DML2000

Magnetic Locator User's Guide

DUNHAM & MORROW
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Quick Start Instructions

1. Make yourself magnetically clean. Typical items known to be magnetic include, but are not limited to watches, key rings, pocket knives, belt buckles, and shoes with steel toe protectors.

2. HOLD the instrument by the pistol grip located below the Electronics Box and on the top of the instrument's Sensor Tube.

3. Turn the Volume Switch clockwise to activate the instrument and set the volume to a comfortable level.

4. Set the Sensitivity Switch to position 3.

5. Sweep the unit back and forth in front of you as you walk and search the area. With no magnetic (ferrous) targets present, the unit will idle at approximately 20 hertz. As you approach a ferrous target, the frequency will increase and peak directly over the target.

6. For strong or shallow targets, raise the unit approximately 12 inches above the ground or select a lower sensitivity setting. Conversely, for weak or deep targets you may wish to increase the instrument's level of sensitivity.

Always remember that the DML2000-XRM and DML2000-XR are precision instruments and should be treated accordingly.

The **DML2000-XRM** is identical to the **DML2000-XR** with the exception that it also includes a visual display (a full 3 ½ digital LCD panel meter) in addition to the audio output.

NEVER use the DML2000-XR as a substitute for a shovel

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Introduction

The state-of-the-art DML2000-XR Magnetic Locator packs all of its sophisticated electronics into a nicely balanced, water resistant package weighing less than 2 pounds. O-rings are used to shock mount the sensors and thus ensure proper instrument operation. The electronics' housing is water resistant and unaffected by rain and snow; the sensor tube is waterproof and can be submerged in shallow water up to 3 feet.

The unit has six sensitivity settings for better control. Normal locates are performed on setting two or three. Lower settings may be used for large, relatively shallow targets; higher settings work best for weak or deep targets. The instrument audio output idles at a nominal 20 Hz when no magnetic objects are present and increases whenever the DML2000-XR approaches a magnetized object.*

The DML2000-XR Magnetic Locator is the ideal instrument for locating survey markers, septic tanks, buried iron or steel pipes, water valves, water meters and any other ferrous objects covered by dirt, pavement, water, snow or ice. The capabilities of this instrument are unlimited, and an experienced operator will find many uses for the DML2000.

The separate Power/Volume and Sensitivity controls allow the operator to leave the Sensitivity control in a favorite or preset position, deactivate the instrument and later resume operation with this setting unchanged.

There is no need to worry about the instrument battery level. A built-in Low Battery indicator begins flashing whenever the operator has 2 to 3 hours of normal operation remaining. Typically the DML2000-XR will provide over 60 hours of operation from a set of 4-AA, alkaline batteries. Using lithium batteries can increase this to over 100 hours of operation.

***BEWARE!** A strong warble output from the instrument means you are probably over an energized power line; a weak warble output often indicates the presence of a telephone or communications cable.*

Theory of Operation

The DML2000-XR Magnetic Locator uses fluxgate magnetometers to detect and measure the local magnetic field. Fluxgate magnetometers are vector magnetic field sensors that measure the average magnetic field component along their sensitive axis, i.e. the magnetic field component along the longitudinal axis of the sensor tube.

For a magnetic locator to work properly, two magnetometer sensors are required. One sensor measures the positive magnetic field, and the other sensor, located 20 inches away, measures the negative magnetic field. The instrument then sums the output of the two sensors. By summing the two output signals, you cancel any field common to both sensors, such as the Earth's Magnetic Field, and leave only the differential magnetic field. The differential magnetic field, the magnetic field detected by one sensor and not the other, is the magnetic field of interest.

Magnetic Cleanliness

The importance of the operator's magnetic cleanliness prior to beginning a search cannot be overemphasized. Some of the more common sources of local magnetic interference are watches, key chains, pocket-knives, cell phones, belt buckles, and steel arch supports or toe protectors in shoes.

