



**Lmic USER MANUAL:
Operators Guide**



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1. INTRODUCTION

Lmic

The Lmic is an easy-to-use, low cost, electronic listening stick and ground microphone combined. It is ideal for general leak sounding operations and can be fitted with either a tripod foot (for use as a ground microphone) or probe rods (for sounding at fittings or in soft ground).

The control unit is hand-held with a "trigger" operation and a volume/sensitivity rotary control. An LED indicates operation and battery status. It can be used to confirm the position of underground leaks audibly from ground level; sound pipe fittings; penetrate soft ground to listen for leaks or carry out traditional acoustic surveys.

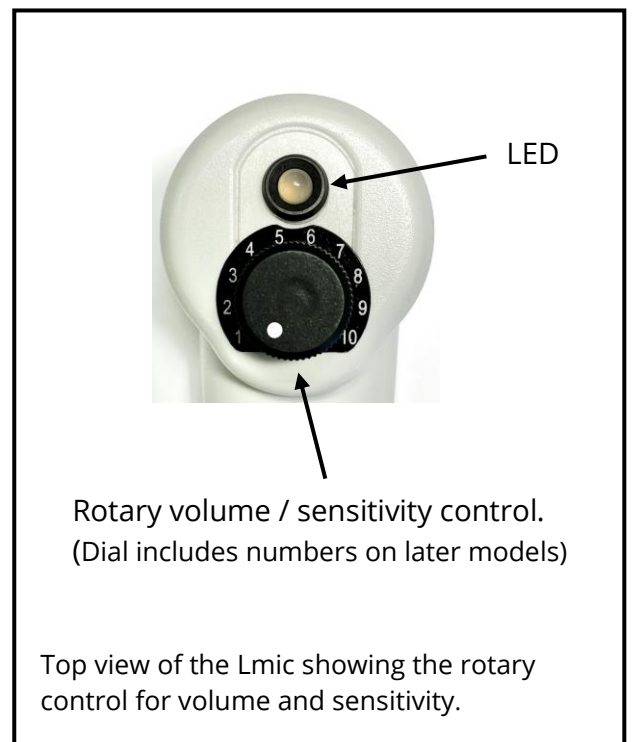
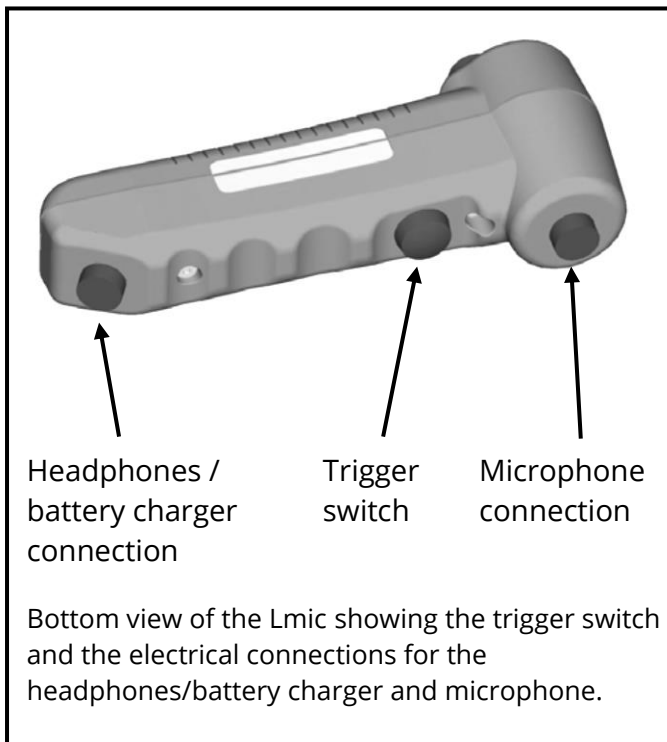
Equipment list

- 1 Lmic hand-held control unit
- 2 Microphone unit with cable
- 3 Tripod unit
- 4 2 probe rods
- 5 AC adapter
- 6 Headphones
- 7 Carry bag
- 8 Instruction manual



Figure 1. Lmic equipment. (Battery charger not shown)

Lmic Controls



2. USING THE LMIC

The Lmic is simple to operate. Select either the probe rods or the tripod unit and screw into the microphone unit. (Use the tripod foot on hard ground and use the probe rods on soft ground or when accessing water pipe fittings). Connect the headphones to the rear connector and connect the microphone cable to the forward connector. Put on the headphones and press the trigger button underneath the hand-held unit to listen for leaks. The volume/sensitivity can be adjusted using the rotary control.

LED indication

The green LED shows when the unit is operating and the red LED indicates low battery power.

Care of the Lmic

The Lmic is rugged and showerproof (to IP65) but contains electronic circuitry and should be handled with care. It should be kept clean and dry and where necessary cleaned with a damp cloth; abrasive materials must not be used.

Battery Warning

The Lmic contains lithium-ion batteries which must not be used under any circumstances on any other equipment if removed. Only batteries supplied by Palmer Environmental must be used as replacements. Do not short circuit or misuse these batteries as this may result in explosion or fire.

