INSTRUCTION MANUAL

GREENLEE®
COMMUNICATIONS
A Textron Company

EML100

Marker-Mate® Electronic Marker Locator

Read and **understand** all of the instructions and safety information in this manual before operating or servicing this tool.

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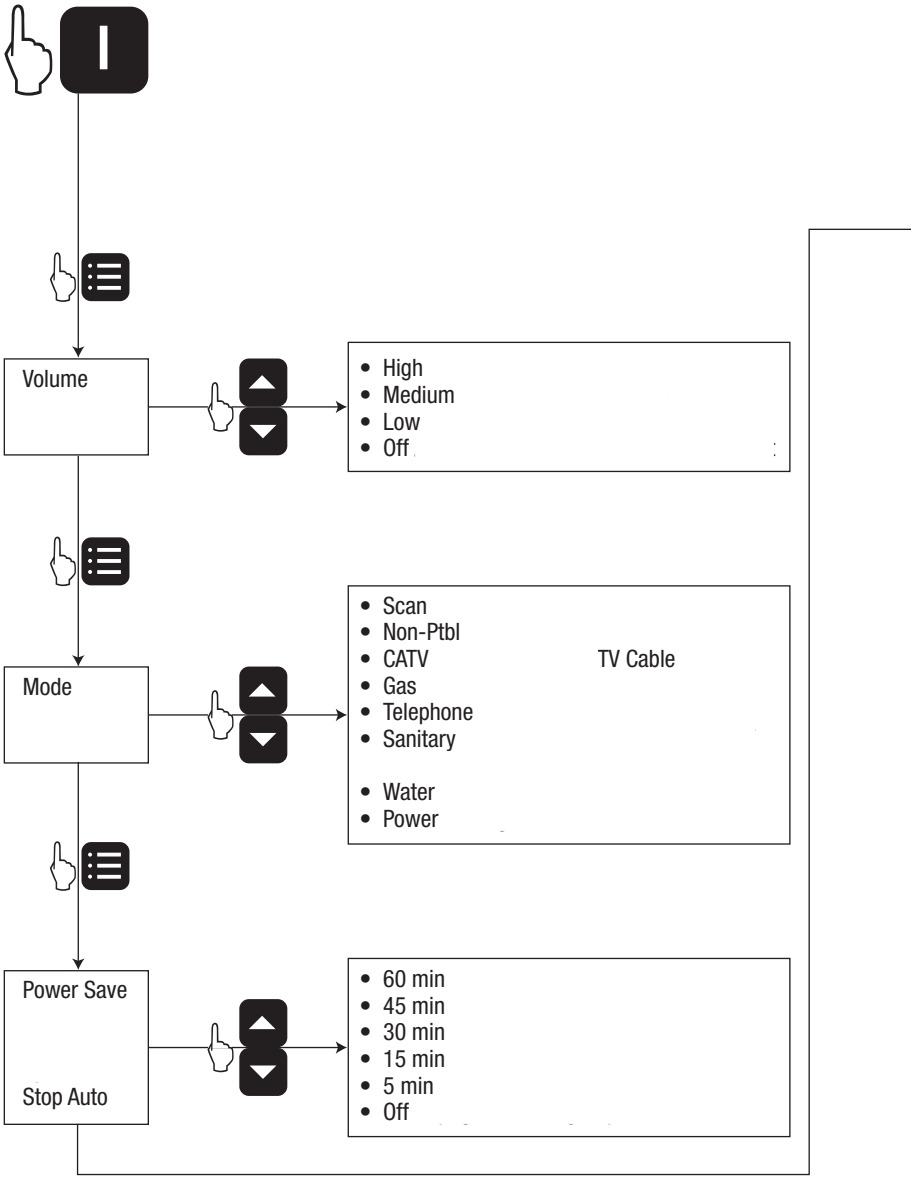
GREENLEE COMMUNICATIONS

