

# User manual



## LEADER Scan



**EN** Read this manual carefully, before the first use

# LEADER Scan

## UWB device to search for buried victims by detecting movement

Japanese patent: 10-54795  
PCT (international patent): PCT/RU2005/000483

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Product number

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D11.07.023	LEADER Scan – English version
D11.07.024	LEADER Scan – Chinese version



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# 1 INTRODUCTION

## 1.1 Presentation of LEADER Scan

**LEADER Scan** uses UWB (Ultra Wide Band) technology to survey debris. It can be used to detect and locate victims buried under rubble after landslides, avalanches, collapses, explosions, etc. The victims are located using movement detection. This movement can be as small as the thoracic movements caused by breathing.



For the device to work well, it is important to properly understand its limits depending on the environment in which it is used. For example, **LEADER Scan** cannot detect a victim who is behind or under a solid metal screen or water. It is not intended for detection through damp conducting materials like wet clay, etc. However it is able to detect through dry materials like wood, brick, concrete, etc...  
Reinforced concrete will be more difficult to scan (see **Directions for Use** chapter).

## 1.2 Composition of LEADER Scan

- 1 UWB sensor (fixed in a shock-proof and watertight orange case).
- 1 special USB cable: 1 x 5 m (4.5x15ft).
- 2 batteries for the sensor (battery life: 5 hours each).
- 1 battery charger for the sensor.
- 1 control box with a screen, keyboard and support straps (shoulder strap and handle).
- 1 fixed antenna to fix onto the control box for wireless communication with the sensor.
- 1 rechargeable battery pack to power the control box (battery life: 5 hours).
- 1 x 100/240V 50/60Hz charger unit, delivered with 1 international adapter set.
- 1 emergency battery pack for 10 x AAA batteries - not supplied (battery life with Lithium batteries: 2 hours).
- 1 sun shade.
- 1 technical and instruction manual.
- 1 backpack to transport the Leader Scan and its accessories.
- 1 watertight and shock-proof transport case for all the equipment listed above.



**Please note: Do not damage the USB cable if storing it under the sensor's cover.**

**Important:** Follow the instructions for use in this manual. If you do not, the device may not work correctly.



- Carefully read the leaflet before use.
- Handle the device carefully, do not drop it and do not subject it to strong impacts.
- Do not dismantle the product as this will void the warranty.
- Do not try to repair this product or replace parts (unless the manual gives you specific instructions on how to do this). Any maintenance or repairs should be carried out by your local dealer or the **LEADER** maintenance department.



## 1.3 Detailed technical features

Please refer to the product technical file available on our website [www.leader-group.eu](http://www.leader-group.eu)

## 2 DESCRIPTION OF LEADER Scan

### 2.1 Control box

#### 2.1.1 Description of control box

➤ The polypropylene control box is made up of:

- 1 x 7in TFT 16/9 bright colour screen.
- 1 keyboard to adjust settings and browse through different menus.
- 1 rechargeable fixed battery pack.
- 1 fixed antenna to communicate with the sensor.
- 1 watertight connector without a cap to connect the UWB sensor in wired USB mode
- 1 watertight cap to screw onto the antenna connector when not in use.
- 1 Bump protector on the edge for improved shock resistance.
- 4 hooks to fix the carry strap and the handle.
- Dimensions: L24xH15.2xD5.1cm
- Weight: 1.38kg
- Battery life: up to 5 hours

➤ The control box:

- 1 ergonomic graphic interface including an intuitive menu with English captions.
- Can be reversed for use by a right or left handed operator (“**Left/right hand**” function to select in the menu).
- **IP54:** Protected against dust. No harmful deposits.  
Protected against water splashes from all directions.
- Possible connection with USB sensor: WiFi or USB cable.
- Supplied with sun shade.
- Supplied with micro SD card.

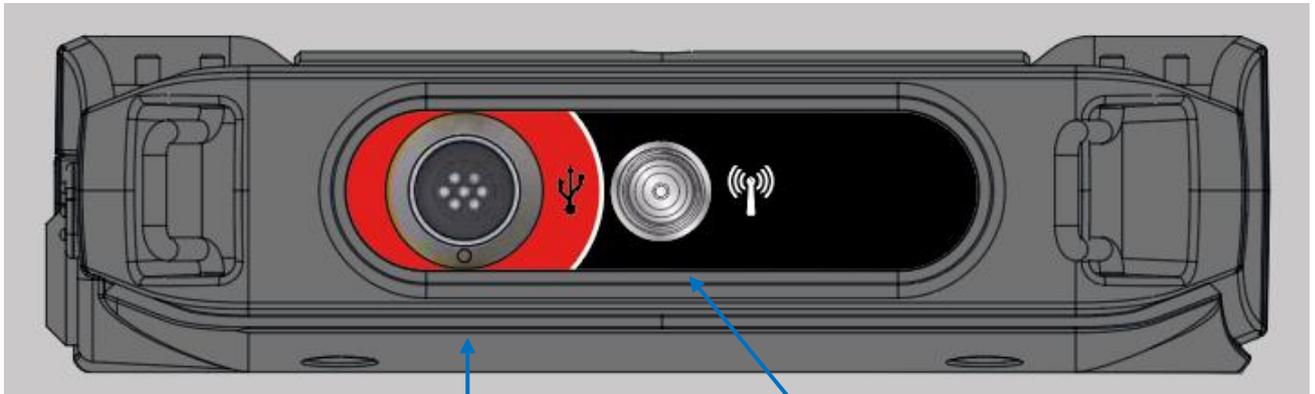


- For daily cleaning, use a soft dry cloth.
- Never use solvents or alcohols of any kind to avoid discolouration and/or distortion of the device.
- Avoid impact or high pressure exerted on the screen.



## 2.1.2 Control box connectors

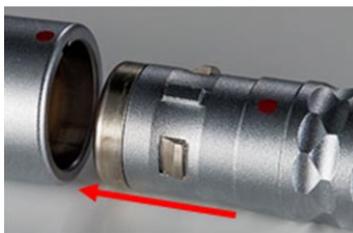
To make it easier to connect accessories, each female connector for the control box is marked with a colour code and symbol.



The **USB connector** is marked with the USB symbol  and a red colour code to connect to the male connector with the USB cable's red sleeve.

The male connector is a “**push & pull**” connector.

The male and female connectors have a key and are marked with a red circle join and connect them:



To disconnect the connector, you just need to pull on the male connector's sliding ring.

The USB connector is used to connect the UWB sensor in wired mode. It does not have a cap as it is watertight even when not connected.

The antenna connector is marked with the  icon and a black colour code to connect the antenna.

The antenna is screwed into the connector:

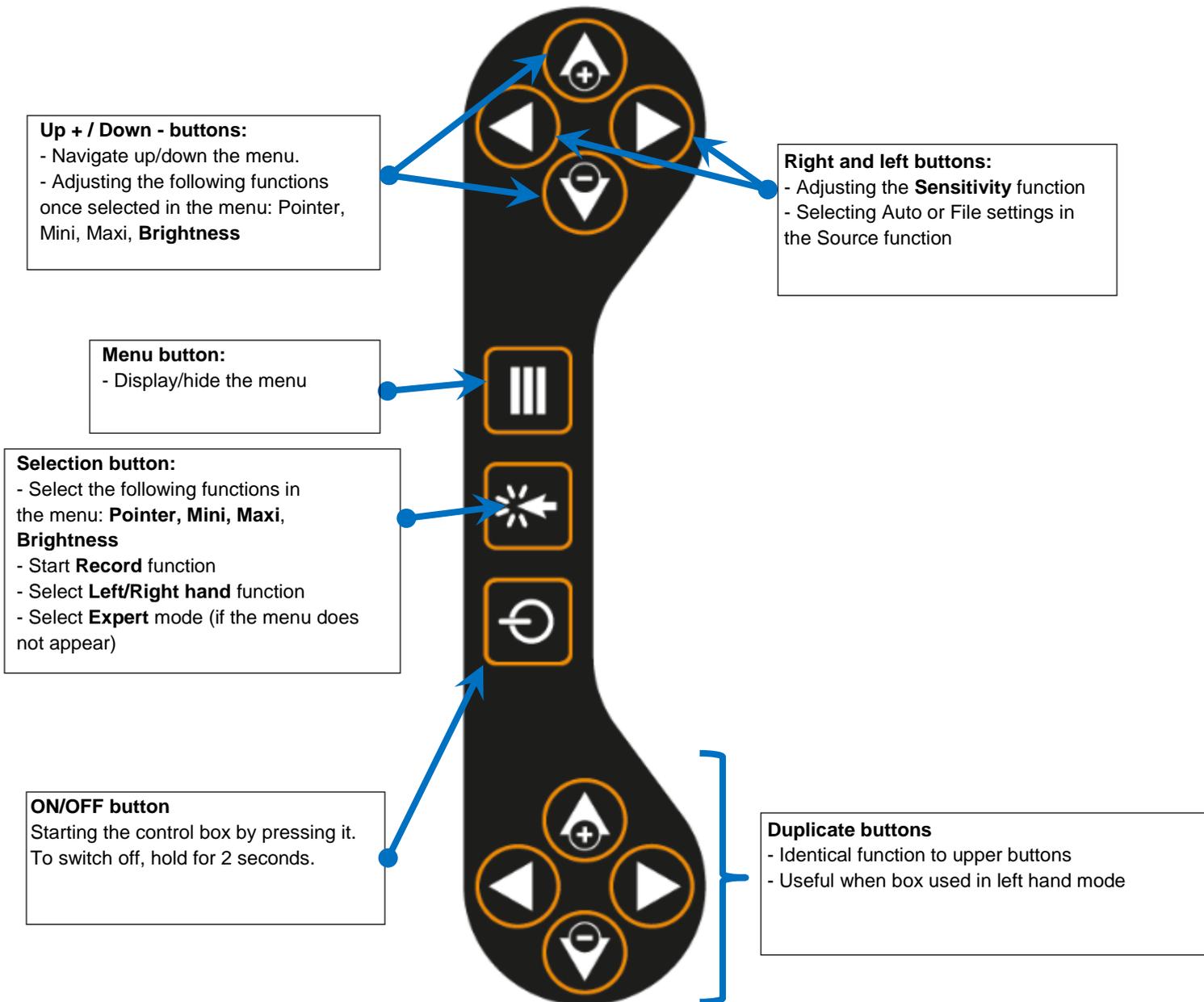


A watertight cap can be used when the antenna is not in use. It is attached to the box with a small chain.

