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For more information, visit www.con-space.com
The Delsar LifeDetector Model LD3 provides seismic and acoustic sensors designed to detect and locate signs of a victim’s presence in the voids of a collapsed building or similar entrapment situation.

The LD3 is equipped with two separate sensor systems to detect and locate victims. The seismic sensor detects sound vibrations generated by a victim’s movement or activity traveling through the structural members of the building. The acoustic sensor detects sound vibrations traveling through the surrounding airspace.

The LD3 Display Interface (DI) allows an operator to listen to and review the relative response of up to six seismic sensors or two acoustic sensors. The LD3 displays each sensor’s response on the display graph simultaneously for easy comparison and to provide continuous feedback of the victim’s response. The operator of the system can listen to any combination of the six seismic sensors.

The acoustic sensors allow two-way communication with the victim using an integrated intercom system.

**NOTE:**

Only one type of sensor can be used with the system at a time.
Ordering Configurations

The Delsar® LifeDetector® Model LD3 is available in three standard configurations. The following matrix outlines the components and quantities of each component for each configuration:

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<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
<th>LD3-6 (QTY)</th>
<th>LD3-4 (QTY)</th>
<th>LD3-2 (QTY)</th>
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<td>Seismic Sensor #3</td>
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<td>Seismic Sensor #4</td>
<td>6020-02-004</td>
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<td>Sensor Connecting Cable 9 feet (3m)</td>
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*Item Not Shown
Case Layout
The case is designed to house all of the LD3 standard equipment. The following drawing shows LD3 component location within the case.
LD3 Kit Contents

The Delsar® LifeDetector® Model LD3 is shipped in a protective transport case. Not all components packed with the system are used in all situations and the operator needs to determine which and how many sensors to use.
OVERVIEW

- Battery Charger
- Lanyard Strap & Pouch
- AC Power Adapter & Power Cord (for Battery Charger)
- Lithium Ion Battery, Disposable Battery Adapter Tube & Disposable Batteries
- Headset
Optional Items

- **Telescoping Probe (for use with acoustic sensors)**
  6020-03-005
  This rigid probe allows the operator to attach an acoustic sensor to its end providing the ability to push the sensor into a crevasse or hole with a diameter as small as two inches (5cm). The telescoping probe allows the operator to place the sensor into the lower layers of a collapsed structure by extending the probe as needed. *As of May 2010 the tube sets are the same as the SearchCam 3000®.*

- **Replacement Sensors**
  6020-02-001 (Seismic Sensor #1) 6020-02-002 (Seismic Sensor #2)
  6020-03-003 (Acoustic Sensor #1) 6020-03-004 (Acoustic Sensor #2)
  The LD3 supports up to six seismic sensors or two acoustic sensors. For LD3-4 users, two additional seismic sensors and one additional acoustic sensor can be added. For LD3-2 users, four additional seismic sensors and one additional acoustic sensor can be added. Cables must be purchased for additional sensors.

- **Replacement 10 Meter Cables**
  6020-04-010
  Cables must be purchased if ordering additional sensors.

- **Replacement 3 Meter Cables**
  6020-04-003
  The 3 meter cable is ideal for “Hasty Search” operations.

- **Replacement Headset**
  6010-03-000
  The LD3 system supports the connection of up to two headset units.

All other components such as spikes, magnetic clamps, and batteries are also available.
LD3 Display Interface

The Display Interface (DI) is the main control center for the LD3. The DI controls each sensor and displays the sensor’s responses on the bar graph while routing the signals to the headsets for listening. It also controls the recording and playback of responses.

The numbered sensor selection keys control which sensors are listened to in the headsets. Each numbered key corresponds to a numbered sensor. The LED in the upper-left corner of the key indicates that the sensor channel audio is selected for listening.

Sensor Selection Keys 1 and 2 are also used when the acoustic sensors are connected. If an acoustic sensor is connected, the LED in the lower-right corner of the key is illuminated.

The Sensor Channel Keys also function as playback controls when using the Record and Playback feature described later in this guide.
The Power key turns the system on or off. To turn the system on, press and hold the key until the DI beeps and the display LEDs illuminate. To turn the system off, press and hold the key until the system turns off. A three second delay is built into the power-off sequence. This key is also used to identify newly added sensors.

The Amplitude Graph LED bars indicate the response level of each sensor and correspond to the Sensor Channel Keys located above each bar.