Menu Quick Start Guide



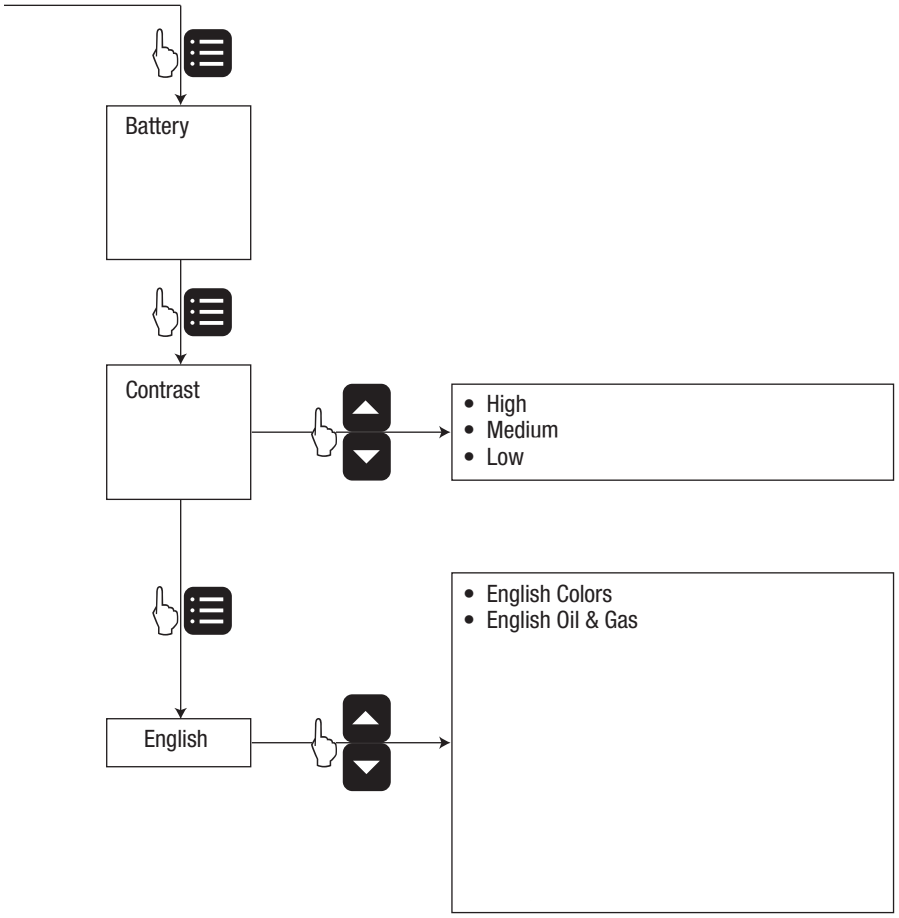


Table of Contents

Description

The Greenlee EML100 is a universal electronic marker locating tool for locating Power, Water, Sanitary, Telephone, Gas, Cable TV, and Non-Potable electronic markers.

Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

Purpose of This Manual

This instruction manual is intended to familiarize all personnel with the safe operation and maintenance procedures for the Greenlee EML100. Keep this manual available to all personnel.

Do not discard this product or throw away!

Important Safety Information

SAFETY ALERT SYMBOL

This symbol is used to call your attention to hazards or unsafe practices which could result in an injury or property damage. The signal word, defined below, indicates the severity of the hazard. The message after the signal word provides information for preventing or avoiding the hazard.

⚠DANGER

Immediate hazards which, if not avoided, WILL result in severe injury or death.

⚠WARNING

Hazards which, if not avoided, COULD result in severe injury or death.

⚠CAUTION

Hazards or unsafe practices which, if not avoided, MAY result in injury or property damage.

⚠WARNING

Read and **understand** this material before operating or servicing this equipment. Failure to understand how to safely operate this tool could result in an accident causing serious injury or death.

⚠WARNING

- Use this unit for the manufacturer's intended purpose only, as described in this manual. Any other use can impair the protection provided by the unit.
- Use accessories that are appropriate for the application.
- Inspect the accessory before use.

Failure to observe these warnings could result in severe injury or death.

⚠CAUTION

- Do not attempt to repair this unit. It contains no user-serviceable parts.
- Do not expose the unit to extremes in temperature. Refer to "Specifications."

Failure to observe these precautions may result in injury and can damage the unit.

KEEP THIS MANUAL

Product Features

The EML100 Marker-Mate® Electronic Marker Locator is designed to locate seven standard electronic markers including the Uni Marker™ and Omni Marker™ products.

Main Features

- Depth range of over 1.5 m (5 ft).
- Detects up to seven different marker types
- SCAN mode provides simultaneous detection of all marker types
- Rapid switching between SCAN and single modes
- User-adjustable detection threshold
- Digital signal processor accuracy
- Large-character display
- Bar graph, numeric, and audible signal strength indicators
- Adjustable speaker volume
- Headphone jack
- Battery level indicator
- Low battery warning
- Adjustable time-out feature
- Weather resistant
- Rugged construction

Electronic Markers

Electronic markers vary in detection range. Markers are color coded as follows:

- Power = Red
- Water = Blue
- Sanitary = Green
- Telephone = Orange
- Gas = Yellow
- Cable TV = Orange/Black
- Non-Potable = Purple

Refer to “Compatible Markers” for details about the Uni Marker and Omni Marker electronic markers.

Headset

A headset may be used to monitor the received signal in high noise level areas when plugged into the jack provided. The normal speaker is de-activated when a headset is used. Any standard stereo headset with a 3.5 mm plug may be used with the EML100.

Display Overview

Note: x's shown in the figures in this manual indicate numeric readings on the display.