## 2.1.3 Control keyboard

The keyboard has photoluminescent buttons to make them easier to see in the dark. The keyboard is reversible so it can be used by a right or left-handed operator. To move from one to the other, the corresponding function must be selected.

View in “Right hand use mode”:



## 2.1.4 Powering the control box

The **LEADER** Scan control box is delivered with a polymer lithium battery pack with a 5 hour battery life which is inserted into the back of the control box.



The battery can be charged whilst in the box, but the box cannot be used. Charging can take place between 0°C min and 45°C max using the supplied charger.

During recharging, an LED located on the charger gives the following indications:



**Battery pack**



**Charger unit**

**Sector adapters**

-  Green: battery charged or battery not connected to the charger.
-  Red: battery charging.

During operation, if the battery pack is flat, the user can either use another battery pack (provided as an option) or the emergency battery pack in place of the battery pack. The emergency battery pack requires 10 x AAA lithium batteries (batteries not provided).



The battery pack can **ONLY** be recharged with the supplied charger unit. It can be used with 100/240v AC - 50/60Hz.

International adaptors allow the battery pack to be recharged using all standard US, Australian, European and UK sockets.

Once the device is switched on and application started, an icon representing the battery pack's charge level is displayed on the top left of the screen.



**5 successive icons to symbolise the control box battery pack's charge level.**



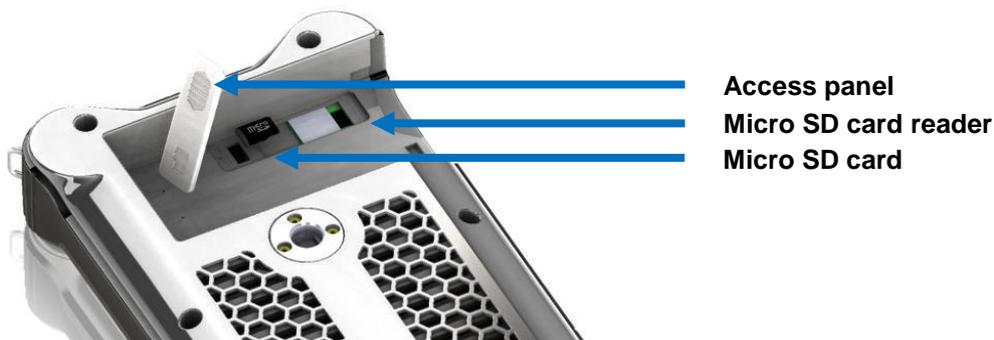
**Icon displayed when using the emergency battery pack.**

## 2.1.5 External SD card for recording

A Class 10 micro SD card is inserted into the reader of every delivered control box.

The number of recordings depends on their duration. However as an indication, taking the example of an average recording of 500KB, the SD card can hold up to 8000 recordings.

The micro SD card reader is located under a panel on the back of the box. To access it, remove the battery pack.



Recordings cannot be deleted from the control box. You must use a computer. To do this, insert the micro SD card into the micro SD adapter (adapter supplied). Then insert the adapter into a computer with a card reader. Open the corresponding folder to delete the files. The recordings cannot be viewed on a computer.



### 2.1.6 Installation of the sun shade

If there is bright sunlight, the sun shade makes the screen darker to make it easier to read. To affix the sun shade on the control box, it must be positioned correctly on the front as indicated. The red lines indicate the correct position.



The elastic bands make it easy and quick to position.

It is stored flat to make it easy to transport. An elastic band on the side keeps it flat and allows it to be affixed to the control box.



## 2.2 UWB sensor

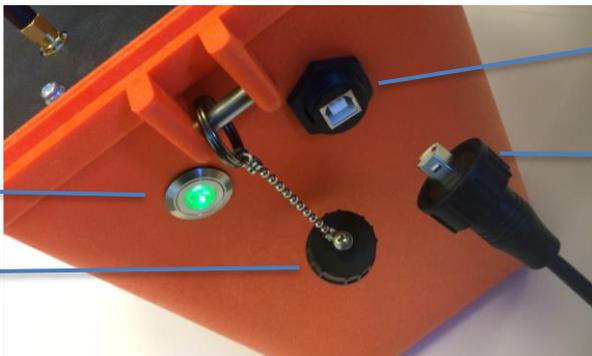
### 2.2.1 UWB sensor connectors



**1/ USB connector** to connect the UWB sensor in wired mode to the control box.

**2/ Watertight cap for USB connector** to protect it when not in use.

**3/ ON/OFF** button to switch on the UWB sensor. If the batteries are OK, the button turns green. If the battery level is low, the button starts to flash.



1

4

**4/ The male USB connector** allowing wired connection between the control box and UWB sensor connects to the female USB connector. It screws tight to be watertight and to avoid it being pulled out.

3

2



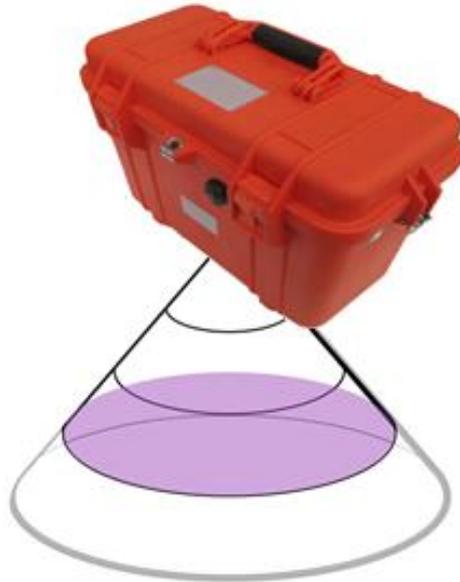
**Open UWB sensor**

**Endura CUE D75** battery on its base. To replace the batteries, see the “Sensor power” section.

**WiFi antenna** to communicate in wireless mode with the control box.

## 2.2.2 Description of the UWB sensor

The sensor detects movement in a cone area in a vertical position.  
The dimensions of the cone can vary depending on the nature of the debris.



<b>Material</b>	<b>Pelicase ABS</b> type case
<b>Technology</b>	UWB (Ultra-Wide Band)
<b>Search distance</b>	Up to 30m (90ft) in an unobstructed space for wide movements
<b>Search volume</b>	Variable depending on type of terrain: approximately 1050m <sup>3</sup> (28280ft <sup>3</sup> ) based on 10m (30ft) search in soil
<b>Dimensions</b>	430 x 244 x 341mm
<b>Weight</b>	≈6.1kg (without battery) and ≈6.7kg (with battery)
<b>Battery life</b>	Up to 5 hours with an <b>Endura CUE D75</b> battery
<b>Power</b>	9 to 16 V/CC

### ➤ **Communication between the control box and the sensor:**

- Wired watertight USB connection (5m (15ft) cable) which ensures excellent operation if there is significant interference which does not allow the use of WiFi.
- WiFi connection with control box when conditions allow. 20-30m (60-90ft) scope in the field and around 50m in free field conditions.

## 2.2.3 UWB sensor power

The **LEADER Scan** sensor power is 9 to 16 V. This is not dangerous for the operator but, in order to avoid any risk with the batteries, battery chargers, etc. Respect the security guidelines set out in the instruction manuals for these accessories.

<b>Polymer-lithium rechargeable battery</b>	<b>ENDURA CUE D75</b>
<b>Capacity</b>	4.9Ah, 73Wh
<b>Voltage</b>	14.8 V
<b>Maximum voltage</b>	16.8 V
<b>Average battery life</b>	5 hours
<b>Charging temperature</b>	0 C° / +40 C°
<b>Operating temperature</b>	-20 C° / +45 C°
<b>Storage temperature</b>	0 C° / +40 C°
<b>Size</b>	97 x 146 x 38 mm
<b>Weight</b>	620 g



Once the device is switched on and application started, an icon representing the UWB sensor battery pack's charge level is displayed on the top left of the screen. 5 icons to symbolise charge level:



## 2.2.4 Battery charger for the UWB sensor

<b>ENDURA V-MOUNT charger</b>	VL-VPC1 IDX
<b>Input voltage</b>	100 to 240 VCA - 50/60Hz
<b>CUE D75 charging time</b>	4.5 hours
<b>Operating temperature</b>	0 C° / +40 C°
<b>Size</b>	83 x 142 x 28 mm
<b>Weight</b>	360 g



## 2.2.5 Sensor battery charging

<p>1. Connect the CA plug of the VL-VPC1 IDX charger to the 100-240V socket.</p>	
<p>2. Place the ENDURA CUE D75 battery in the charger. Battery charged The red LED ● turns red.</p> <p>The charging starts automatically if the battery is not fully charged. The red LED 🌀 starts to flash.</p>	
<p>3. When charging is complete: The red LED ● turns red.</p> <p>⚠️ The approximate charge time for 1 completely flat battery is <b>4.5 hours</b>.</p>	
<p>3. Once fully charged, remove the battery from the charger base using the push button on the side.</p>	

- **Checking remaining battery life:**

To check the remaining battery life, press the side button. If the 3 LEDs switch on, this means that the battery is fully charged.



- **Battery storage (control box and sensor):**

If the batteries are not used for over 3 months, they must be stored at a temperature of 0 to 40°C and a charge level of 50 to 70%. We recommend charging the batteries every 3 months.

## 3 USE

### 3.1 Switching the control box on and off

- Place a charged battery in the box.

**Start: Press the On/Off button**



- A welcome screen appears whilst the software starts up.



- When the device has started, this start screen appears if the sensor is not connected (WiFi or USB):



The icon indicates that there is no SD card inserted, it can appear briefly during start-up even if an SD card is inserted whilst it is detecting it.



The icon indicates that there is an SD card inserted containing recordings.



The icon indicates that there is an SD card inserted without recordings.

From the start screen you can:

- Read the files on the SD card by pressing on



Menu, only available if the recording files are stored on the SD card.

Or

- Connect the sensor to the box.

Or

- Switch off the box. To switch off the control box, press and hold the **ON/OFF** button for 2 seconds. 

A message appears indicating that you should not remove the battery before it disappears.

**POWER OFF**  
**While device is turning off,**  
**make sure battery is not removed to protect software**

Comply with this message so that the software shuts down correctly to ensure that it works correctly when next started.

## 3.2 Connecting sensor to box

### ➤ Connecting the sensor with WiFi:

- Affix the antenna to the box.
- Place a charged battery in the sensor.
- Switch on the sensor by pressing the On/Off button, the button should light up.

