

LifeLocator® TRx System User Guide

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System Purpose

The LifeLocator® TRx System is designed to detect a living human at a range of up to 12 meters (39 feet) through common structural wall materials and building rubble. Results may be better or worse depending on conditions.

The system is able to search up to an 1810 cubic meter volume in about 1-2 minutes to provide locating information on victims.

The system can provide an 80% confidence level when determining that the search volume does **not** contain living human victims.

The large variations in people, their possible medical condition, and the specifics of debris pile materials make the detection of live victims under every circumstance impossible. Nevertheless, the unique properties of radar make it an effective part of the rescuer's arsenal when looking for living victims since it offers unique advantages over other search methods. Success on four Continents has shown that the LifeLocator TRx can safely detect living humans beneath piles of building rubble in the aftermath of earthquakes, hurricanes and other catastrophic failures.



Introduction

This manual will help you learn the field operation of the LifeLocator TRx System. The system has been designed to help find victims trapped beneath debris by detecting their motion or breathing patterns.


The LifeLocator TRx System consists of a wireless Sensor/Antenna and control unit – two Tablet control units are currently available. The Sensor/Antenna emits 1/100th the power of an ordinary cell phone and is powered by two Li-ion rechargeable batteries. Although the Sensor is shielded from above-ground signals, make sure that all Search and Rescue personnel including the operator are more than 15 meters (50 feet) away. WiFi signal strength limits the far range to about 30 meters (100 feet) from the Sensor.

Control Unit:
Panasonic G1
Toughpad Shown



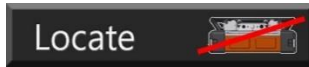
Sensor/Antenna

Section 1: Getting Started

- 1** Insert fully charged batteries into the battery slots on the top of the Sensor and close the doors. Please note that the Sensor batteries are keyed and can only be inserted in one direction – the slotted side of the battery should be facing up prior to insertion. While the system can run on a single battery, it is recommended that you use two batteries to increase the Sensors run time during normal operation to about 10 hours. The batteries are hot-swappable for continuous operation.
- 2** Make sure the Tablet Control unit (G1/M1 Tablet computer) is fully charged. The Tablet/Control unit comes with an AC/DC power supply that is used to charge the internal battery in the Controller. The Controller battery operation time is approximately 10 hours.
- 3** Push the silver Sensor power button for one second. The blue Mode LED and battery status LEDs will immediately turn on. After about 20 seconds the green connectivity light will flash quickly (2x/sec) indicating the Sensor is available.
- 4** On the Control unit (G1/M1 Tablet computer) push the start button  to power up the Tablet. From the GSSI LifeLocator TRx screen press A1 on the G1 control unit (press A on the M1) to start the LifeLocator TRx control unit software.



- 5** Once the Control Software has started you see the Main menu screen.
- If the Sensor and Controller have successfully paired the Sensor number will appear to the right of the word Locate in the menu.
 - If the Sensor and Controller are not paired the Sensor icon will have a red slash through it.



- 6** The battery status for both the Sensor and Controller can be seen at the lower right of the display as well as a WiFi signal strength indicator.



- Sensor battery indicator

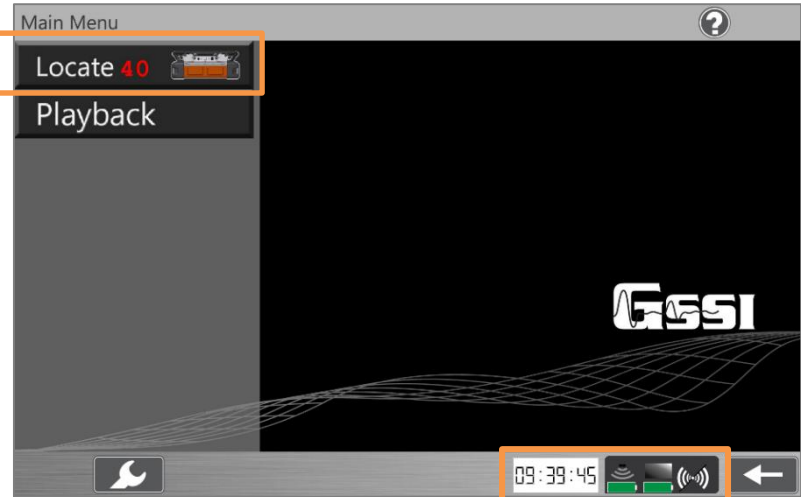


- Controller battery indicator



- WiFi signal strength indicator

- This screen also indicates the current time – to adjust the time use the Windows System User Interface.



