmitted, strikes a target and returns to an RF receiver. If the object is moving, the frequency of the signal is altered. With appropriate signal processing the amount of motion can be determined. Using this technique, RANGE-R determines the presence of moving objects inside a building and classifies them as “movers” (more movement) or “breathers” (less movement) while providing the range to the object on a small display.

RANGE-R uses a type of Doppler Radar known as Stepped Frequency Continuous Wave

(SFCW) Radar, where specific frequencies are emitted in a controlled fashion. This approach makes RANGE-R inherently resistant to jamming or interference with other electronics. Additionally, RANGE-R is certified by the FCC to operate in an approved Radar band and therefore, will not interfere with most non-Radar electronic systems.

Wall Penetration

RANGE- R will penetrate most common building wall, ceiling or floor types including poured concrete, concrete block, brick, wood, stucco glass, adobe, dirt, etc. However, It will not penetrate metal. RANGE-R will generally penetrate up to one foot of wall thickness without adverse effects. While small metal objects embedded in walls (i.e. rebar, conduits, etc.) usually do not inhibit operation, a large enough metal object can impair operation. When this happens, the wisest course of action is to make more than one scan from different locations (move a few feet) for confirmation. If a porous wall is saturated with water, performance can also be degraded due to excessive absorption of the radar energy.

Conical Field of View

The RANGE-R has a conical, 160 degree field of view (FOV). This FOV provides complete coverage of a rectangular room with a single scan. This FOV covers +/- 80 degrees in azimuth AND elevation. This feature enables RANGE-R to penetrate ceilings/floor as well as vertical walls. A typical scan of a two-story house will detect people on the second floor as well as people on ground level.