The Record key activates the internal audio recording feature. This feature allows the recording of the sensor audio going to the headsets. The Record and Playback feature is described later in this manual.

The Playback key allows the recorded audio to be listened to in the headsets.

The green LED bar is used to indicate gain, battery, and zoom levels which are each described later in this manual.
The “Push-to-Talk” key activates the intercom feature built into the acoustic sensors. This feature allows two-way communication with the victim. The LED in the upper-left corner of the key indicates when PTT is activated and the boom microphone is muted.

The L-R headset key activates the stereo feature allowing the operator to listen to one sensor in one ear and another sensor in the other. The stereo feature is discussed later in this manual. This key is also used with the PTT key to temporarily turn off the operator intercom features when both headsets are in use. This is valuable when loud noises enter the system through the boom microphone and make it difficult to listen to the sensor output.

The zoom key changes the resolution of the bar graph to better differentiate the signals in high signal level conditions. These conditions usually occur when the sensors are close to each other during the victim location mode. Zoom mode makes comparison between sensors easier.

The low and high filter keys control the signal filters. These filters can be used to reduce the effects of certain types of noises that can interfere with listening to the seismic sensors. The LOW key activates a low-frequency cut filter that reduces signal frequencies that are below 200 Hz. The HIGH key activates a high-frequency filter that reduces signal frequencies that are above 1000 Hz. This filter reduces background noise like “hiss”.

The battery key activates the battery level LED gauge (shared with the gain level bar graph). Press the key to get a reading. The LED in the upper-left corner indicates that the gain level bar graph is in battery mode and begins to flash approximately 10 minutes before low battery shutdown occurs.

The Up and Down arrow keys control the gain level of the system. The Up arrow increases amplification, while the Down arrow decreases amplification. Gain levels are displayed on the gain level bar graph LEDs. In ZOOM mode, the arrow keys control the ZOOM level.
LD3 Connection Locations

LD3 Sensors

Seismic Sensors
The seismic sensors detect ultra-low levels of vibration created within and around the structure. The sensors convert the minute structure-borne vibrations into an electrical signal that is then amplified thousands of times.

The seismic sensors must be placed in direct contact with the structural members to be effective. The importance of this contact or coupling to the structure cannot be emphasized enough.
A removable spike is provided with each sensor for use in soil and for placement in suitable cracks.

A magnetic mount is provided to allow the sensor to be attached to ferrous metal structural members as required.

The LD3 supports the use of up to six seismic sensors. The sensors are connected by 30 foot (10 meter) cables in a daisy-chain configuration. Seismic and acoustic sensors cannot be mixed. Only seismic sensors or only acoustic sensors can be connected to the DI at any given time.

**Acoustic Sensors**

The acoustic sensor detects airborne sounds when placed in the void spaces of a collapsed building. The sensor is equipped with a highly sensitive microphone element. This element picks up low-level sounds and then amplifies the signal thousands of times. In addition to the microphone, the acoustic sensor is equipped with a loudspeaker element used to provide two-way communication between the operator and the victim.
Research has shown that airborne sound travels within the under layers of debris, but does not often escape through the outer layers of debris to the surface. It is therefore necessary to penetrate into the structure to effectively use the acoustic sensor. The acoustic sensor was designed with this in mind and can be placed under the surface layers of building debris.

Up to two acoustic sensors can be used simultaneously. The sensors can be lowered into the void space by cable or attached to optional rigid probes that can be pushed into the void.
LD3 SYSTEM SETUP

Battery Installation

The unit should be stored with the battery pack removed. Therefore, installing the battery is the first step in system setup.

The battery is inserted into the battery housing located on the right side of the DI as shown.

1. Remove the threaded battery cap by turning counterclockwise.
2. Place a battery pack into the unit inserting the small diameter end first.
3. Replace the battery cap by turning it clockwise.
4. Make sure the battery cap is firmly seated. Avoid cross-threading and do not over-tighten.
Sensor Connection

Only one type of sensor can be used with the system at a time. Seismic sensors cannot be used with acoustic sensors. Connecting mixed sensors (seismic and acoustic) can cause erratic system operation. Decide whether to use seismic or acoustic sensors.

Seismic Sensors

Seismic sensors can be connected to either (or both) of the two ports on the DI console and can be connected in any combination. However, it is recommended that the sensors be connected in ascending numerical order starting with the sensor closest to the DI.