Local Time

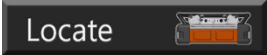


System Menus

The Screen System Preferences can be accessed from the Main menu by pressing the Settings icon on the lower left. Three options are available:

- **Connect to ####:** The menu allows the user to select the Sensor the control unit will pair with. Pressing again removes this pairing preference. Once selected, the control unit can only be paired with that number Sensor. This is convenient if there is only one LifeLocator TRx deployed. The control unit does not have to take the extra step of pairing. Only one Sensor can be connected to one control unit at a time. Once the Sensor number is selected, the number will appear to the right of the words Connect to – e.g., **Connect to 40**.
- **Depth:** The depth preference allows the user to change the maximum detectable range of the system – 6 or 12 Meters.
- **Maintenance:** This menu allows the user to view or change three options:
 - **Save Data On or Off:** This preference allows the user to choose to save all data collected for review at a later time. This is recommended for real disaster scenes where the data or use of the system may be reviewed at a later date. Setting this preference to off will not save data to the internal hard drive of the Tablet Controller.
 - **Clear Storage:** This preference allows the user to selectively delete data files located on the Controller hard drive. All files can be deleted by checking the box at the top, or individual files can be deleted one at a time.
 - **System Info:** This location is used mostly for servicing the software for the system and Controller. When software updates are made available through the GSSI Technical Support website, this location will be used to update software. Please refer to updating software tech notes for more details.

Section 2: The Search and Rescue Process

- Step 1:** Confirm the Sensor and the control unit has been powered up and connection has been established.
- Step 2:** Place Sensor on rubble pile, making sure that all personnel are greater than 15 meters (50 feet) away, but less than 30 meters (100 feet) away from the Sensor.
- Step 3:** To start locating a victim press the Locate button located on the main menu screen in the upper left corner of the display. Note that if the Sensor is not already paired with the Controller the software will ask you to select the appropriate Antenna serial number first. Once the Sensor is paired, pressing Locate opens to the Target display screen.

- Step 4:** The target display screen appears and the run clock at the top right starts incrementing. The filename is indicated in the upper left portion of the target display screen. **Red** circles (breathing) and **Black** squares (motion) may be seen and grow larger as detection confidence improves. The approximate distance of the detected motion is indicated on the right margin of the screen.

The program will look for both breathing and motion.



Motion above the alarm threshold produces a **black** square.

Pre-detection of motion will display as White, Red or Yellow depending on what data color option you select.