### ➤ The sensor connects automatically and the following screen appears:

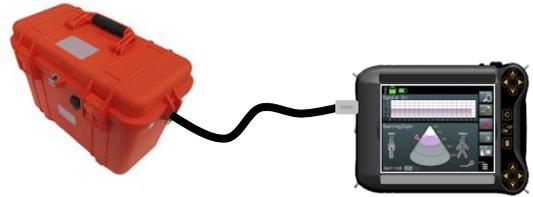


- In WiFi mode, the device displays this icon  in the top left. 5 successive WiFi signal levels are defined to illustrate the connection level.



➤ **Connecting the sensor with USB:**

- Place a charged battery in the sensor.
- Connect the USB cable between the sensor and the box.



➤ **The sensor connects automatically and the following screen appears:**



- It is possible to move from WiFi to USB connection automatically, you just need to connect the USB cable and conversely disconnect the cable.

### 3.3 Languages and measurement units

➤ **Languages:**

The **LEADER Scan** graphic interface was designed to be as intuitive as possible and easy to use (shortcuts, easy menu sequences and functions...) in the field. The icons are subtitled in English and Chinese depending on the chosen device reference.

➤ **m / ft measurement units:**

**LEADER Scan** can be used in metric (**m**) or imperial mode (**ft**).

**To switch units:**

- With the box switched off, press the menu button. 
- Press the **On/Off** button  to switch on the box.
- Release the buttons when the screen switches on.

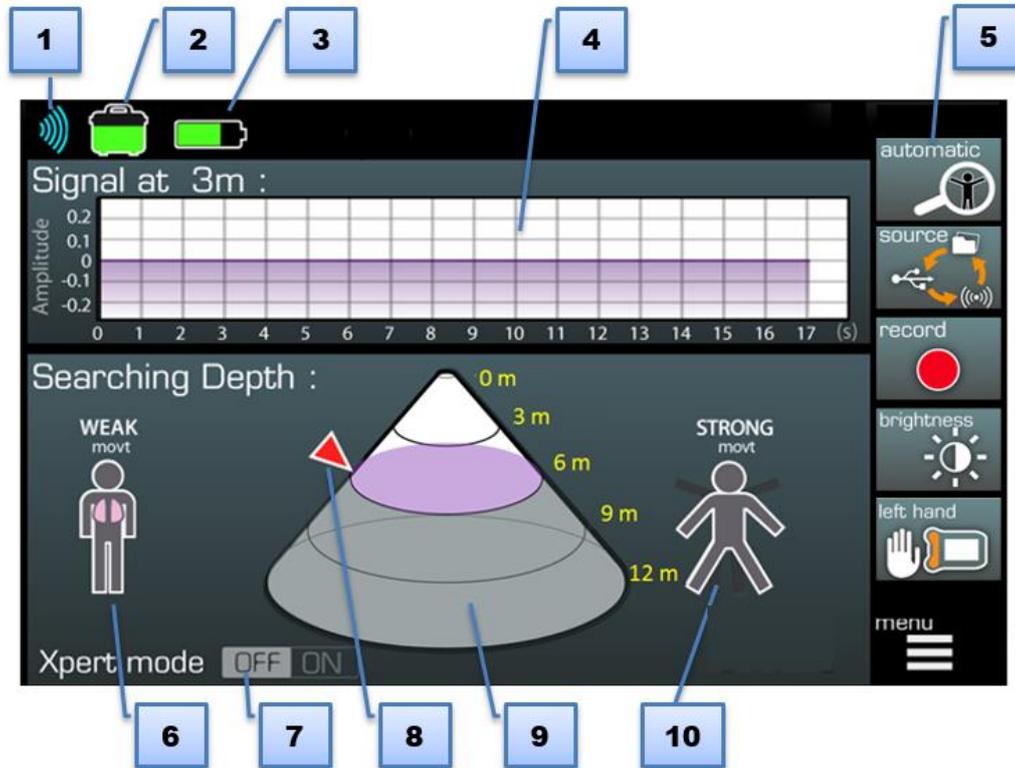
Once the sensor is connected to the control box, all measurements will have changed unit.

This adjustment is kept until the mode is changed again.

The procedure is the same for changing from metric to imperial and imperial to metric.

## 3.4 Control screen

➤ Once the sensor is connected to the control box, the following screen appears:



**1. Level of WiFi signal** (sensor connection). If the sensor is connected with the USB cable, the corresponding icon appears. 

**2. Sensor battery level.**

**3. Control box battery level.**

**4. Oscillogram** representing the signal of movements detected by the device at a given distance (in collaboration with the “pointer”).

**5. Menu** (for detailed functions **see chapter 4**).

**6. Weak movt:** When a weak movement is detected, this icon flashes and is also duplicated in the cone at the detected distance.

**7. Xpert Mode:** When activated, the expert mode display gives additional information to the classic display (cone diameter, detection surface, detection volume).

**8. Pointer:** Moves on the side of the cone to indicate the desired distance and help display the signal at this depth in the oscillogram.

**9. Detection cone:** Detection area where the “Weak movt” or “Strong movt” icons appear to locate the depth at which the movement has been detected.

**10. Strong movt:** When a medium/strong movement is detected, this icon flashes and is duplicated in the cone at the detected depth.

## 4 Menu: Description of functions

Each functionality is controlled from the control keyboard, either with the **up + /down -** arrows or the **right/left** arrows (see chapter 2.1.3)

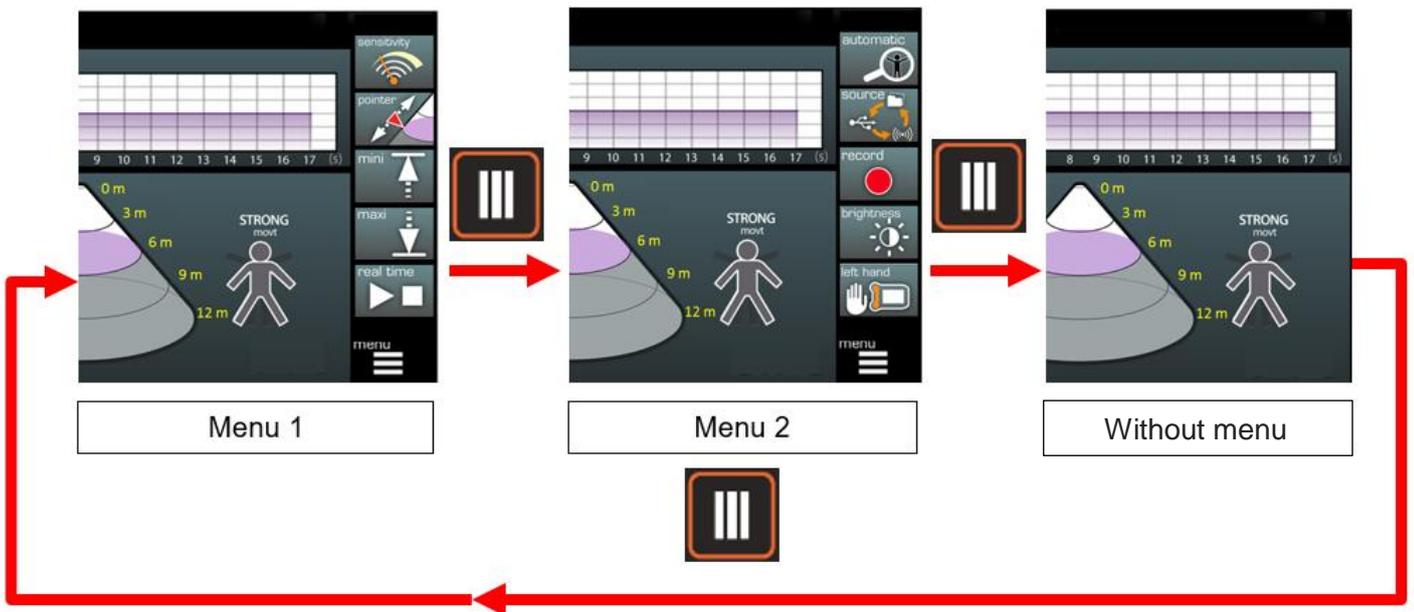


	<p><b>Sensitivity:</b> Adjustment of the UWB sensor's sensitivity (5 sensitivity levels).</p>	
	<p><b>Pointer:</b> Allows positioning of the pointer on the side of the cone to adjust the distance and view the signal of this depth in the oscillogram.</p>	
	<p><b>Mini:</b> Selection of minimum search depth (start of detection cone).</p>	
	<p><b>Maxi:</b> Selection of maximum search depth (end of detection cone).</p>	
	<p><b>Real time:</b> Activation of real-time search mode to view movement detection of a person in real time.</p>	
	<p><b>Automatic:</b> Activation of automatic search mode to view movement of one or several people via detection by 3m section.</p>	
	<p><b>Source:</b> Selection of source: <b>"Auto"</b> source, connection of sensor with USB or WiFi, <b>"File"</b> source, reading SD card recordings.</p>	
		<p><b>Record:</b> Activation of control screen recording. If the SD card has not been inserted into the control box, the icon is greyed out.</p>
	<p><b>Brightness:</b> Adjustment of screen brightness.</p>	
		<p><b>Right / Left hand:</b> Allows definition of use of the control box by a left handed or right handed operator. (reverses image, display of functionalities, and keyboard use).</p>

- When the device starts, the menu appears as follows:



There are two different menus, you can move from one to the other by pressing the menu button  Or by using the up and down arrows.

