

## Tracking, Safety and Navigation System for Firefighters

Firefighting is a dangerous and difficult job performed in a hostile environment. During a fire, the air inside a burning structure can rapidly fill with dense smoke that can reduce visibility to only a few inches. Even though the time window for locating and rescuing a disabled firefighter is short, the task can be difficult and time consuming. Tragedies occur when rescuers are either unable to find the disabled firefighter or unable to safely return to the exit. The Personal Locator Ultrasound System, or PLUS™, is based on a new, patent-pending technology and can locate firefighters and exits in dense smoke.

The primary function of the PLUS™ technology is to enable a firefighter or Rapid Intervention Team (RIT) to quickly locate and rescue a disabled firefighter. The system uses ultrasound – sound waves above the normal human hearing range – to communicate between two components, called a Beacon and a Tracker. The Beacon is a device, similar to a Personal Alert Safety System (PASS), that is worn by a firefighter and transmits an omnidirectional ultrasonic signal when the firefighter becomes disabled. The Tracker is a hand-held device that contains an ultrasonic receiver with a directional beam pattern and is carried by the rescuing firefighter. The strength of the received signal from the Beacon is displayed on a bar graph on the front panel of the Tracker and is further indicated by the pulse rate of a beeper. Because the receiving beam pattern of the Tracker is directional, the height of the bar graph increases when the Tracker is pointed at a transmitting Beacon. Furthermore, since shorter distances between the Beacon and Tracker result in stronger signals, the height of the bar graph is an indication of the distance to the disabled firefighter. By first scanning an area with the Tracker to determine the direction of the strongest signal, and then moving in that direction, the rescuer can quickly locate the disabled firefighter. By leaving a second Beacon with a different ultrasonic frequency at the exit, the rescuer can use the Tracker to rapidly locate and return to that exit.

The technology has a feature not found in thermal imaging cameras or radio-based navigation systems: the system can find firefighters even if they are not in a direct line-of-sight. The PLUS™ system, which has been successfully tested in smoke rooms and burn buildings, is currently being readied for production.

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