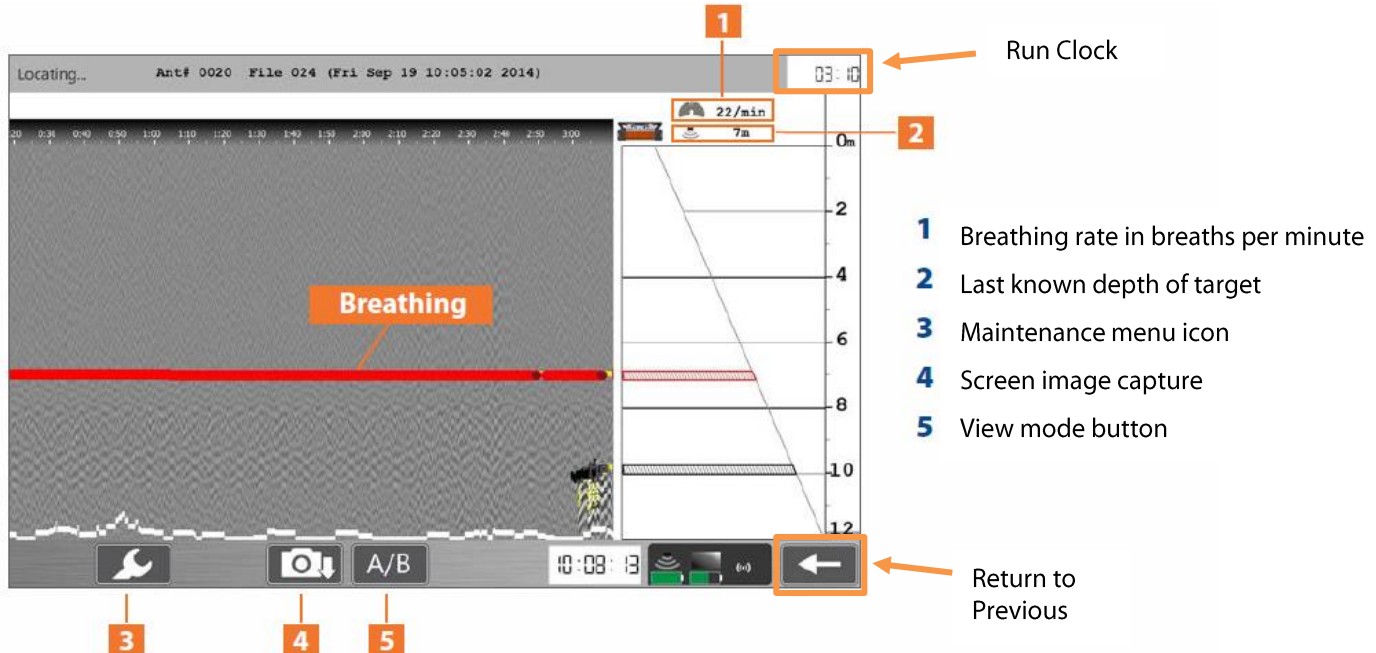


Breathing above the alarm threshold produces **red** concentric circles.

Pre-detection of breathing will display as White, Red or Yellow depending on what data color option you select.

Sustained motion or breathing will result in larger squares or circles.

Target Display Screen Overview





Target Display Screen: Maintenance Overview

Data Display Color Options: The user has the option for displaying the radar data in 4 different color options. Color options are changed by toggling the button to the desired position.



Data Gain Control: This option allows the user to increase or decrease overall displayed sensitivity of the radar data. Data display sensitivity is increased by pressing the right side of the button and subsequently decreased by pressing the left side of the button.



Targets On/Off: This option allows the user to choose what targets are being displayed or reported on the screen. The Motion and Breathing targets can be controlled independently, and are automatically reset ON each time the Control Software is started.



Screen Image Capture: By pressing this button while in the target display screen the software will instantly capture whatever is present on the screen at that time. There will also be an audio indicator signifying that a screen shot has been captured.



A/B Mode: Toggling of this button allows user to change the target display screen from Locate view to Expanded view. Please note that the radar data can be turned off only when the user has selected Locate view mode.



Breathing Rate Indicator: When breathing is detected this icon will display the last known estimate of the breathing rate from the victim. It is also important to note that a different higher pitch audio indicator is played when a breathing target is detected. Range of breathing detection is from 3/Min to 30/Min.



Last Known Position: This icon which is located in Locate View at the top right of the screen indicates that last known position of a breathing or moving victim. This number will update as new target information is received and displayed by the system.