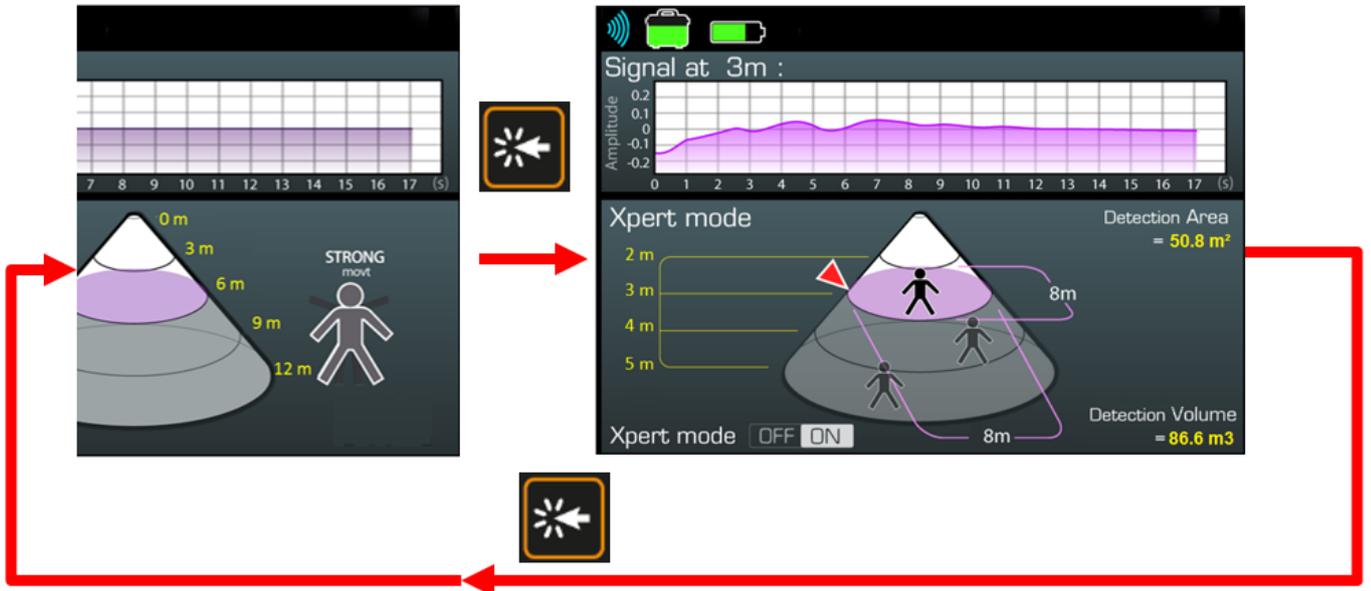


## 4.1 Xpert mode function

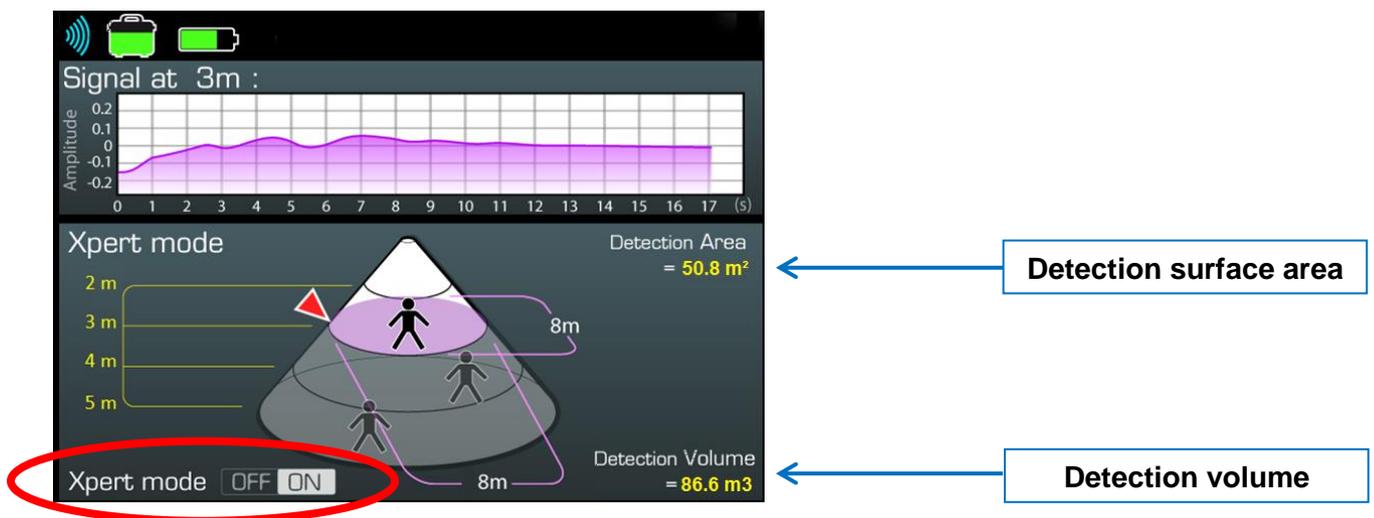
To move into Expert mode, press on



outside the menu, the same to leave expert mode.



The icon on the bottom of the screen moves to **ON**  Xpert mode  and now displays the distance at which the pointer is located as well as detection surface and detection volume.



It is possible to keep this expert mode to use the menu functions and adjust Mini, Maxi and Pointer to view the changing dimensions depending on the position of the **“Pointer”**.

## 4.2 Adjustment of search parameters

For the **Sensitivity, Pointer, Mini, Maxi and Brightness** functions, adjustment is as follows:

- Scroll through the menu until you highlight the desired function.



- Once the function is highlighted.

- Use the arrows   to directly adjust the chosen function.

Or

- Press on  a bar graph appears: modify the settings using the arrows.



- modify the settings using the arrows.  
- Press and hold to reach the chosen setting more quickly.

### 4.3 Sensitivity function



- This function helps adjust the sensitivity of the UWB sensor to be more or less sensitive. Sensitivity can be adjusted from **0 to 4**.

**0** = Reduced sensitivity to help ignore major surrounding movements which are too clear. However the device will be less successful in detecting weak movements.

**4** = High sensitivity which helps uncover the weakest movements. However the device will detect surrounding movements more easily.

**2** = Intermediate sensitivity which helps with initial searches with average sensitivity.

### 4.4 Pointer function



- This function adjusts the position of the pointer on the side of the cone to adjust the distance at which the user wishes to view the signal.

The signal can be read on the curve in the oscillogram.

By default the pointer is positioned at 3m (9ft) (with a minimum setting at 0m and a maximum setting at 5m (15ft)).



## 4.5 Minimum distance function



- Selects minimum search depth located at the start of the detection cone.



Minimum search depth (Mini)

By default the Mini is set to 0m (0ft).

When adjusting the minimum distance, the difference between the minimum and maximum does not change, the maximum distance is therefore modified at the same time as the minimum depth.

## 4.6 Maximum distance function (Maxi)



- Selects maximum search distance located at the end of the detection cone.

By default the Maxi is set to (5m 15ft). The maximum value is 30m (90ft).



Maximum search depth

## 4.7 Screen brightness function



- Adjusts the screen brightness in order to adapt it the surrounding brightness conditions.

Reducing brightness can save battery energy in use and can increase the equipment's battery life. By default, brightness is set to 50% power.



## 4.8 Real time mode function



- Activates real time search mode to view movement detection in the entire detection cone in real time and to view the movement signal on the oscillogram

Unlike Automatic mode, Real time mode constantly scans the defined zone and can only detect and display one movement/person.

### ➤ Use of “Real time” mode:

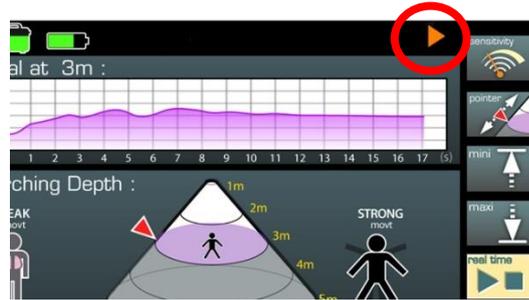
- Adjust the “Mini” and “Maxi” depths to define the search zone.
- Go to the menu and select.
- Launch the “Real time” mode by pressing



An orange triangle starts to flash at the top of the screen.

The device takes 15 to 20 seconds to start before starting the scan.

To stop the search, select the “**Real time**” icon again and press  
The flashing orange triangle disappears.



During a search in “**Real time**” mode, if several people/movements are found in the previously determined detection zone (cone), only the largest person/movement will be used and displayed.



When “**real time**” mode is launched, it is possible to browse through the menu.

Only some functions can be accessed and/or adjusted:

“**Sensitivity, Record, Brightness, Right/Left hand, Source**”

The other functions cannot be adjusted.

They must be adjusted before launching “**Real time**” mode.

If not, stop the search in progress to adjust them.

## 4.9 Automatic mode function

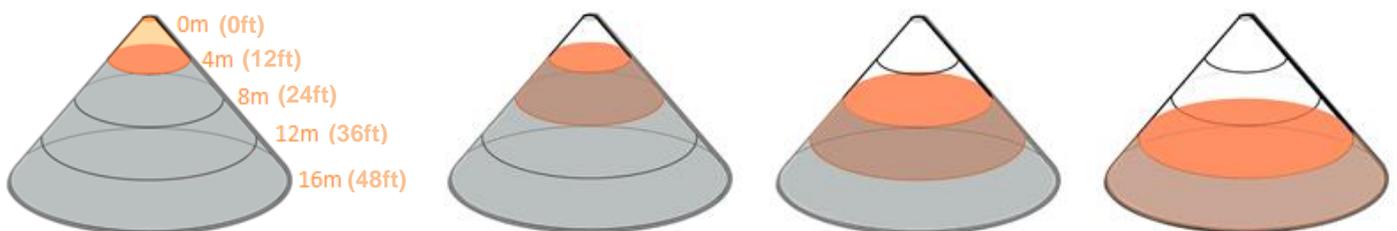


- Allows the activation of automatic search mode to display the position of one or several people in the detection cone per 4m (12ft) section and view their movements in the oscillogram. Your device may be set with 3m (9ft) search zones, not 4m (12ft). Software level algorithm adjustments were required for recent device versions (with a 4m (12ft) search area). This does not affect the performance of the devices.

The automatic mode breaks down the search mode into 4m (12ft) sections defined by the “**mini**” and “**maxi**” adjustments.

The device then scans each section one after the other.

The section being analysed appears in **orange**, the non-scanned sections in grey and the scanned sections in white.



If a movement is detected in a section, the device displays “**WEAK movt**” or “**STRONG movt**” in this section depending on the range detected and then moves to the next section, only the strongest movement will appear.

If no movement is detected after one minute in a section, the device moves onto the next section.

➤ **Uses of the “Automatic” mode:**

- Adjust the “Mini” and “Maxi” depths to define the search zone.

- Go to the menu and select.



- Launch the Automatic mode by pressing



A magnifying glass starts to flash at the top of the screen.

The device takes 15 to 20 seconds to start before starting the scan.

Once all sections have been scanned, a “finished” icon appears.

At any time you can stop the search by selecting the Automatic icon



and press.

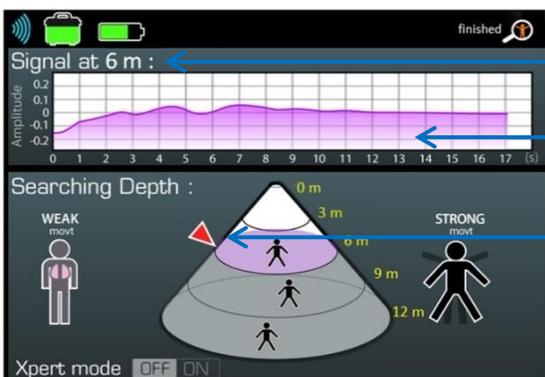


During a search in “Automatic” mode, if several people/movements are found in the detection section, only the largest person/movement will be used and displayed in the corresponding section.