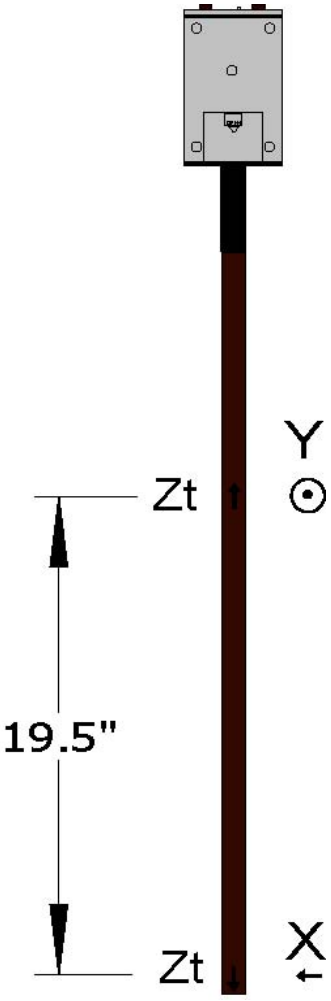

Figure 1: Sensor Location

Operation

To begin operation, you must first Power On the instrument. Then, adjust the Volume Control to a comfortable setting and set the Sensitivity Control to position 2 or 3.

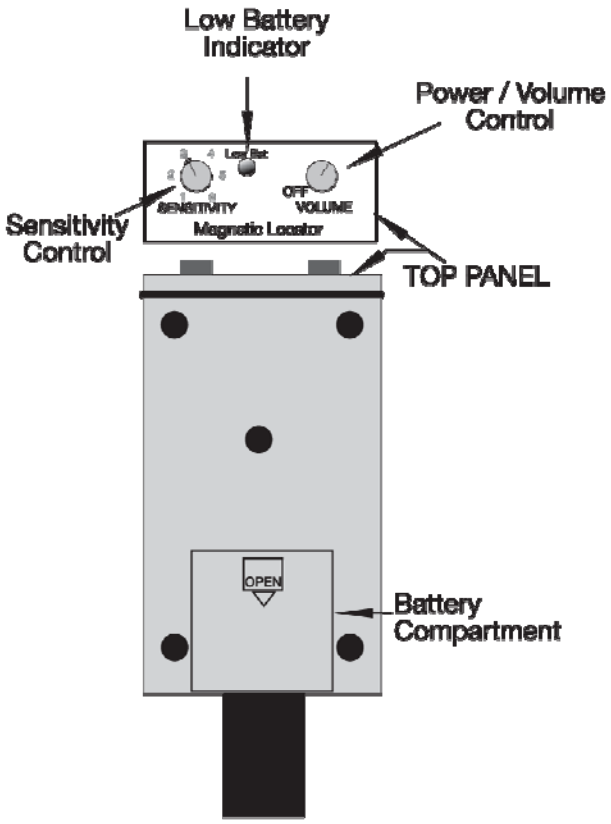

Figure 2: Instrument Controls

Sensitivity Setting

Most search operations work well with the Sensitivity Control set to Level 2. For small and relatively weak magnetic targets, a higher sensitivity setting may be desirable. Conversely, when the operator is searching for large, relatively strong magnetic targets, a lower sensitivity setting may be desirable.

Audio Output

When no magnetic objects are present, the instrument's audio output idles at approximately 20 Hertz. As the magnetic locator is swept back and forth in a desired search area, the speaker output tone increases in frequency when/if the DML2000-XR approaches a magnetic object.

Pinpointing your Target

In order to maximize your search area, hold your locator at an angle and swing it back and forth as you walk. When you want to pinpoint your target's location, it is advisable to hold the locator vertically and use an "X" or crossing pattern.

Panel Meter (DML2000-XRM only)

The DML2000-XRM Magnetic Locator has all of the standard features of the DML2000, plus an easily readable Liquid Crystal Display (LCD) panel meter. The 3½ digit (0 to ± 1999) Digital Panel Meter provides a high resolution display, and the digital display provides an exact numeric readout with a separate polarity indicator.