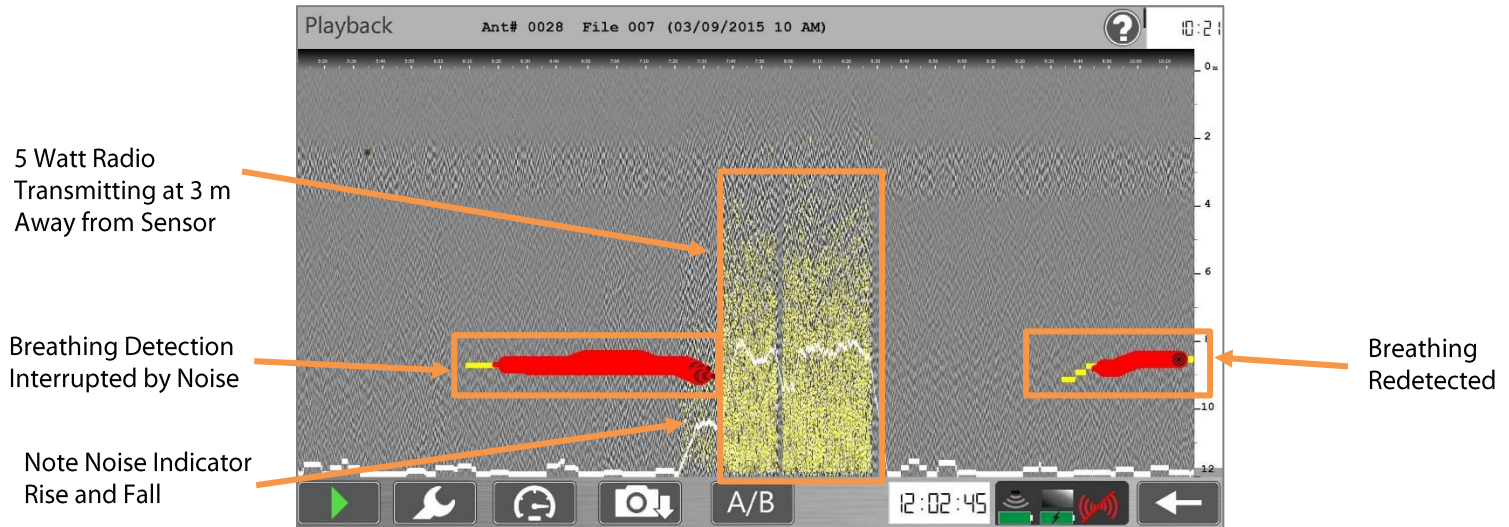
Target Display Screen: Tips and Tricks:

- Pressing the Left arrow button located on the bottom right of the screen quits and returns to the previous screen.
- From the Main menu screen pressing the Left arrow button calls up a secondary icon to verify that you want quit the program pressing this icon return the user to the Windows desktop. Pressing this large icon will completely exit you from the program
- Pressing and holding the power button on the Tablet Controller turns the Tablet power off.
- The Tablet Control Units volume control may be increased/decreased by using the Tablets dedicated volume control buttons.