Battery replacement

Although these batteries are rechargeable, they may eventually need to be replaced. To do this undo the two screws underneath the hand-held unit and separate the two halves of the Lmic unit. Gently pull out the battery holder and replace the batteries. When refitting the batteries and battery holder make sure no wires become trapped.

Charging the Lmic batteries

Connect the charger lead to the rear connector of the Lmic and connect the charger power lead to the AC supply. The Lmic can then be charged overnight. An optional accessory is the car cigarette lighter adapter that can also be used to charge the batteries.



Figure 2. The Lmic in use



Figure 3. The Lmic connected to the universal 110-240V AC charger.

3. Lmic Operator Guidance:

Background information to effective acoustic leak detection

All acoustic leak detection methods are based on the premise that normal water passage through pipelines takes place noiselessly. When the water passage is disturbed, a noise is created. Causes can include partial pipe blockages, sudden changes in pipe diameter, abrupt changes in pipe direction, pumps or meters installed in the pipeline, consumer usage or pipeline damage. Pipeline damage can include holes, cracks or splits, complete pipeline rupture, leaking joints or leaking valves.

Careful application of leak detection techniques will enable the operator to eliminate detected noises generated by poor pipeline design or consumer usage and to identify leakage due to pipe system damage.

The strength and clarity of noise generated by leaks will be affected by the water pressure, the size and shape of the hole allowing leakage, the type of ground material around the pipeline, the type of ground cover over the pipe, the diameter, wall thickness and material of the pipeline and the quantity of water leaking.

A small hole and high water pressure generally produce a higher frequency noise. Often the noise level increases around valves, pipe elbows, T connections, pipe ends, etc. since the partial obstruction increases pressure and creates some further disturbance in the water path.

Leak noise is transmitted along the pipeline both through the water and the pipe wall as well as into the ground around the pipe. The noise travels much better through "hard" materials so that the noise travels much further along metallic pipes than asbestos cement pipes which themselves are better than plastic pipes. Ground material generally provides a poorer travel path than the pipeline itself. Soft sandy ground provides a worse travel path than well compacted ground with a hard paved surface covering.

The leak noise can change in strength and pitch as it travels along the pipe or through the ground. The deeper the pipe is buried and the softer the ground the more the noise will be dampened. The harder the pipe material, the higher the frequencies detected will be, and the further from the leak the noise will be detected and the harder it becomes to accurately pinpoint the exact point of maximum.

Background noise can interfere with leak detection. Traffic and machinery noises can travel for considerable distances through both air and ground material and often occur in the same frequency bands as leak noise. Sometimes it is necessary to use leak detection techniques at night when interfering noises are less.

It is very important to adopt a methodical approach when using any instrument for acoustic leak detection. It is necessary to practice the technique in order to distinguish between different sounds, recognising background or interfering noises, so that they can be eliminated. It is also essential that other (non-leakage) noise sources such as consumer draw-off or partially closed valves are eliminated by logical site inspection practices prior to any excavation taking place.

Hand probe

For normal soft ground surfaces the single pointed extension rod should be connected - do not overtighten the screw thread. For direct contact with underground fittings via access covers it may be necessary to use the second extension rod - remove the single rod and connect the extension rod - replacing the pointed rod again. If the rods have been overtightened, spanner slots allow easy removal.

The leak location can be narrowed down by listening at accessible contact points such as meters, hydrants, valves and stop-taps, which provide points of good sound pick-up particularly if the pipe is metallic. Use the hand-probe/extension rod to listen at these points.

If there are no accessible contact points or if the pipe is of non-metallic material use the microphone tripod foot for listening, placing the foot over the pipe route in the area of the suspected leak. Move along the pipe route listening at each accessible pipe-fitting or at regular positions on the ground until you have identified the area of maximum noise level.

Note: When you are listening on pipe-fittings the location of the point of maximum noise will probably not indicate the leak position, only the fitting closest to the leak. The noise level will also appear stronger where there is less thickness of ground or other material for it to pass through. The leak noise will follow the path of least resistance.

Pinpointing the leak position

Pinpointing the leak position involves a process of comparing a number of leak noises. Select the most suitable sensor device; the microphone tripod foot for hard ground surfaces or the hand probe for soft ground. Press the trigger to operate the Lmic and adjust the headphone volume control to a comfortable listening level. Once you have listened to the noise through the headphones, release the trigger to switch off the amplifier and move the microphone tripod foot or hand probe to the next test location.

Repeat the sequence to listen to each of the test locations moving along the pipe route in the direction where signal strength is increasing. If the leak noise level falls you have passed the leak and should go back and reduce the distance that you move between measurements. The loudest leak noise will then indicate the location of the leak bearing in mind the ground conditions already mentioned.

4. OPTIONAL ACCESSORIES

- High specification aviation quality headphones.
- Car cigarette lighter adapter with 12V DC output.
- Acoustically shielded ground microphone foot, for use in all weather conditions.

5. TECHNICAL SPECIFICATIONS

Please refer to the HWM datasheet for technical specifications of the Lmic product.



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