The highly-visible LCD panel meter is also helpful if high background noise begins to overwhelm the speaker. When background noises overwhelm the speaker, the operator can still continue his search operation by referring to the LCD display. The digital display on the LCD panel meter tracks changes to the instrument output frequency.

Figure 3: Meter Option

Common Magnetic Signatures

Most common underground targets have a predictable magnetic pattern and consequently produce a predictable output frequency change in the magnetic locator. In the figures that follow, the bold line above ground indicates the relative output frequency level of the DML2000-XR as it moves across the indicated target; the higher the line, the higher the instrument output frequency.

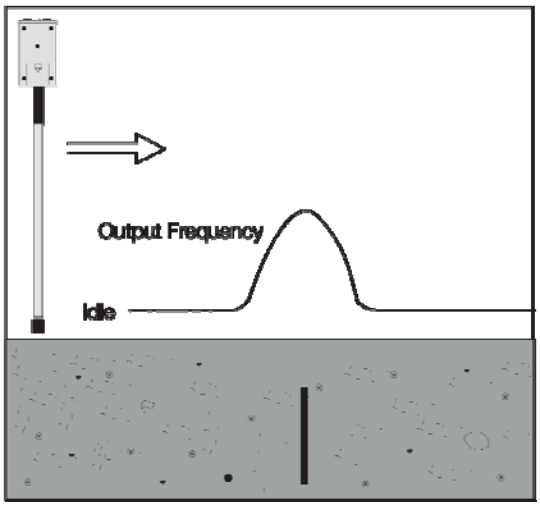

Figure 4: Survey Marker / Well Casting

The peaking of the DML2000-XR output frequency normally indicates that you are over the top center of a vertical dipole (survey marker or well casing).

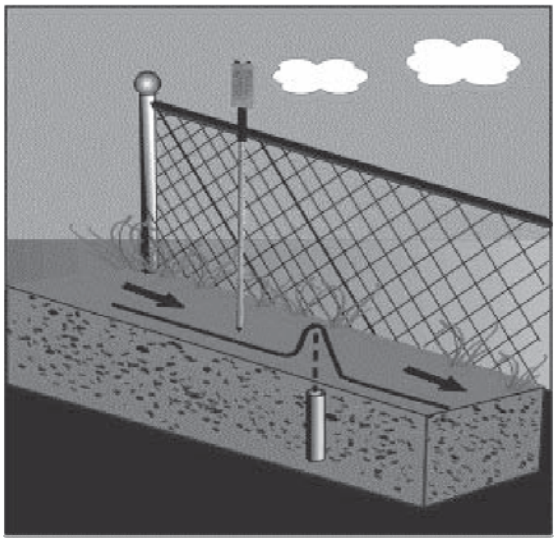

Figure 5: Chain-Link or "Cyclone" Fences

Hold the instrument vertical to the ground, and walk parallel to the fence (approximately 8" to 1' away). You will hear the magnetic field of the fence and fence posts as you walk. If your target

is near or under the fence, there will be a dramatic increase in the instrument's frequency as you approach the target, and you will have no difficulty distinguishing your target from the fence.