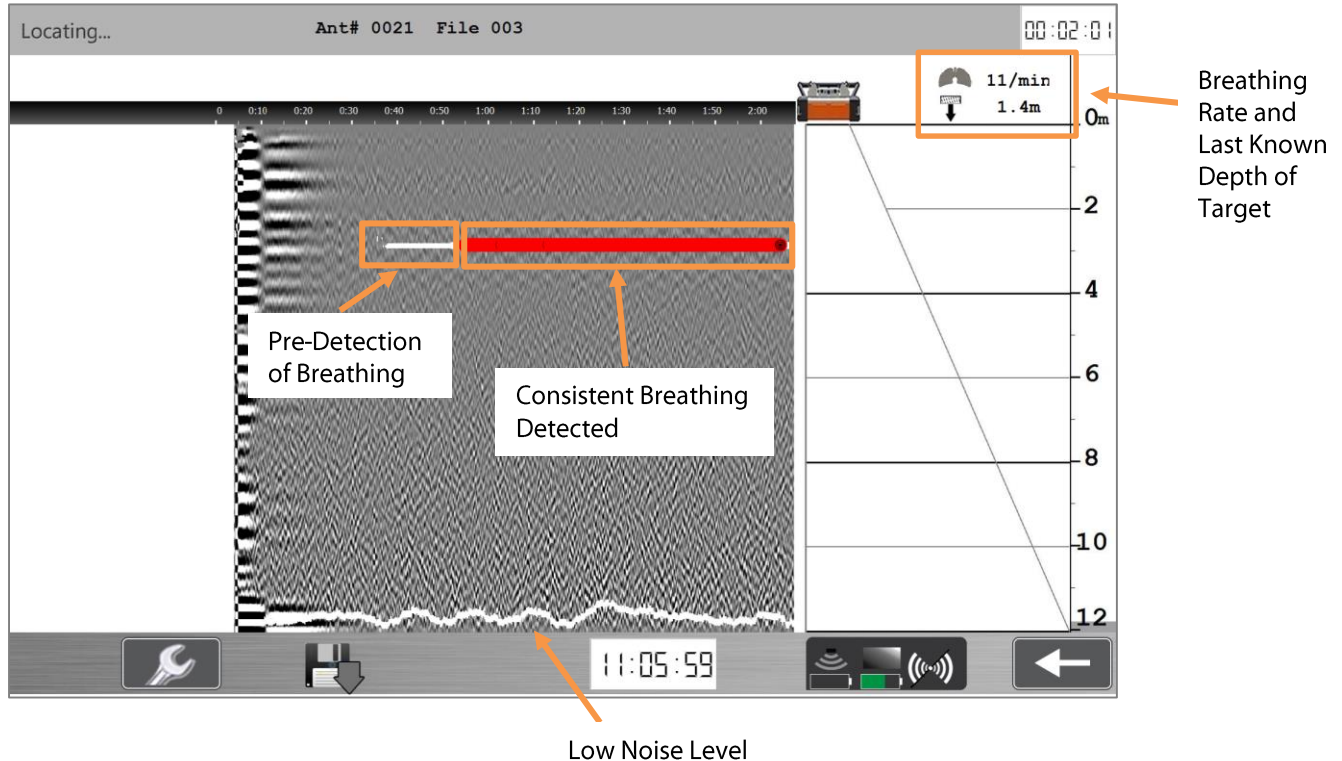


Target Display Screen: Noise Monitoring

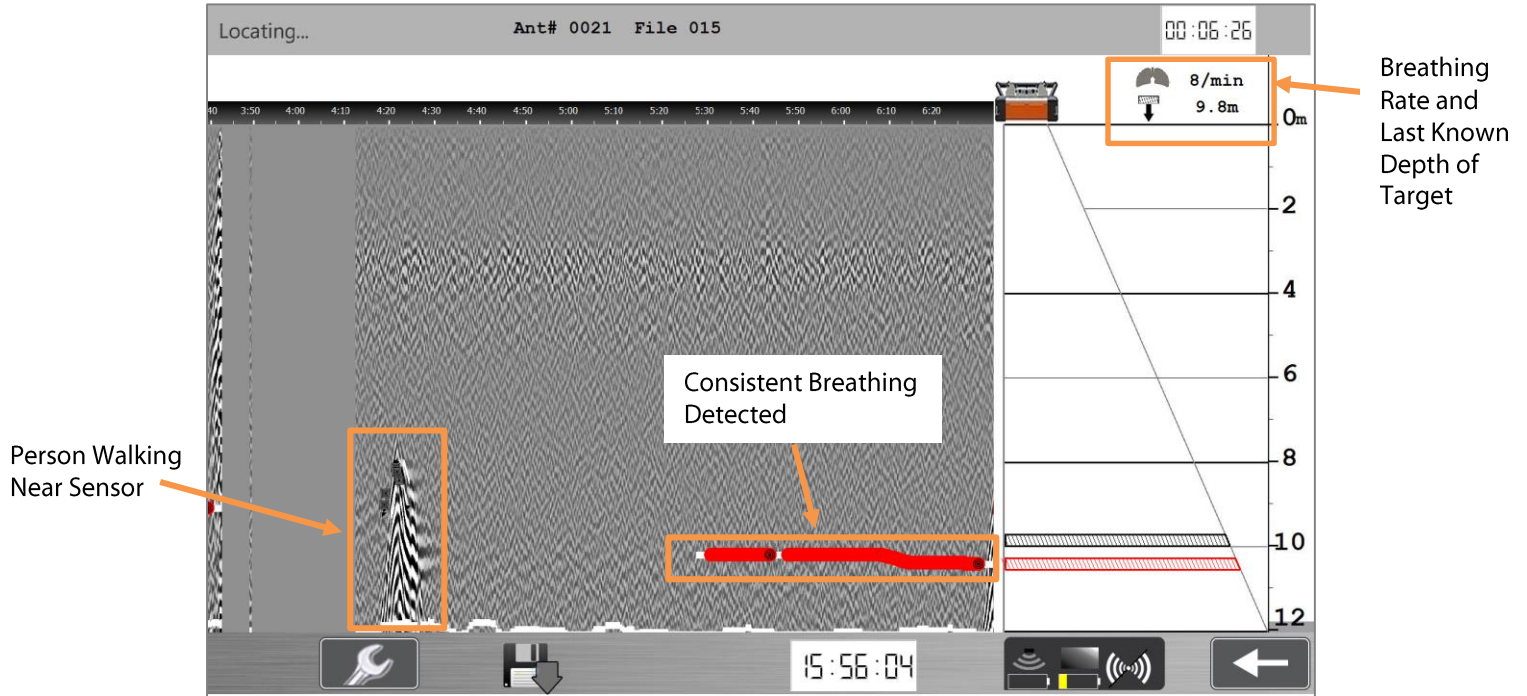
Since LifeLocator TRx detects radar, it is susceptible to radio interference. The system has been designed to continuously measure interference it is unable to shield, and to display this noise level as a continuously varying line at the bottom of the data -- the depth below which it cannot detect. In this way the system automatically protects against false detections.