**Example: For a 0-12m search.**

- **0-4m section:** 0 victims detected.
- **4-8m section:** 1 victim moves and is detected.
- **8-12m section:** 5 victims move (only the person moving the most will be displayed, based on the principle that if a victim is found there could be others nearby).
- **12-16m section:** 1 victim moves and is detected.

=> Total displayed in the cone: 3 victims/movements:



**2 - Pointer distance**

**3 - Oscillogram**

**1 - Pointer**

After analysing each section, the pointer (1) is positioned on the maxi of the section.

Once the full scan is complete, the pointer is positioned at the level of the closest detected movement to the sensor, indicating this depth (2).

The oscillogram (3) shows the detected signal at the depth indicated by the pointer.

It is possible to move the pointer in order to view the desired depth signal on the oscillogram.



For a 0-30m search, **LEADER Scan** can detect up to 10 people:

1 per section (0-4, 4-8, 8-12, 9-12, 12-16, 16-20, 20-24 and 24-26m). The scan can last up to 10 minutes in this case (less if the victims are detected before 1 minute in some sections)



For a 0-10m search, the device will divide the cone into 0-4, 4-8 and 8-10m.

For a 0-6m search, the device will divide the cone into 0-4 and 4-6m.



When **“Automatic”** mode is launched, it is possible to browse through the menu.

Only some functions can be accessed and/or adjusted:

**“Sensitivity, Record, Brightness, Right/Left hand, Source”**

The other functions cannot be adjusted.

They must be adjusted before launching **“Automatic”** mode.

If not, stop the search in progress to adjust them.

## 4.10 Source function



- Allows switching between Auto mode to SD card read mode.

Go to the menu and select.



Move from **“Auto”**



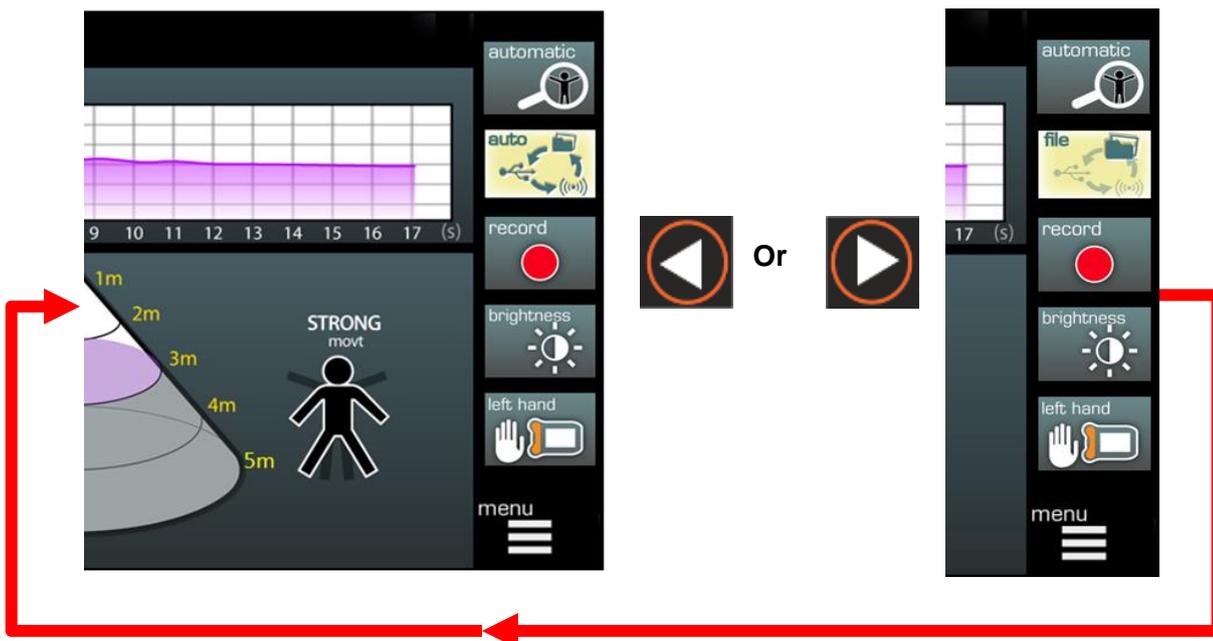
to **“File”** mode



using the



buttons.





If there is no SD card inserted or an SD card inserted with no recording files, the “File” mode cannot be accessed.



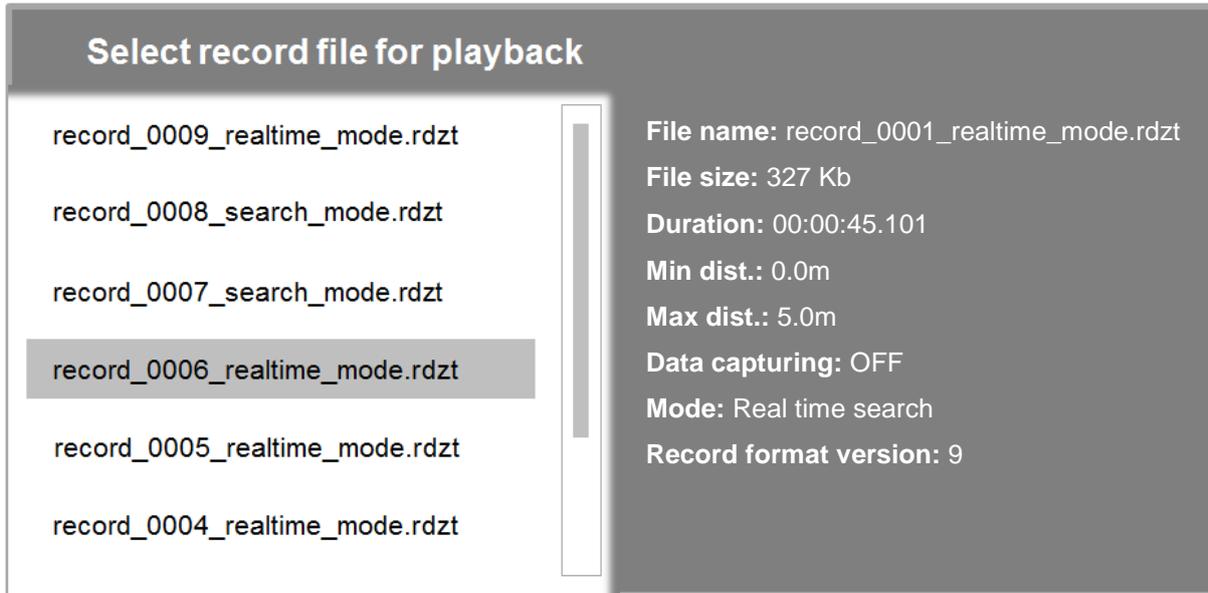
“Auto” mode: When the mode is selected, the box connects automatically to the sensor using WiFi or USB. It prioritises the USB connection.



“File” mode: When mode is selected, you must confirm by pressing



A screen appears listing the recordings on the SD card and allowing you to read each of the files.



- File name:** Name of the file which flashes when reading the recording.
- File size:** Size of the recording file.
- Duration:** Duration of the recording.
- Min dist:** Adjustment of minimum distance during recording launch.
- Max dist:** Adjustment of maximum distance during recording launch.
- Data capturing On or OFF:** Status of the sensor during start-up of the recording (If sensor in “Automatic” or “Real time” mode, Data capturing = On)
- Mode:** Recording in “Real time search” mode or “Automatic search” mode
- Record format version 9:** Software information (for use by LEADER technician)



Use the arrows to navigate in the list and delete the desired file.

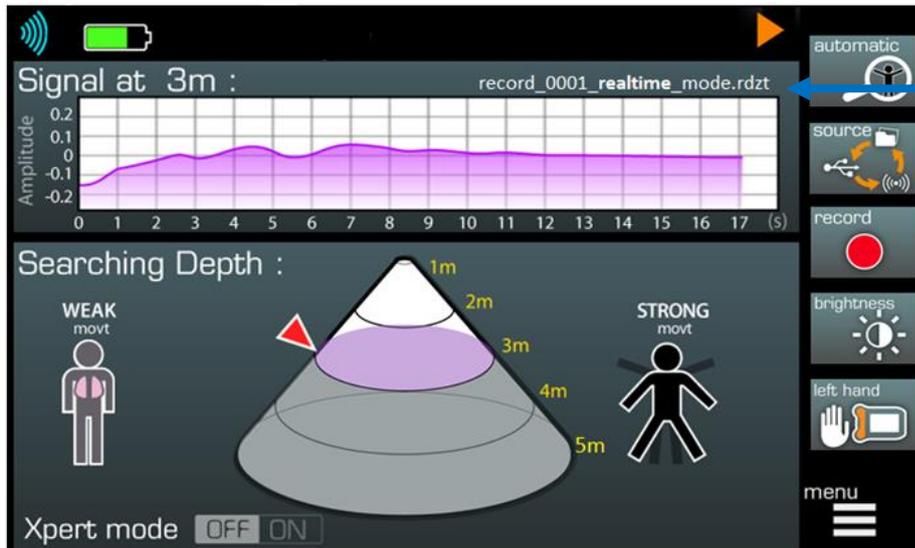


Open the file by clicking with .

The recording is then opened and displayed full screen. The recording is the exact copy of the screen during recording.

A flashing message “record\_0001\_xxx\_mode” appears on the screen and helps clarify that it is a file reading (1).

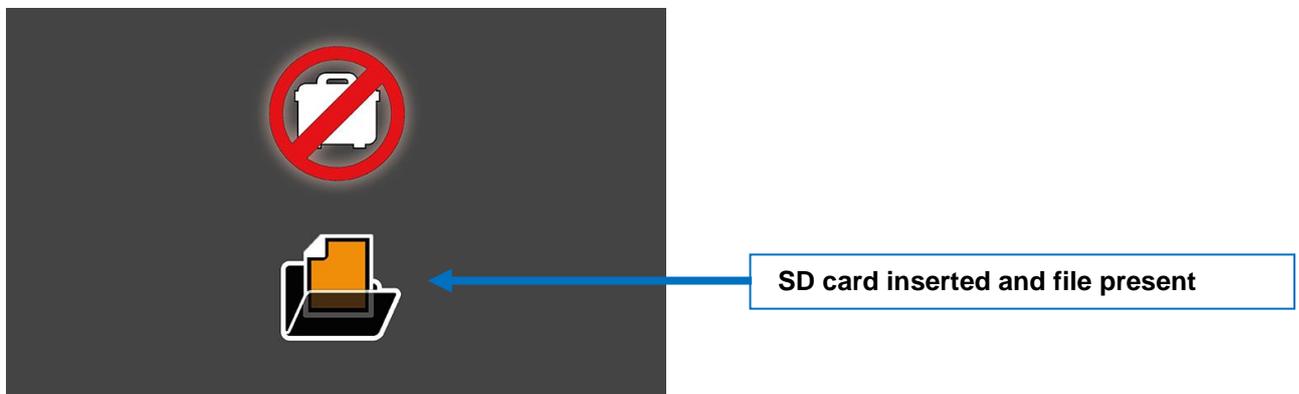
If the recording was made in “Automatic” search mode, the flashing message will display “record\_0001\_search\_mode”, if the recording was made in “Real time” mode, the flashing message will display “record\_0001\_realtime\_mode”.