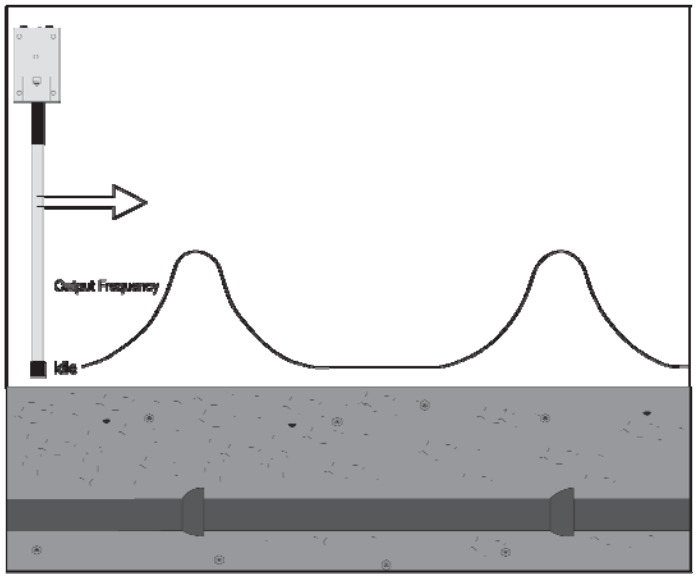

Figure 6: Horizontal Pipe

As illustrated in Figure 6, the peaking of the DML2000-XR output frequency normally indicates that you are over the end of a pipe section, which can be either a weld or a "Bell" joint. When searching for horizontal gas and water lines, look for a polarity change on the digital panel meter.** A polarity change that occurs when the output frequency is low means you are nominally over the midpoint of the pipe section. A polarity change when the output frequency is high typically indicates a pipe joint or weld.

***** DML2000-XRM (Applies to metered units only)***

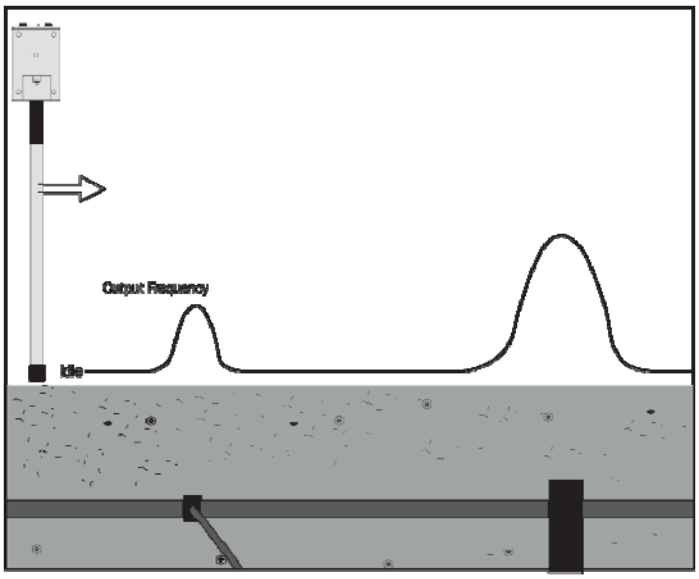

Figure 7: Service Connections & Valve Boxes

Frequency peaking occurs over any discontinuity:

- pipe joint
- service connection
- elbow
- valve box
- meter

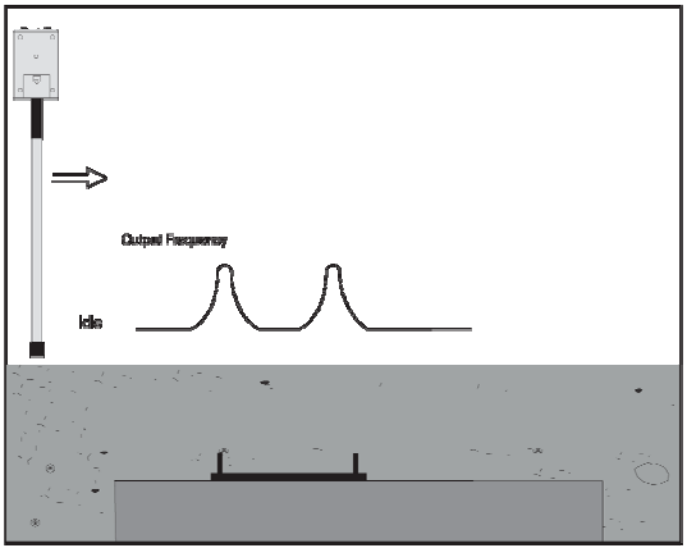

Figure 8: Septic Tank

Most concrete septic tanks have a cover with two handles. The handles are inverted, U-shaped pieces of rebar that are highly magnetic. In most cases, the audio output of the DML2000-XR will reach its peak directly over the handles, which makes it easy for the operator to identify the

correct place to dig. In other cases, the DML2000-XR will also detect the magnetic field of the wire mesh or rebar in the concrete. This allows the operator to not only pinpoint the location of the cover but to also outline the tank and determine precisely its orientation.