For example, sensor #1 would be the first sensor in the chain followed by sensor #2, sensor #3 and so on.

Note: While this system of deployment helps to establish a standard pattern of deploying the sensors, it is not necessary to have the sensors deployed in any particular order for the LD3 to work properly. The sensor will function in any location in the chain. The sensor will always be displayed by its corresponding number on the bar graph, not its location in the chain. Duplicate sensor numbers cannot be used on the same DI.
Examples of other deployments:

Connect one end of the cable to either of the two 10-pin connector ports on the DI. To make the connections on both the DI and the sensors, align the key on the cable connector and push the connector into the port. Do not twist the connector.

**Note:** To aid sensor setup in demanding conditions and speed up deployment of the system, the LD3 is designed to eliminate the need for cable connection polarity. Either end of the cable connects to either port of the sensor.
Plug the other end of the cable into the sensor.

**Note:** If the cable is removed completely from the spool, be sure to place the cable spool in a safe location. If the cable is left partially on the spool, secure the spool to ensure that it does not move and cause noise near the sensor.

If deploying multiple seismic sensors, connect additional cables to create a daisy-chain configuration as pictured on pages 14 and 15.

Once the final sensor in the chain is connected, install a protective cap on the unused connector port. This will keep debris and water spray out of the open port. The seismic sensor is water-resistant but is not intended to operate under water. Water pooling in the unused port could cause malfunctions.

**Note:** If during operation a new sensor is attached and not detected automatically within 30 seconds by the Auto ID feature, press and release the power switch. This will cause the DI to re-identify all connected sensors.
Acoustic Sensors

Acoustic sensors are connected using the cable in the same manner as the seismic sensors. Acoustic sensors are not designed to be daisy-chained and therefore only a single connector port is built into the sensor. The standard LD3 system is shipped with one acoustic sensor, identified as sensor #1. An optional second sensor, identified as sensor #2, is available to allow expanded search capability.

The acoustic sensor can be connected to either of the two 10-pin sensor ports on the DI. The sensor is identified on either Channel 1 or Channel 2 corresponding to the sensor’s identification number.

It is recommended that the #1 acoustic sensor be used on the left port and the #2 sensor (if used) be used on the right port. This will visually align the sensors with the bar graph on the DI console and assist the operator in coordinating sensor movement.

**Note:** In case of multiple system deployment, duplicate sensor numbers cannot be used on the same DI. To use dual acoustic sensors, there must be a sensor #1 and a sensor #2.
Acoustic sensors can either be lowered into a void space using the cable, or be attached to the optional telescoping or tubes used to push the probe into a void space.

To attach the acoustic sensor to the telescoping tube, remove the thread protection ring surrounding the connector port by turning counter-clockwise.

Feed the cable through the telescoping tube sections and attach the cable to the acoustic sensor.
Align the guide on the sensor with the mating guide on the tube end.

Push the sensor on the tube until the tube collar threads engage the sensor threads. Tighten the collar clockwise until it seats all the way into the sensor body. Do not overtighten the collar. Apply just enough pressure to firmly seat the sensor.

The acoustic sensor housing is designed to be pushed into debris, but is not designed to be a ram rod. Make a hole in the debris with a suitable tool and then insert the acoustic sensor.

**Note:** The microphone is water resistant but is not designed to work underwater. If the sensor gets too wet, it may not work properly until allowed to dry. Water exposure will not cause any permanent damage.

*If debris accumulates in the speaker holes, unthread the dome shaped headpiece only, clean away debris, and re-install the headpiece as shown in the Maintenance section of this manual.*
Headset Connection

The headsets are connected to the DI using the ports on the right side of the display. There are two headset ports to facilitate the use of two headset sets. Experience has shown that two operators listening to the sensor output can enhance the search process. The LD3 has an integrated intercom system between the headsets to allow conversation between the operators while using the headsets.

Place the headsets on the head with the boom microphone originating from the right ear cup.

*Note: This orientation is required when using stereo listening mode.*

The headsets are designed to be worn with protective headgear. The strap is adjustable and should go over the top of the head.

The spring clamp should go behind the head and will apply pressure to hold the headset in place over the ears. Adjust the headset microphone very close to the mouth and speak in a normal voice.
LD3 SYSTEM OPERATION

Starting the DI Unit

1. To turn the unit on, press and hold the power key on the display panel.
2. When the unit beeps and the LEDs illuminate, release the power key.