 Whilst reading a recording, the sensor battery icon  disappears.

**The file recorded on the SD card can only be accessed if the sensor is connected.**

When the box is switched on and the sensor switched off, if there are recordings on the SD card, the following screen appears:



To access the recordings list, click on "select"  and the screen listing the recordings appears.

## 4.11 Record function



- Allows the control box screen activity to be recorded. Used to review a search moment or for testing during training.

Go to the menu and select.



If the SD card is full or if there is no SD card inserted, the following icon is displayed:

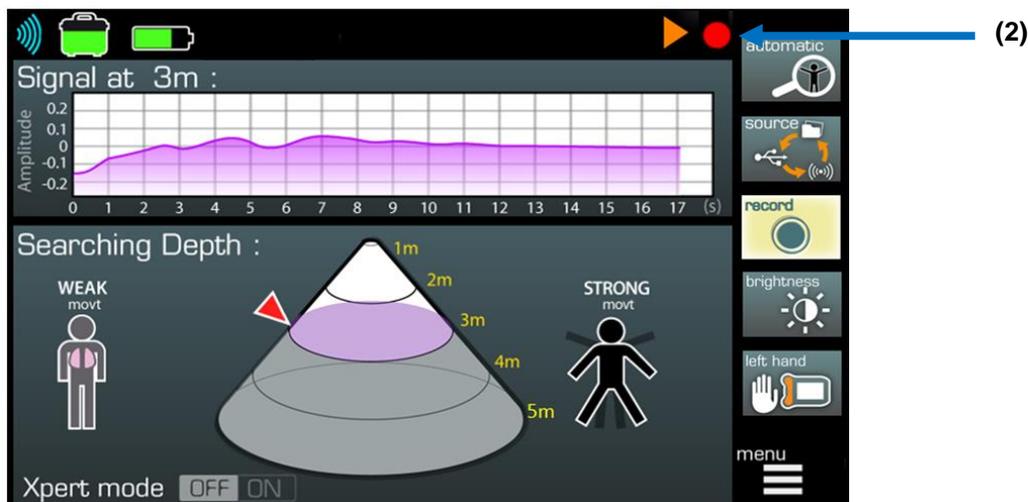
In this instance a recording cannot be made.

Start the recording by clicking on .



A red circle icon (2) flashes at the top of the screen for the recording.

To stop the recording, just click on  again.



The recordings can only be read on the control box.

To avoid any handling mistakes, the recorded files cannot be deleted from the **LEADER Scan** box.

To delete the files or clear the SD card, you must use a computer.

You can record approximately 110 hours on a 4 GB card.



When “**Record**” mode is launched, it is possible to browse through the menu.

- The following functions can be adjusted and their setting can be viewed when viewing a recording: “**Pointer, Mini, Maxi, Real time, Automatic**”.

The following functions can be used/adjusted and their setting cannot be viewed when viewing a recording: “**Sensitivity, Brightness, Right/Left hand, Xpert Mode**”.

The “**Xpert mode**” function can be viewed when viewing a file if and only if activated before opening the recording.

## 4.12 Right/Left hand function



- Allows the control box to be used by a left handed or right handed person.

Go to the menu and select.



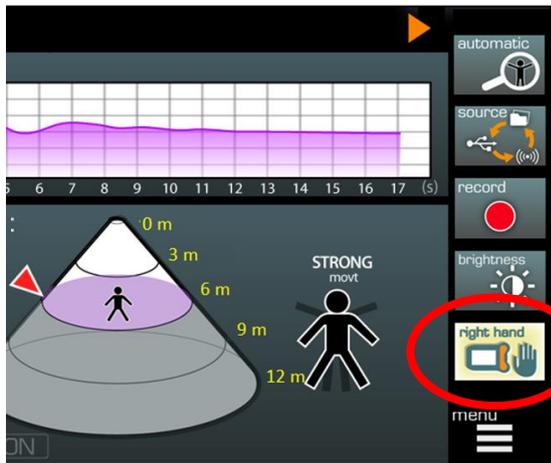
Click on.



The device moves to left handed mode, highlighting the “Left hand” icon.



Once selected, the function inverts the image, as well as the functionality displays (menu and sub-menus) and the keyboard use.



By default, the software is adjusted for use by a right handed person.



Box in right handed mode



Box in left handed mode

## 5 Use in the field

### 5.1 Physical positioning of UWB sensor

In order to optimise search results, it is necessary to position the device so that the lower parts and obstacles being scanned (walls, etc.) are as close as possible (there must be no space between the lower part of the device and the obstacles).

The **LEADER Scan** sensor can detect movement in a cone area in a vertical position. The rubble density extends the detection angle, as the debris acts like a lens for the UWB antenna. The UWB sensor search angle is  $90^\circ \times 90^\circ$ .

(See table in appendix p46).

**- Examples:**

**- Circle diameter:**

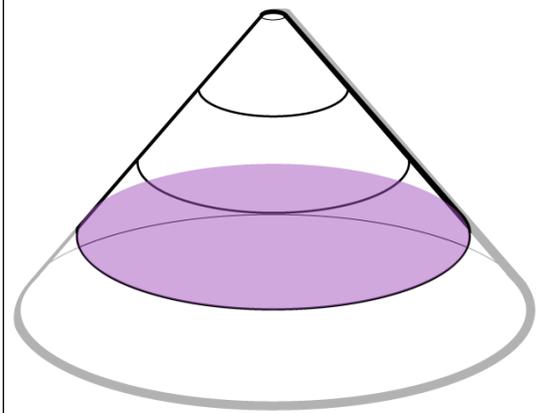
at 5m(15ft) = 10m(30ft) / at 10m(30ft) = 20m(60ft)  
→ Diameter of Purple circle.

**- Search surface:**

at 5m(15ft) =  $78.5\text{m}^2(706.9\text{ft}^2)$  / at 10m(30ft)  
=  $314.2\text{m}^2(2827.4\text{ft}^2)$ .  
→ Purple circle.

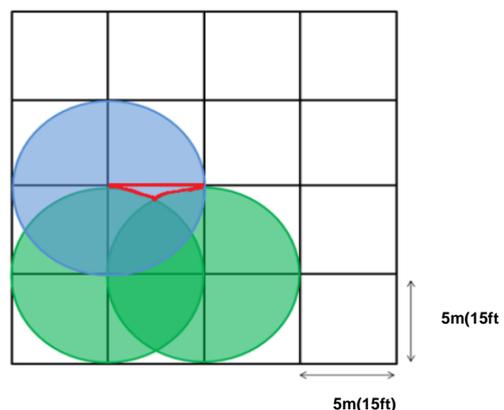
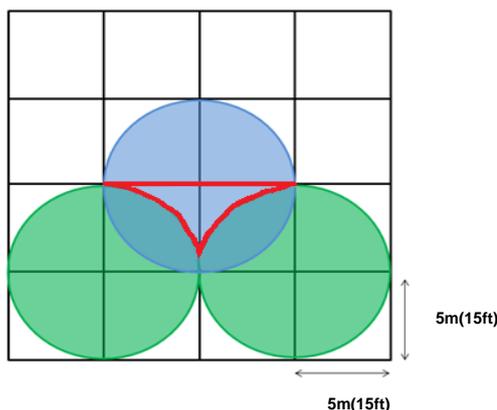
**- Search volume:**

at 5m(15ft) =  $130.9\text{m}^3(3534.29\text{ft}^3)$  / at 10m(30ft)  
=  $1047.2\text{m}^3(28274.33\text{ft}^3)$ .  
→ Entire circle



Due to the 5m(15ft) diameter circle footprint at 5m(15ft) distance, it is recommended to move the UWB sensor above rubble in a 5mx5m (15ft x 15ft) virtual grid pattern (or 10mx10m(30ft x 30ft)) within the disaster zone to locate the buried victims, whilst an operator follows the progress from the control box.

Overlap is necessary between each position, given that the rubble density slightly modifies the detection angle and that certain zones are not covered due to the circular shape of the detection zone. This process helps avoid missing a zone where a victim could be found (see red zone in illustrations above).







The compact size of the UWB sensor allows it to be inserted into cavities and gain several centimetres to increase the percentage success of detecting a victim.

## 5.2 Detection through materials

### ➤ The UWB sensor cannot detect through:

- Metal plates.
- Water, puddles and saltwater.
- Slabs of wet clay.
- ...

### ➤ The UWB sensor could detect (with difficulties) through:

- Sludge.
- Soil contaminated with salt.
- Earth mixed with small pieces of rock.
- Damp earth.
- Reinforced concrete (depending on the welded lattice section and mesh, thickness and whether it is dry or wet).
- ...

### ➤ The UWB sensor can detect through:

- Concrete.
- Bricks.
- Bitumen/Asphalt.
- Snow (depending on moisture).
- Ice (depending on moisture).
- Wood.
- Sand.
- Tiled type flooring (non-metal).
- Roof tiles or roof elements (non-metal).
- Glass (non-metal).
- Dry plasterboard.
- Plastics.
- ...

## 5.3 Recommendations

The operator must stay at least 5m (15ft) minimum from the sensor and must not move during the search process.

Do not use wireless devices which create interference (mobile phone, radio, laptop WiFi, etc.) during the search process.

For good wireless connectivity, adopt the attitude of a user who is aware that the wireless equipment has certain usage constraints and apply the following advice to your victim search equipment:

- Place the sensor in view of the control box.
- Position yourself up high with the control box.
- Leave a free space between the control box and the sensor as a maximum:  
Person between the box and sensor; the human body creates a natural body, do not place your back to the sensor.
- Consider the weather: depending on humidity/electricity in the air/sun, wireless will work better or worse (e.g.: A radio can emit further in good weather).

If there are obstacles (like a wall, etc.) between the device and the computer, the wireless connection may not work correctly. In this case, use a USB cable.