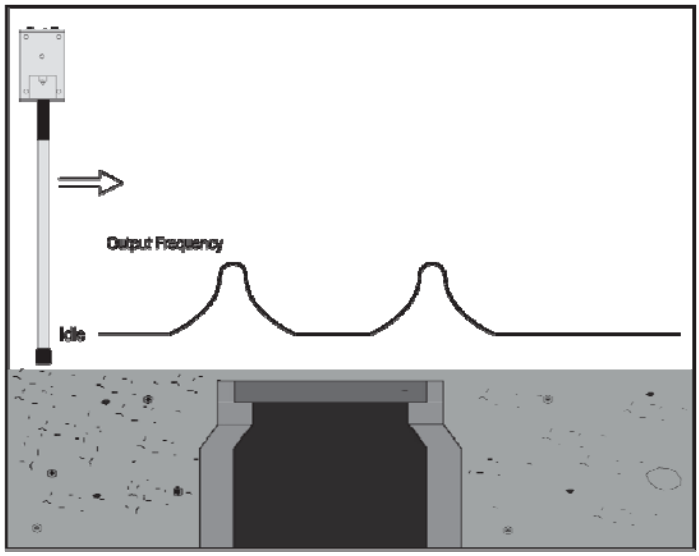

Figure 9: Manhole Cover

A typical manhole cover is actually a combination of two magnetic fields: the magnetic field of the cover itself and the magnetic field of the steel support ring. When both fields are aligned, they add and are easy to detect. When the manhole cover and its support ring are 180° out of alignment, their magnetic fields tend to cancel and the detection distance is greatly reduced.

General Specifications

(Specifications subject to change without notice)

Dimensions:	42.5” L x 3.75” W x 1.75” D (108 cm L x 9.4 cm W x 4.4 cm D)
Waterproof Length:	36” (91.4 cm)
Weight:	< 2 lb. (0.9 kg)
Operating Time:	Up to 60 hours using alkaline batteries (100 hours w/ lithium batteries)
Power:	4 - “AA” Batteries
Low Battery Indicator:	RED, flashing LED with 2-3 hours use remaining
LCD Panel Meter:	[0 to ± 1999] Digital Display (Applies to Model DML2000-XRM only)
Temperature Range:	-20º F to 120º F (-29º C to 50º C)
Audio Output:	Variable Frequency, (20 – 3,200) Hertz

Warranty & Service

Dunham & Morrow, by Schonstedt Instrument Company, warrants each product of its manufacture to be free from defects in material and workmanship subject to the following terms and conditions. The warranty is effective for 3 years after the date of shipment by Dunham & Morrow/Schonstedt Instrument Company to the original purchaser.

Dunham & Morrow's obligation under the warranty is limited to servicing or adjusting any product returned to the factory for this purpose and to replacing any defective part thereof. Such product must be returned by the original purchaser, transportation charges prepaid, with a description of the defect in writing. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed. Specifically, this warranty does not cover product that has been subject to inundation by fire, water or other liquid intrusion, or units that have been damaged or compromised due to repair, alteration or modification by anyone other than an authorized repair representative. Prior to a repair being performed by Dunham & Morrow, a cost estimate will be submitted and no work will be completed until authorized by the customer. Batteries are specifically excluded under the warranty and should be addressed to the manufacturer of batteries in question.

Dunham & Morrow shall not be liable for any injury to persons or property or for any other special or consequential damages sustained or expenses incurred by reason of the use of any Dunham & Morrow product.

Service Information

If your locator needs service, please return it to the factory along with the following information: Name, Address, Telephone, Fax number, Where Purchased, Date, and Description of Trouble(s). An estimate will be provided prior to service work being done.

For Service or Repair
Please ship locator (in its case) to:

Dunham & Morrow
100 Edmond Road
Kearneysville, WV 25430