The system will now identify which sensors are connected. This process can take up to 30 seconds depending on how many sensors are connected. If a sensor is not identified within 60 seconds, press and release the power key to identify the sensors.

3. To turn the unit off, press and hold the power key until a tone is heard and all LEDs illuminate, then release.

Reading the Sensor Response Graph

Once the sensor is identified by the LD3 system, the lowest or zero LED bar will illuminate in the corresponding numerical column of the bar graph. For example, if sensors #1 and #2 are connected, the graph bars labeled “1” and “2” should illuminate. Usually, there will be sufficient sensor activity to cause the bar graph to respond beyond the zero LED level.

Bottom LEDs illuminate to indicate sensor connection
The LD3 will always visually display the sensor responses whenever sensors are connected. The bar graph will display the peak signal for approximately one second to allow easy comparison of sensor responses.

The Sensor Response scale is relative. Use the scale as a reference for comparison of sensor responses.
Listening to the Sensor Response

To listen to a sensor, press the numbered key that corresponds to the desired sensor. The sensor’s audio response will be heard in the headsets.

For example, to listen to Sensor #3, press the number 3 key.

**Note:** The red LED in the upper left corner of the numbered key indicates that seismic sensor audio is selected for that particular sensor.

Any combination of sensors may be listened to at any time by selecting or de-selecting the appropriate key. As sensors are selected, their audio signal is added into the overall audio feed going to the headsets.

This channel summing feature is important to remember during victim detection operations since each sensor’s audio contribution is added to others to increase the area covered and has the effect of creating a much larger virtual sensor.

When using an acoustic sensor, use keys 1 or 2 to listen to audio picked up by the sensor microphone. The LED in the lower right corner of the key indicates which acoustic sensor is being listened to.
Muting the Boom Microphone

The microphone on the headset set is live by default. This allows for voiceover recording and allows two operators to communicate between their two headsets. When listening to responses from seismic sensors, it may be desirable to eliminate wind noise or other ambient noise entering through the microphone.

To mute the microphone, simultaneously press the L-R headset key and the PTT key. The LED on the PTT key flashes when the microphone is muted.
Adjusting the Headset Volume

The audio gain control for the headsets is controlled by the green up and down arrow keys. Adjusting the gain up or down increases or decreases the audio level in the headsets. The green LED bar graph shows the level of amplification.

The gain control does not, however, have a large impact on the bar graph since the bar graph gain levels are controlled automatically.

Using Stereo Listening Mode

The blue L-R key allows the operator to place any two sensor audio signals into stereo listening mode. This feature can be helpful in comparing the audio responses from two different sensors.

Note: When using the Stereo Listening Mode feature, make sure that the headset is worn with the microphone boom coming from the right ear cup.

1. Press and release the L-R headset key. The left LED will begin to flash indicating that the system is ready to assign the left channel audio source.
2. Choose a sensor to listen to using the numbered sensor keys. The number chosen will correspond to the sensor that will be heard in the left earphone.
   The left LED will switch to a solid illumination and the right LED will flash.
3. Select the second sensor source to be assigned to the right earphone.
   Both LEDs of the L-R headset key illuminate solid red to indicate that headset audio is in stereo. The assigned sensor selection LEDs also illuminate to indicate that the sensors are selected for listening.
4. To cancel the stereo feature, press the L-R headset key.

Using Two-Way Communication

When using an acoustic sensor, the PTT key is used to activate two-way communication with a victim.

To use this feature, press and hold the PTT key and speak into the boom microphone to talk to the victim through the acoustic sensor. The PTT key must be released to hear a response.

Note: The PTT key (when pressed with the Stereo key) is also used to mute the headset boom microphone when seismic sensors are in use.
Using the Record and Playback Functions

Record

The record feature allows the operator to record audio signals from the sensors. When the record feature is activated, the system continuously records the audio signal going to the headsets in a five minute loop. Once the five minute loop is attained, the system begins recording over the oldest portion of the loop.

The system only records what the operator hears. Microphone audio is also recorded to allow the operator to make verbal notes. If two headsets are attached, any conversation between two operators is also recorded.

**Note:** If the operator does not want to record microphone audio, the headset should be muted by pressing the PTT and L-R headset keys simultaneously.

The REC record key activates the internal audio recording feature. The five minute loop recording cycle repeats until the REC key is pushed or the PLAY BACK key is pressed.