## 5.4 Usage advice

Radar detection technology is highly sensitive technology.

The use concept seems simple but use in the field is complex and precise. It requires training to be interpreted correctly.

UWB technology gives very good results when searching for victims but can produce mistakes at certain times. Following a disaster, the urban environment is in disarray. Collapsed structures cause a mix of construction materials which can make UWB detection complex. A user who cannot see the material types through which they are pointing their UWB sensor is not able to 100% accurately interpret results which can be indicated by the device due to reflection off certain buried materials.

**LEADER Scan** cannot detect a victim who is behind or under a solid metal screen or water.

The device cannot detect through damp conducting bodies, like wet clay. Damp soil is not ideal for UWB scanning as water acts as a shield against waves. However it is able to detect through dry materials like wood, brick, concrete (reinforced concrete is more difficult to traverse), plastic, plasterboard, etc.

Beyond the necessary training and device awareness, movements generated under debris (victims, animals, structural movements....) or on debris (emergency workers...) or from the environment (movements due to a passing truck, use of a backhoe, jackhammer...) are some of the constraints which could affect UWB detection.

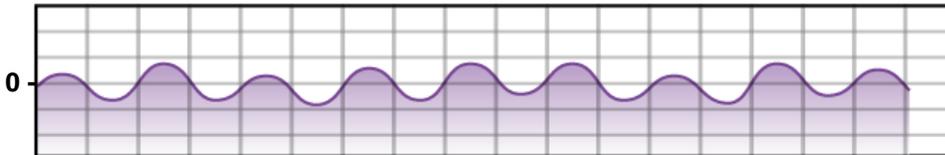
Detected movements are not necessarily those of a victim but can make someone think that there is a buried person if a small animal moves, also there may be a large number of insects and worms in a decomposing body, or a concrete part which is moving, or nearby movements which the sensor detects...

In these difficult search conditions, it is advised to repeat procedures in "**Real time**" mode (x3 scans minimum) then in "**Automatic**" mode (x3 scans minimum) for the same location where movement is detected. These repeated scans can give a good idea of the movements that are along the sensor axis. By compiling all detection information, the user and their team can decide to rescan the detection location, the position of one or several potential victims.

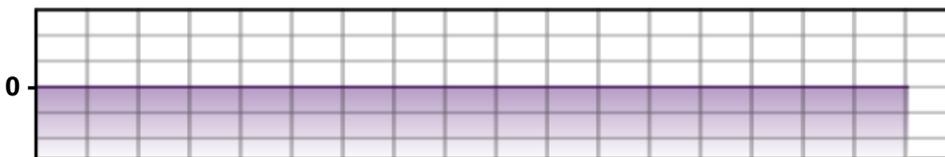
## 5.5 Interpreting the signal on the oscillogram

The **LEADER Scan** combines a detection zone (cone) and an oscillogram (graph) of detected movements on the screen. Movements are interpreted on the curve. (Number of movements and intensities of these movements).

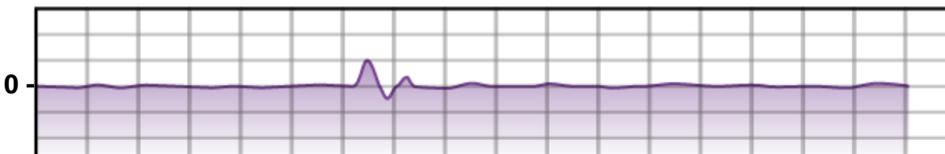
- If the curve is sine curve, the user is in the presence of repeated movement (breathing, victim tapping regularly...).



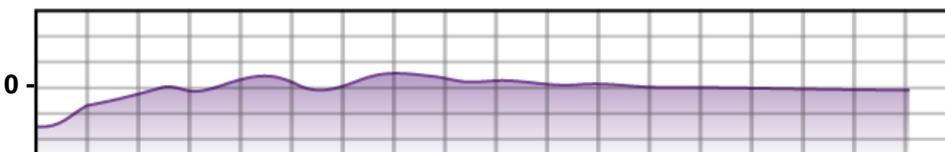
- The following curve shows that the device has not yet started searching ("**Real time**" or "**Automatic**").



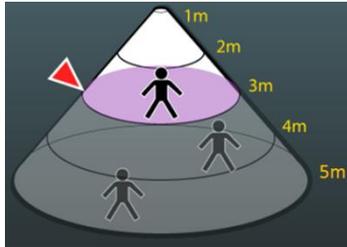
- The following curve shows a non-repeated movement which could be due to a stone rolling through the UWB detection cone during a search in progress.



- The following curve shows movements which must be strong (start of the curve) but which seem to reduce and disappear.



**Animal or human victim:** The shape of the curves (sine curve) will depend on the person, their position, the depth, etc. Fundamentally, the animal breathing curve will be the same shape as for humans, but could have different frequencies, for example the breathing frequency of a dog is usually 25-30 breaths per minute, but for humans it generally does not exceed 15-20 breaths per minute, but in situations of intense stress, this frequency can exceed 20 breaths per minute. This makes it harder to interpret the curves.



The position of the pointer (red pointer on the cone) at the detected movement display level appears in the cone (“**weak movement**”  or “**strong movement**” icon ), helps display if the oscillogram signal is stronger. By moving the red points on the cone above and below its initial position, we note more or less significant variations in sine curves. With a large sine curve, the user can conclude that the movement would be at this position.

The pointer therefore helps define the distance at which the movement is detected and therefore confirm the presence of movements.

The scale of the Y axis adapts to the signal intensity to balance the heights of the curve on the screen and therefore the movements detected in the field.

The **LEADER Scan** remains one of several tools used when searching for buried victims. The emergency worker must understand that they must rely on other search equipment or knowledge like their experience of collapsed structures to identify potential pockets of life in rubble, lines used by search dogs, the indexes generated by using search cameras and vibration detectors, etc.

UWB technology has its limits and, where possible, it must be combined with seismic technology by using detection of vibration caused by a victim (**LEADER Search**, for example) and/or using visual location (using a search camera (**LEADER Cam** for example)) where holes and recesses allow insertion.

By summarising all this information using different tools and the opinion of the emergency team, they will be able to decide if it is necessary to go back over certain area.

## 5.6 Automatic and Real Time modes

**Real time mode:** The user obtains information in real-time on movements detected inside the selected zone (for example 0-4m 0-12ft).

This means that the user obtains maximum information in a short period: the user can freely move the pointer (red pointer) to check what happens on the oscillogram (what type of curve) at the selected distance (for example at 1m, 2m, 3m (3ft, 6ft, 9ft), etc.). For example, if there are breathing movements at 1m, the user can view the breathing signal of the person on the oscillogram.

The Real-time search mode is faster than Automatic mode as the user can select a distance zone 0-9m and see the result in near real time.

**For automatic mode:** the zone to be detected (0-9m (0-27ft) for example) is automatically divided into 3 search sub-zones (0-3m (0-9ft), 3-6m (9-18ft), 6-9m (18-27ft)), it takes up to 3 minutes to complete the search (1 minute to scan each 3m section).

The automatic mode search time is longer but has the advantage of being easier (the user sees the search result on the screen). It does not provide additional information gathered from the oscillogram. The user must wait for the end of the search to be able to move the pointer to the distance where they would like to analyse the signal on the oscillogram.

The real-time mode is aimed at a more experienced user who has carried out various situation tests in the field to understand the information obtained when reading the oscillogram curves.



**Please note: In real time mode, the user can see the “weak movement” icon or the “strong movement” icon only if a person moves or breathes. If the person stops moving, after a few seconds the movement icon will disappear. In Automatic search mode, the movement icon will not disappear, even if the person stops moving or breathing.**

## 5.7 Define the search distances

Modify the search distances based on the debris composition in the field and depending on the depth to be analysed.

**Real time search mode:** A closer search zone (Mini-Maxi) helps provide higher sensitivity in the selected zone and less “noise” from the outside.

If the user selects 2-5m (6-15ft), the noise at a distance under 2m (6ft) and a distance over 5m will be lower. If the user selects the 0-10m (0-30ft) zone, they will keep all noise in the 0-10m (0-30ft) distance.

**Automatic search mode:** A larger zone means a longer search time as each 3m (9ft) section requires 1 minute of search. If the user selects zone 0-9m (0-27ft), it will take up to 3 minutes to complete the search.

The user must first locate the possible locations to find living people and then define the relevant detection zone. In general, a minimum height of 30cm is required to allow the survival of a person lying between 2 concrete slabs.

It is possible to detect the position of “pockets of life” to direct the search. If a victim is potentially present from 3 to 4m (9 to 12ft) from the UWB sensor, the emergency worker will define a 2-5m (6-10ft) search zone.

### Main rules for defining a zone:

1. Narrower zone: Higher sensitivity and less noise (Real time mode) and a faster search (Automatic mode).
2. It is preferable to start the search from 0.5m (1.5ft) or higher. In the majority of cases, the emergency worker on the surface of the debris sees the initial layers where to place the UWB sensor and knows what is under the first centimetres/metres (a wall with an empty space behind, a concrete slab which is 50cm (1.5ft) thick, etc.). They can therefore define the Mini (minimum distance on the top of the cone) at 0.5m, 1m or 1.5m (1.5ft, 3ft or 4.5ft) to optimise sensitivity from this distance and therefore avoiding scanning a known zone.

## 5.8 Defining the sensor sensitivity

Sensitivity is a threshold for the device algorithm which allows it to make a decision if a “**weak movement**” or “**strong movement**” icon is displayed in the determined search zone (cone).

High sensitivity allows detection of a small movement, therefore the possibility of detecting a large number of movements in the same zone (Movement of fabric or vibrating cord, etc...) which means that it is more likely to detect a false victim.

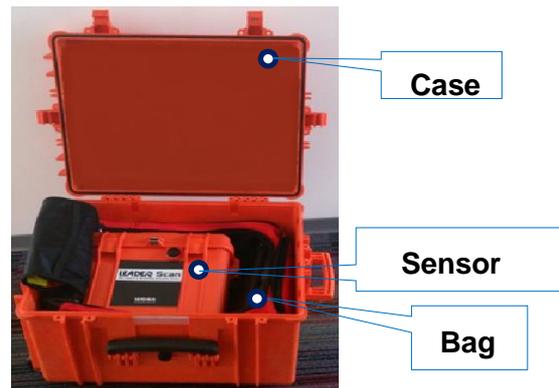
**Advice:** In a free field, reduce the sensitivity to the average level (2) or even lower (0 or 1). However when dealing with a concrete slab (or other dense material), sensitivity must be defined higher (3 or 4).

