

The Multi-function **GroundHound – Site Safety Warning System** is an instrumentation system designed for the protection of linemen on a work site. The system consists of a Sensor Unit and a Handheld Unit communicating via wireless protocol. The sensor unit, a self-contained ruggedized case that is safety yellow, is connected to the worksite ground and lies 20 feet away from it. The sensor can be set to monitor and alarm on three levels of hazard, utilizing an emergency flashing light and an audible alarm which is loud enough to alert the crew above the sound of a typical worksite's running trucks and bobcats. The handheld unit, a smart phone is clipped to the foreman's belt and contains additional alarms. When an alarm is triggered at the sensor the phone vibrates and sends an audible alarm to the foreman.

$V_1$ , through  $V_3$  are operator set voltage thresholds set by company policy.  $V_1$  warning lights are turned on  $V_2$  represents the threshold where protective gear must be worn.  $V_3$  represents the threshold where work must be stopped. Additionally, a High-energy transient alert is indicated when a transient exceeding 13 joules is detected. Information on time and energy are recorded for future analysis.

Alerts	Condition	Response
$V_1$ exceeded	GPR at warning level.	Warning lights are turned on
$V_2$ exceeded	GPR at danger level	Warning lights and siren are turned on. Crew should put protective clothing on
$V_3$	GPR at evacuate level	Warning lights and sirens turned on. Crew should leave the area
High-energy Transient	A high-energy transient has been recorded	The sensor records the time and energy
Wireless disconnection	Handheld unit loses communication with Sensor or Alarm unit	Alert the operator that communication has been lost
Sensor battery low	The battery in the sensor unit is low	Charge the sensor battery
Handheld battery low	The battery in the handheld unit is low	Charge the handheld battery



The handheld unit provides remote status indication for the sensor unit. A graphic shows the current GPR level in relation to the user set  $V_1$ ,  $V_2$  and  $V_3$  thresholds. If a GPR alarm occurs, the user can acknowledge these from the handheld unit.

The user can set the GPR thresholds and alarm notifications (sound, vibrate) from the handheld unit.

After an initial power up screen, the GPR handheld receiver-screen is displayed. The GPR handheld receiver screen contains the following information:

1. The measured work site GPR and resistance
2. A sensor unit battery charge level indicator icon
3. A handheld receiver unit battery charge level indicator icon
4. A Radio Signal Strength Indicator icon
5. A communications heartbeat icon (indicates the reception of a good data packet).

An additional display and four pushbuttons are incorporated into the sensor unit providing the same options as the hand-held, as well as an option to initiate a system self-test.

Two system modes exist, a manual alarm mode where the users determines and inputs directly the values for  $V_1$ ,  $V_2$  and  $V_3$  and an automatic alarm set-point input mode, the instrument computes the thresholds for  $V_1$  and  $V_2$  using the data provided by the user.

The transient feature captures transients that occur and records the peak voltage with a date and time stamp so that the foreman can review this information against events that may have occurred during the work.

The instrument is designed to be used in all seasons and weather conditions; it is weatherproof and rugged, easily transported in the bed or bin of a truck. The handheld unit is protected by an enclosure designed for the environment

Additional menu screens provide the following functions:

- Display GPR alarm set-points to 3 voltage levels ( $V_1$ ,  $V_2$  and  $V_3$ ).
- Display/change vibratory alarm status (on/off). Display/change audible alarm status (on/off).
- Save data changes to memory.
- Display Safety Manager's Safety Tips
- Display Peak Voltage of highest Transient

Safety Ratings:

Instrument complies with industry standards: CE mark & UL 61010- 1 pending approval

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Designed to comply with IEEE Std. 80-2000 - 29 CFR 910.269 OSHA for Step & Touch hazards.