The number 6 bar graph displays a single LED bar to indicate the location of the recording in the time index printed on the right side of the bar graph.

**Note:** If a #6 sensor is used, the index will not be shown until PLAY BACK is selected.
Playback

The PLAY BACK key switches the internal audio recorder to playback mode which allows the recorded audio to be listened to in the headsets. In playback mode, the audio feed from the sensors is disabled. Only audio from the recorded playback is heard.

Playback is controlled using the sensor selection keys 3, 4, 5, and 6.

The blue symbols on each key indicate the playback function:

- 3 is used as the stop function
- 4 is used for the reverse function
- 5 is used for the play function
- 6 is used for the skip forward function

Since recorded audio is stored in 15 second increments, play back can be initiated at the same intervals. Use the forward and reverse keys to move through the 15 second recording time blocks, then press the Play key to listen to the recorded audio starting in that time block.

Audio playback begins at time index zero when the PLAY BACK key is pressed.
Filtering

Press the LOW key to filter out low frequency sounds. Press the HIGH key to filter out high frequency sounds. The LED in the upper left corner of the key will light when the filter is activated. Press each key again to deactivate the filter. Filters can be important tools for the operator of the LD3. However, filters must be used carefully in order to prevent filtering vital information. By design, the filters remove information from the signal spectrum generated by the vibration of the building and surrounding area. Some of this information may be useful responses from the victim, while other information is useless noise.

Reducing unwanted noise serves two purposes: to make it easier to detect the victim’s response and to make using the system more comfortable for the operator. Our research has shown that in most structures the victim’s response will occur in the frequency range between the low and high filters. The filters will work to enhance the search process and the operator’s comfort.

The filter cannot distinguish noise from useful information. Because of this, the operator should only use filters when he is certain no victim response will be present in the filtered frequencies.

All filters should be off when conducting initial victim detection operations. Once a victim response is observed, it is usually safe to turn on the filters to eliminate annoying noise. If a filter is used and the victim’s response disappears, turn off the filter and attempt to re-acquire the victim’s signal. If the victim’s response immediately reappears, there is a good chance that the filter was intercepting the victim’s response and should not be used.
Using the Zoom Feature

To operate in zoom mode, press the ZOOM key. Press the key again to return to normal operation. The LED in the upper left corner will light when zoom mode is activated. The zoom function increases the resolution of the bar graph. This enhances the ability of the operator to distinguish between strong sensor responses and makes comparison between sensors easier. The system should be operated in the normal mode while conducting victim detection operations. The normal mode provides for full dynamic range of the bar graph. This allows the operator to visualize very small signals as well as very large signals. This is important because the range of signal amplitude is unknown while performing initial victim search and detection operations.

Once a victim is detected, zoom mode can be activated and should be used during victim location operations. The zoom mode is designed to be used when a signal from the victim has been detected and the relative strength is known. This is because the zoom feature increases bar graph resolution, but the increased resolution hides the very low signals. When in zoom mode, the up arrow and down arrow gain keys increase or decrease the amount of zoom used in the bar graph and the green LED gain bar will flash. The zoom mode only affects the bar graph response. Zoom mode does not change the audio response. When switching to zoom mode, the audio level will lock at the level it was set at in normal mode. The operator can toggle back and forth between normal and zoom modes as he learns the strengths of each mode.
Placing Sensors

Effective operation of the LifeDetector system requires proper seismic sensor placement. The seismic sensor detects vibrations that travel through the structural members. These vibrations are very low-level signals and the sensor must be in physical contact with the structure to detect the signals. Any material, other than the structure itself, that is in contact with the sensor could reduce the signal response. Please adhere to the following sensor placement guidelines:

- Place the sensor on the largest and most massive components of the structure. Clean all debris off the structure member before placing the sensor. Make sure that there is no dirt, concrete dust, or drywall dust between the sensor and the structural surface.
• Avoid placing the sensor on soft sound-absorbing materials such as carpet, vinyl, fiberboard, or drywall. These materials absorb vibrations before they reach the sensors and limit effectiveness.

• Avoid placing the sensor on materials that are loose or not connected solidly to the structure. For example, a loose plywood panel should be avoided.

• When placing multiple sensors, try to place the sensors on common materials. For example, if four sensors are deployed, all four should be on concrete, rather than two on concrete, one on wood, and one on steel.
• Whenever possible, place all sensors in the same orientation. Sensor orientation is especially important when operating in locating mode since it will be necessary to compare the relative output of each sensor. A mixed sensor deployment with some on their sides and some on their bases may produce varied results.