## 5.9 Storage

### Case

A Pelicase type high visibility orange case allows you to store the entire system. (Control box + UWB sensor + accessories + backpack).

<b>Weight of case alone:</b>	12kg
<b>Dimensions:</b>	670 x 510 x 372 mm
<b>Weight of entire unit:</b>	25 kg



### Backpack

A resistant and ergonomic backpack is provided to store the accessories. (Batteries, control box, sensor, cables, instruction manual).



Reflective band

Outside front pocket

Outside side pockets

Comfortable straps



Control box

Sensor

Sensor

## 6 APPENDIX

“Detection cone” measurements (radiation pattern) depending on the depth (distance) determined with the “Mini” and “Maxi” functions:

Distance (m)	Diamètre cône (m)	Surface de détection (m2)	Volume de détection (m3)
0,5	1,0	0,8	0,13
1	2,0	3,1	1,05
1,5	3,0	7,1	3,5
2	4,0	12,6	8,4
2,5	5,0	19,6	16,4
3	6,0	28,3	28,3
3,5	7,0	38,5	44,9
4	8,0	50,3	67,0
4,5	9,0	63,6	95,4
5	10,0	78,5	130,9
5,5	11,0	95,0	174,2
6	12,0	113,1	226,2
6,5	13,0	132,7	287,6
7	14,0	153,9	359,2
7,5	15,0	176,7	441,8
8	16,0	201,1	536,2
8,5	17,0	227,0	643,1
9	18,0	254,5	763,4
9,5	19,0	283,5	897,8
10	20,0	314,2	1047,2
10,5	21,0	346,4	1212,3
11	22,0	380,1	1393,8
11,5	23,0	415,5	1592,7
12	24,0	452,4	1809,6
12,5	25,0	490,9	2045,3
13	26,0	530,9	2300,7
13,5	27,0	572,6	2576,5
14	28,0	615,8	2873,5
14,5	29,0	660,5	3192,5
15	30,0	706,9	3534,3

Distance (ft)	Diameter cone (ft)	Surface of detection (ft2)	Volume of detection (ft3)
1,5	3,0	7,1	3,53
3	6,0	28,3	28,27
4,5	9,0	63,6	95,43
6	12,0	113,1	226,19
7,5	15,0	176,7	441,79
9	18,0	254,5	763,41
10,5	21,0	346,4	1212,26
12	24,0	452,4	1809,56
13,5	27,0	572,6	2576,50
15	30,0	706,9	3534,29
16,5	33,0	855,3	4704,14
18	36,0	1017,9	6107,26
19,5	39,0	1194,6	7764,84
21	42,0	1385,4	9698,10
22,5	45,0	1590,4	11928,23
24	48,0	1809,6	14476,46
25,5	51,0	2042,8	17363,98
27	54,0	2290,2	20611,99
28,5	57,0	2551,8	24241,71
30	60,0	2827,4	28274,33
31,5	63,0	3117,2	32731,08
33	66,0	3421,2	37633,14
34,5	69,0	3739,3	43001,73
36	72,0	4071,5	48858,05
37,5	75,0	4417,9	55223,31
39	78,0	4778,4	62118,71
40,5	81,0	5153,0	69565,46
42	84,0	5541,8	77584,77
43,5	87,0	5944,7	86197,84
45	90,0	6361,7	95425,88

Distance (m)	Diamètre cône (m)	Surface de détection (2)	Volume de détection (m3)
15,5	31,0	754,8	3899,6
16	32,0	804,2	4289,3
16,5	33,0	855,3	4704,1
17	34,0	907,9	5144,9
17,5	35,0	962,1	5612,3
18	36,0	1017,9	6107,3
18,5	37,0	1075,2	6630,5
19	38,0	1134,1	7182,7
19,5	39,0	1194,6	7764,8
20	40,0	1256,6	8377,6
20,5	41,0	1320,3	9021,7
21	42,0	1385,4	9698,1
21,5	43,0	1452,2	10407,4
22	44,0	1520,5	11150,6
22,5	45,0	1590,4	11928,2
23	46,0	1661,9	12741,3
23,5	47,0	1734,9	13590,4
24	48,0	1809,6	14476,5
24,5	49,0	1885,7	15400,2
25	50,0	1963,5	16362,5
25,5	51,0	2042,8	17364,0
26	52,0	2123,7	18405,5
26,5	53,0	2206,2	19488,0
27	54,0	2290,2	20612,0
27,5	55,0	2375,8	21778,4
28	56,0	2463,0	22988,1
28,5	57,0	2551,8	24241,7
29	58,0	2642,1	25540,1
29,5	59,0	2734,0	26884,0
30	60,0	2827,4	28274,3

Distance (ft)	Diameter cone (ft)	Surface of detection (ft2)	Volume of detection (ft3)
46,5	93,0	6792,9	105290,09
48	96,0	7238,2	115811,67
49,5	99,0	7697,7	127011,84
51	102,0	8171,3	138911,80
52,5	105,0	8659,0	151532,76
54	108,0	9160,9	164895,92
55,5	111,0	9676,9	179022,48
57	114,0	10207,0	193933,66
58,5	117,0	10751,3	209650,65
60	120,0	11309,7	226194,67
61,5	123,0	11882,3	243586,92
63	126,0	12469,0	261848,61
64,5	129,0	13069,8	281000,93
66	132,0	13684,8	301065,11
67,5	135,0	14313,9	322062,33
69	138,0	14957,1	344013,82
70,5	141,0	15614,5	366940,77
72	144,0	16286,0	390864,39
73,5	147,0	16971,7	415805,89
75	150,0	17671,5	441786,47
76,5	153,0	18385,4	468827,33
78	156,0	19113,4	496949,69
79,5	159,0	19855,7	526174,75
81	162,0	20612,0	556523,71
82,5	165,0	21382,5	588017,79
84	168,0	22167,1	620678,18
85,5	171,0	22965,8	654526,09
87	174,0	23778,7	689582,73
88,5	177,0	24605,7	725869,30
90	180,0	25446,9	763407,01

## 7 OPTIONS

- Additional batteries for the UWB sensor (**Ref. D11.07.015**).
- Additional battery charger for the UWB sensor (**Ref. D11.07.016**).
- Additional battery for the control box (**Ref. D11.04.341**).

## 8 MAINTENANCE

**LEADER Scan** and its accessories do not require maintenance, just some basic precautions:

- Disconnect the batteries before long-term storage.
- Recharge the batteries every 3 months.
- Use a soft cloth to remove sand and other debris likely to damage the product.
- Clean and dry the product and its accessories if they have become wet during training or a rescue.



- Never use solvents or alcohols of any kind to avoid discolouration and/or distortion of the device.
- Avoid blows or high pressure exerted on the screen.

## 9 TROUBLESHOOTING

Problem	What to do
The control box does not start up	<ul style="list-style-type: none"> <li>• Check that the battery is charged.</li> <li>• Check that the battery pack is connected.</li> <li>• Check that the battery is not being charged whilst connected to the box.</li> </ul>
Sensor not detected (USB)	<ul style="list-style-type: none"> <li>• Check that the USB cable is not damaged.</li> <li>• Check that the USB connector is correctly connected.</li> <li>• Check that the sensor is switched on.</li> <li>• Check the battery charge.</li> </ul>
Sensor not detected (WiFi)	<ul style="list-style-type: none"> <li>• Check that the sensor is switched on.</li> <li>• Check the battery charge.</li> <li>• Check that the sensor is not outside of range.</li> <li>• Check that the sensor is correctly paired to the control box.</li> </ul>
Cannot record	<ul style="list-style-type: none"> <li>• Check that the SD card is inserted.</li> <li>• Check that there is space available on the SD card.</li> <li>• Replace the SD card.</li> </ul>
Cannot view recordings	<ul style="list-style-type: none"> <li>• Check that the SD card is inserted</li> <li>• Check that there is a recording on the SD card</li> </ul>

If the wireless connection is interrupted, one of the screens below with the icon “**No wireless sensor**” shows the reconnection time.



If this occurs during an “**Automatic**” or “**Real time**” search, the search restarts automatically. It is relaunched and restarts.

When connected with USB, the device displays this icon  in the top left. If it flashes, the connection between the sensor and control box is not good. Unplug and plug it back in if needed.





## 10 WARRANTY



**LEADER SAS** guarantees to the original buyer of **LEADER Scan** (hereinafter “the device”) that this device has no material or workmanship defects for a duration of two **(2) years** from the purchase date and six **(6) months** for the batteries. This limited warranty is only applied to the original purchaser and not to any third parties to whom the material may be resold.

**LEADER**'s obligation under this warranty is specifically limited to replacement or repair of the device (or its parts), and only after **LEADER** has inspected the device and deems it to be defective due to the fault of **LEADER**. To qualify for this limited warranty, the purchaser must return the equipment to **LEADER SAS** in a timely manner after discovering said defect. **LEADER** will examine the device. In the event **LEADER** determines that the defect is its fault, the company will resolve the problem within a reasonable time period. If the device is covered by this limited warranty, **LEADER** will bear the repair costs.

If any defect attributable to **LEADER** under this limited warranty cannot be reasonably resolved by a repair or replacement, **LEADER** could choose to refund the device purchase price, minus a reasonable depreciation cost, to fulfil its obligations of this limited warranty. If **LEADER** so chooses, the buyer must send the device to **LEADER** for free and without encumbrance or constraint.

This warranty is limited. The original purchaser, any person to whom it was later sold, or anyone who may be the intended recipient of the device, may not require the payment of damages from **LEADER** in case of injury and/or property damage due to faulty equipment produced or assembled by **LEADER**. Some countries do not allow the exclusion or limitation of damages: the paragraph above will therefore only apply to certain countries.

**LEADER** will not be held liable under this limited warranty in the event the device was used inappropriately, neglected (including the absence of reasonable care), had an accident, or was repaired or modified by a third party.

**THIS WARRANTY IS EXPLICITLY A LIMITED WARRANTY ONLY. LEADER REFUSES, AS TO THE DEVICE, ALL IMPLIED WARRANTIES OF MERCHANTABILITY COMMENSURATE TO AN ALTERNATIVE USAGE. NO WARRANTY OF ANY KIND OTHER THAN THAT PROPOSED BY LEADER UNDER THIS DOCUMENT WILL BE RECEIVABLE.**

# LEADER

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## MANUFACTURER

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Our policy is to constantly seek to improve our products. We therefore reserve the right to change their technical specifications at any time and without prior notice. - Non contractual images



PLEASE RECYCLE

Manual code :  
SCAN.00.ZN8.12.EN.1