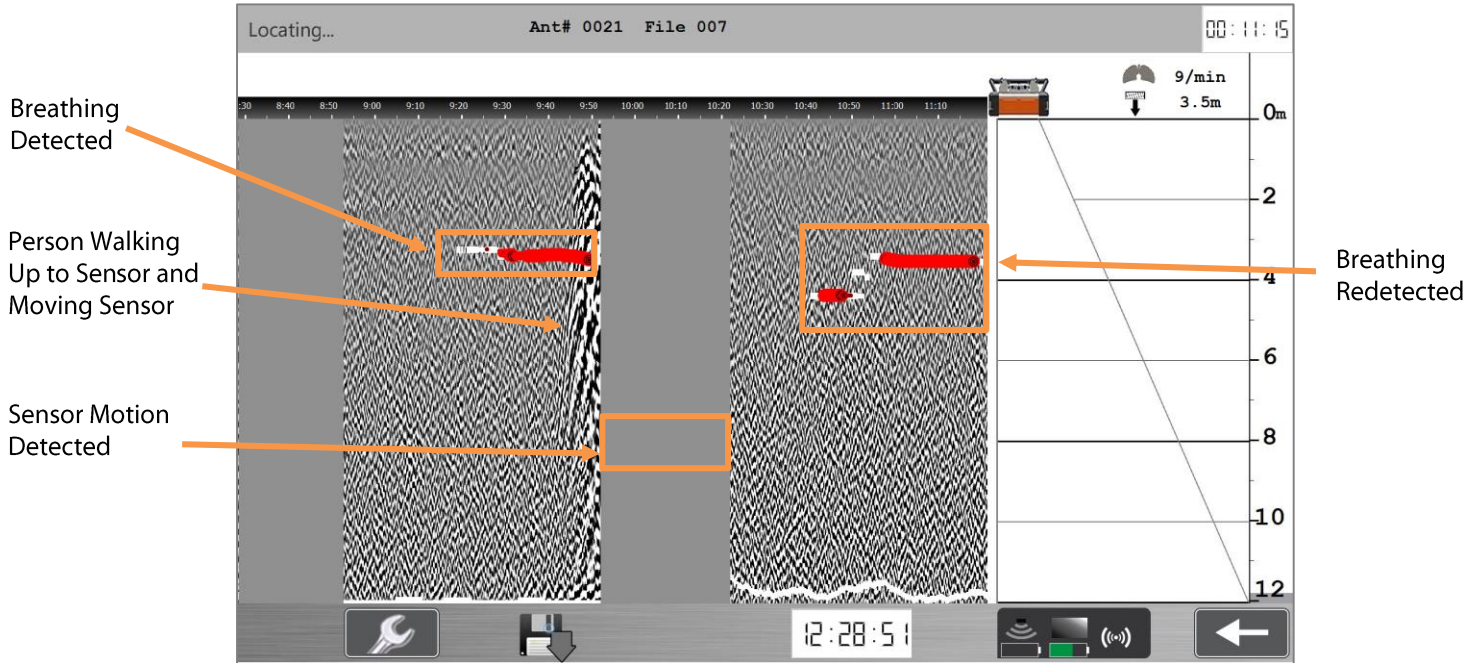
Example Data: Breathing at 1.4 Meters



Example Data: Breathing at 9.8 Meters






Example Data: Faint Breathing at 3.5 Meters with Sensor being Moved





Sensor/Antenna Lights




Connectivity (Green) LED:

-  Sensor ready to be linked to Tablet/Controller
-  Sensor Paired/Linked
-  Sensor in Operation

Status (Blue) LED:

-  Sensor Shock Detected
-  Power On

Battery (Red) LED:

-  Flashing Red LED: <20 Minutes Remaining on Battery



Section 3: Playback

- 1** To playback a file (an individual search cycle), select Playback from the Main menu screen. Select the file you want to play by using the scroll bar on the right side of the screen and tapping the file you want to playback. Related images that have been captured can be used to preview the data.
- 2** While on the Select File screen, you may sort by File/Image Number, Ant (Antenna) Number, Date/Time or by file length by tapping any of those column headers.
- 3** Once the chosen search cycle file is selected it will automatically open and begin to playback the file. Note that toggling the speed button (icon) will either speed up or slow down data playback speed. All functionality present in data collection is also available in data playback.

Appendix A: Battery Use

Checking Sensor Battery Life: There is a viewing window on the end of the battery near the pull tab. Columns indicate the status of the battery:

- 5 columns – 100%
- 4 columns – 80%
- 3 columns – 60%
- 2 columns – 40%
- 1 column – 20% or less.

Batteries showing 1 or 2 columns should be fully charged prior to use.

Recharging Sensor Battery: To recharge a battery, insert it into the charger. Full recharge time takes about 2 hours.

Recharging the Tablet/Control Unit Battery: To recharge the Tablet/Control Unit, insert the supplied Panasonic AC/DC adapter (16V – note yellow sticker) into the side of the Tablet/Control Unit, then plug in and charge until the Tablet is fully charged. See the supplied Panasonic manual for more information on battery maintenance.



Appendix B: Troubleshooting

Check battery status on both units when there is a problem. Low battery power may cause communication or data errors.

Error: Radar Time Out or Connection Abandoned error box appears.

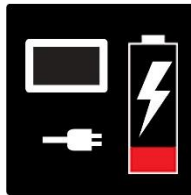
Solution: Exit out of LifeLocator, reenter and try again. If same error appears, repeat the Startup Procedure including turning the Sensor Off then On again.

Error: Erratic detection of motion or breathing.

Solution: Check around the Sensor. Make sure that there is no other motion within 50 feet (15 meters) of the Sensor. Keep in mind that this may include other rescue workers, wind blown grass, overhead trees or debris.

Check Sensor and control unit battery power. If problems persist, the environmental noise due to other communications equipment may be overwhelming the Sensor. These can be visualized with data mode on.

Note: The internal 128 GB memory can store more than 25 days of continuous data collection.



Low Battery
Warning



Low Storage
Warning

Appendix C: System Use and Maintenance

- The user should place the Sensor face down on the rubble and back away about 15 meters (50 feet) or more, up to 30 meters (100 feet) max. The Antenna/Sensor collects data for about two minutes and indicates the presence and distance to the victim. Although breathing may be detected in as early as twenty seconds, a longer period of time improves the confidence level in order to detect faint breathing. After two minutes of no detection, the Sensor should be positioned to the next point in the search grid.
- A single Sensor returns only the approximate distance to but not the exact position of the victim, since there is a “solid viewing angle” that widens and narrows depending on the medium being penetrated. For example, the victim might be six feet away from the Sensor but not directly beneath it. In moist sand, the victim could be about 50 degrees away from perpendicular, whereas in dry sand or concrete rubble, this angle might be wider.
- Although a user might pinpoint the victim’s position by moving a single Sensor around and triangulating the distances, it is probably more important simply to make the positive ID and start digging. A proposed search pattern is shown in the diagram. It uses a 4 meter (12 foot) grid spacing between search points with staggered lines to minimize the area not searched close to the surface.
- Since it is impossible to know when disasters will strike, it is important that periodic LifeLocator training be conducted. **GSSI recommends that all System batteries remain fully charged and inspected monthly.**