• Sensor cable placement should be considered when placing the sensors. The cables are connected to the sensors and vibrations picked up by the cable can be transferred to the sensor. Cable noise can be eliminated by securing the cable from movement using tape or sandbags, and by keeping the cable away from anything that generates noise.
SEARCH OPERATIONS

Search operations are divided into two modes of operation when using the LD3:

- Victim Detection
- Victim Location

While the basic operation of the LD3 remains the same in both modes, how the sensors are deployed and how the bar graph is interpreted will be different.

Prior to beginning any search, it is important to establish scene control and reduce noise levels as much as possible. All unnecessary personnel should be moved off the rubble pile. Any equipment not needed for the search process should be shut down or moved.

Noise levels are relative and it is not usually necessary to have it absolutely quiet on the scene at all times. Normal voice conversations should not distract from the process, but many people walking on the rubble pile could cause distractions. It is important to have the ability to request “all quiet” quickly and have personnel briefed on the importance of responding quickly to the call for all quiet.
Victim Detection

When using the LifeDetector for victim detection operations, the primary goal is to determine whether or not there is a viable victim in the collapsed structure.

In detection mode, it is best to rely initially on the listening capability of the LD3 since it is possible to hear very faint audio signals that may be too weak to be accurately displayed on the sensor response graph.

When in detection mode, the first priority should be to get as many sensors coupled to the structure as quickly as possible. The sensors should be distributed around the structure as widely as possible. If it is not possible to spread sensors evenly about the structure, it is still valuable to have all the sensors on the structure, even if they are relatively close together.
Once the sensors are deployed, activate all sensor selection keys for listening. Keep in mind that the audio from all the sensors will be summed. For detection purposes, using all available sensors will yield the best results.

In some situations, the victim’s activity will be heard and seen on the bar graph as soon as the sensors are placed. However, it is important to always signal to the victim and request a response. This can be done by calling into the structure and requesting that the victim tap three times on the structure. It is best to use a public address system or a bullhorn to call out, but do not underestimate the victim’s ability to hear normal voice conversations. Many building collapse survivors have stated that they could hear people on the surface quite well.

Once the call is made into the rubble pile, listen for a response from the victim. If no response is heard, use a hammer to tap three times on a large portion of the structure then listen for a response. Repeat this process several times.

Upon detecting a potential victim, mark the area appropriately and proceed with victim location techniques.
Victim Location

Once a victim is detected, the task turns to identifying the general location of the victim in the structure by evaluating the relative response of each sensor. The highest amplitude on the bar graph or in the headsets generally means the victim is closest to that particular sensor.

Sensor placement is much more critical in location mode since the response of each sensor will be compared to determine the strongest signal. Verify that all sensors are placed firmly on solid structural members and all sensors are orientated in the same position.

There are many variables that will affect how best to conduct victim location operations. These variables include the type of construction of the building, the type of collapse, and the size of the structure. While it is impossible to cover every potential situation in the context of this text, it is generally safest and most efficient to start at the top of the rubble pile.

The number of sensors used depends on the size of the building. The effective location range of a sensor on a concrete slab is approximately 30 feet (10 meters).

Obviously, many different sensor layouts are possible with the given building geometry, but in rescue situations speed is most important. Our experience has shown that a single line of sensors is most efficient. Placing sensors in the middle is best for narrower buildings. In larger buildings, it may be necessary to start near one edge of the building and move the line toward the opposite edge.

The following is a textbook example of sensor placement for Victim Location. Since vibrations can be carried a long distance from the source and travel differently through various substrate materials, a valid source can be elusive. It is very important for all users to obtain as much field practice as possible to become skillful at victim location.
With the sensors in place and activated for listening, initiate a response from the victim while viewing the bar graph. Look for the sensor with the strongest signal.

Sensor #4 receives the strongest signal.
Once the strongest signal is identified, in this case from sensor #4, reconfigure the sensor chain in a circular pattern around the strongest sensor but do not move the strongest sensor. It is recommended that the sensors be moved to approximately half the distance of the original placement. The following example shows the placement of sensors around sensor #4.

Sensor #4 receives the strongest signal. Readings for sensors 2, 3, 5, and 6 are stronger than before.
At this point, since the readings are clustered in a strong response range, ZOOM mode should be activated for better discrimination of the response graph readings. Gradually move the perimeter of the sensors inward toward the original strongest sensor. Ideally, the signals from the perimeter sensors should increase as they are moved closer to the original strongest sensor indicating the location of the victim. If this is not the case, reconfigure the sensors and repeat the process.
Primary Search

In large multi-building collapse situations, it may be necessary to prioritize search and rescue resources. Primary (or Hasty) search operations may be requested in order to accomplish prioritization planning.

In a Primary Search, victim detection is more important than victim location. Typically, the victim’s general location will be marked near the detection point and on a search map and the Search Team will move on in an attempt to detect additional victims.
The LD3 can be configured for rapid Primary Search by using two sensors plugged in two separate sensor input ports. The most efficient manner to conduct the Primary Search is to assign one person to each sensor, while a third person monitors the DI console.

Start at one end of the building and logically place each sensor in a promising section of the building. This is essentially a grid search. The Primary Search can be done very quickly with an experienced crew using the LD3.

A Primary Search can be done effectively with acoustic sensors or seismic sensors.
Secondary Search

The Secondary Search is a more complete and detailed search using all sensors in a coordinated pattern. It is best to assign one person to each sensor being used and move the sensors in a line until a victim response is detected.
The sensor emitting the strongest signal should be left in place while the other sensors are positioned in closer proximity to the potential source. This takes more time but produces a more accurate location to proceed with the Searchcam® products and rescue operations. Secondary or detailed search operations are the preferred method to conduct the search, but in large-scale disasters, limited USAR resources can preclude the initial use of the detailed search methods.
**LD3 SYSTEM MAINTENANCE**

**Battery Care and Charging**

The single most important maintenance issue with the LD3 is battery care.

The LD3 uses a lightweight Lithium Ion battery capable of powering the system for six to ten hours. The battery pack must be recharged and stored properly. It is best to recharge the battery after ANY use. The Li battery pack will not develop a memory like other types of batteries. Frequent partial discharge and recharge cycles are better than full discharge and recharge cycles.

The battery should never be stored in the DI console. The console will draw a small amount of current even when shut down. This drain can slowly discharge the battery to the point that it cannot be recharged. If this occurs, battery replacement is required. If the battery is fully discharged, this deep discharge can occur within a few days. For this reason, it is very important to always recharge the battery as soon as possible after each use.

A normal maintenance recharge cycle should be about every 90 to 120 days. If the batteries are stored in temperatures higher than 80 degrees F, the batteries should be recharged every 60 days.
Charging the Battery:

1. Plug the AC adapter cord into the power supply and plug the power supply cord into the battery charger.

2. Remove the threaded cap on the battery charger and insert the battery.

3. Replace the threaded cap and plug the AC power cord into a power source. The charger will automatically charge the battery once the cap is replaced and power is available. The LED on the end of the charger will illuminate RED when the battery is charging.

4. Remove the battery when the LED turns Green indicating that it is fully charged.

The battery requires approximately five hours to fully charge. Once the charge is complete, remove the battery for proper storage or use. Do not leave the battery in the charger without power.

*Note:* A small amount of silicone grease should be maintained on the battery cap O-ring seal and threads.
Cable Care

Use protective rubber connector caps when the cable is not connected. Do not drop the connectors or allow them to strike the ground. If the connector body becomes deformed, it will not mate.

To wind the cable on the spool:

1. Attach the Velcro strip at the center of the cable length to the Velcro on the spool.
2. Start turning the spool and wind the cable in parallel. Use one hand to align the cable during wind-up to prevent twisting.
3. Pull the slider on the cord down to hold the cable and connectors in place.
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Acoustic Sensor Debris Removal

If debris accumulates in the acoustic probe speaker holes or inside the speaker cavity, unthread the dome shaped headpiece only. Clean away any debris and re-install the headpiece.

Routine Maintenance

- Test the system after each use to assure that there are no repair concerns.
- Clean the cables, sensors, and DI unit with a dry cloth or compressed air. Then wipe with a damp cloth using a mild soap solution if necessary. Do not immerse any of the components.
- Apply a small amount of silicone grease if needed on the battery cap threads to protect the O-ring and reduce the chance of corrosion.
- Assure that no battery is stored in the DI unit.
- Charge all batteries.
- Inventory system components making sure that easily misplaced items are accounted for.
- Do not remove screws on the DI console or sensors. These components contain no servicable parts. No calibration adjustments are required on the sensors or the DI. The sensors must be maintained as a sealed unit to avoid moisture contamination.

Wet Weather Maintenance

- After using the system in wet weather, dry the equipment thoroughly. A 48 hour dry time is recommended. If the case foam contains any moisture, remove all equipment and leave the case lid open to dry.
- Remove the main unit from its pouch and remove the battery pack, leaving the battery cap off.
- The microphone in the acoustic sensor is water-resistant and exposure will not cause any permanent damage. However, the microphone is not designed to work underwater. If the microphone gets too wet, it can become temporarily non-functional until allowed to dry.
- Remove all protective caps from the sensors and cables for drying.
- Do not seal the case until all components are thoroughly dry. The case is airtight and moisture in the case can cause severe damage.
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WARRANTY

The Delsar® LifeDetector® Model LD3 is warranted to be free from all defects in material and workmanship under normal usage for a period of one year. This warranty is granted only to the original purchaser and is subject to the following provisions.

Exclusions

- Parts of the unit that require replacement under normal use, such as batteries.
- Damages or malfunctions caused by negligence, abuse, inadequate maintenance, or use not in accordance with the intended purpose of the unit.
- Defects or damages cause by unauthorized service, modification, or use of non-genuine CON-SPACE parts.
- Defects or damages caused by operation outside of environmental specification.
- Damage caused by common carrier or airline.

Relief

CON-SPACE, Ltd will, at its option, repair or replace a defective unit or unit part that is covered by this warranty. As a matter of warranty policy, CON-SPACE will not refund the consumer’s purchase price.

Obtaining Warranty Service

To obtain warranty service, you must contact CON-SPACE Communications to obtain a Return Merchandise Authorization number (RMA) and instructions.

Disclaimer

This warranty is expressly in lieu of all other warranties. CON-SPACE specifically disclaims any liability for any general, special, or consequential damages arising out of sale, manufacture, or use of this product, whether based upon contract, tort, or any other legal theory. CON-SPACE makes no warranties, express or implied (including, but not limited to, any warranty of merchantability or fitness for any purpose) with respect to the identified products.
SERVICE

If your system should require service or if you have a question regarding the Delsar® LifeDetector® Model LD3 contact CON-SPACE at 604-244-9323 (1-800-546-3405) for assistance. Always contact CON-SPACE before returning a system for service. For service outside North America, contact service by phone at 604-244-9323, by fax at 604-270-2138 or www.con-space.com.

Before you return the Delsar® LifeDetector® Model LD3 for repairs or upgrades:

1. Contact CON-SPACE for a Return Merchandise Authorization (RMA) number.
2. Insure the system for the purchase price of the system.
3. Place the address label on the outside and the inside of the shipping container. Shipping labels can be downloaded at www.con-space.com.
4. Include contact information, return address, and a description of the reason for the return.
5. Customers are required to pay shipping to and from CON-SPACE.

For international shipments, mark the shipping document as follows:

Service Centres

<table>
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<tr>
<th>US Repairs</th>
<th>Canadian Repairs</th>
<th>UK &amp; European Repairs</th>
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<tr>
<td>CON-SPACE</td>
<td>CON-SPACE</td>
<td>Lowe Electronics</td>
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<tr>
<td>1927 Boblett Street</td>
<td>505-5600 Parkwood Way</td>
<td>Sandyhill Park</td>
</tr>
<tr>
<td>Blaine, WA 98230</td>
<td>Richmond, B.C. V6V 2M2</td>
<td>Middleton, Matlock DE4 4LR</td>
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</table>

“Goods of CDN origin being returned for repair”

According to most export laws, the customs value stated on the return shipment will be either the repair price in the case of billable repairs or the cost of repair to the manufacturer in the case of warranty repairs. The recipient is responsible for payment of all customs charges such as duty upon re-entry to their country. Documents showing proof of original export for repair may be required to minimize these charges. Return documents will state an Insurance Value for the equipment in case of loss. This value is usually much higher than the Customs Value. An Ex-Works return shipment can be requested if the customer chooses not to insure the return shipment.

User comments and suggestions are always appreciated. We continually strive to improve our products and this can only be done with your help. Let us know what you like and what changes would help make the system better to suit your needs.
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Thank you for your support.

Please visit our website to see how our other search rescue gear can assist in your searches.

www.con-space.com