LCD indicates:

- Mode: SCAN mode (with detected marker type shown), or single marker mode (i.e., Power, Water, etc.) (Figures 12 and 13)
- Numeric indication and bar graph (Figure 3)
- Gain setting (Figure 11)
- Volume adjustment for speaker response (Figure 4)
- Estimated battery life in hours and low battery warning (Figure 2)
- Time-out feature with disable (Figure 7)

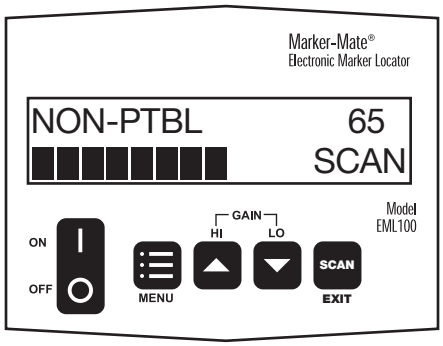


Figure 1. EML100 Display Panel

ON/OFF Switch

When the EML100 is turned on, the display will first show the firmware version and then the estimated battery life remaining (Figure 2). After the Power-On Sequence, the unit will default to the mode and settings that were used last. For example, if the unit was last used to locate Gas markers with the Volume set on Low, it will return to the same settings (Figure 3).

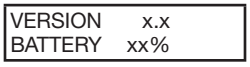


Figure 2. Version and Battery

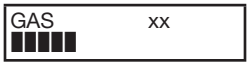


Figure 3. Sample Display

MENU Key

Note: The EML100 is active as soon as it is turned on and completes the Power-On Sequence. The bottom line of text on the display shows available options when using the MENU key.

Press the MENU key to cycle through the following sub-menus:

Volume Control

Use the ▲ or ▼ key to select Off, Low, Medium, or High; and use the EXIT key to exit the MENU screen (Figure 4).

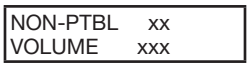


Figure 4. Volume Control

Pressing the MENU key again will display the MODE Select menu.

Mode Select

Use the ▲ or ▼ key to select from the following modes, and use the EXIT key to exit the MENU screen (Figures 5 and 6).

Note: The modes are listed in the order they appear on the display. The ▼ key must be used to change the mode from SCAN, and the ▲ key must be used to change the mode from NON-PTBL.

Figure 5. SCAN Mode

Figure 6. Power Mode

Pressing the MENU key again will display the POWER Save menu.

Power Save Timer

The Power Save Timer may be de-activated, or set in 15-minute increments to automatically turn the unit off.

Use the ▲ or ▼ key to select 60, 45, 30, 15 minutes, or Off; and use the EXIT key to exit the MENU screen (Figure 7).

Figure 7. Power Save Off

Pressing the MENU key again will display the BATTERY menu.

Battery Life

This selection displays the estimated Battery Life remaining in percentage (Figure 8). Press the EXIT key to exit the MENU screen.

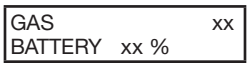


Figure 8. Battery Life

Display Contrast

The display screen's contrast may be changed to adapt to differing lighting conditions. Use the ▲ or ▼ key to select Low, Medium, or High.

Pressing the MENU key again will display the English (Language) sub-menu where Marker Color, English Oil & Gas, and Alternative Language modes can be accessed.

English (sub-menu)—Marker Color, Oil & Gas, and Alternative Languages

- **Marker Color:** The screen can be set to display the color of the marker to be located, rather than the name of the service.

  Press the MENU key two times to cycle to the MODE display.

  Use the ▲ or ▼ key to set the following color marker modes:

Purple	Red
Blue	Green
Orange	Yellow
Org & Black	

- **Oil & Gas (available only in English):** Use the ▲ or ▼ key to set the display to SCAN or to single marker to locate the following markers used in the oil and gas industry:

NON-POTABLE	CO2
PROD WATER	WATER
ELEC-AUTO	UNKNOWN

  Press the MENU key two times to cycle to the MODE display.

- **Alternative Languages:** The screen can be set to display any of the following languages:

ENGLISH	SPANISH
PORTUGUESE	ITALIAN
GERMAN	FRENCH

  From the English sub-menu, press the ▲ or ▼ key to cycle through the following Language/Service Type and Language/Marker Color settings:

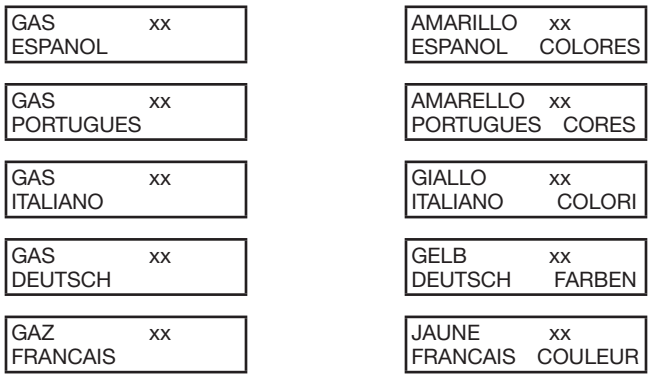


Figure 9. Alternative Languages

GAIN – HI – LO Keys

Menu Navigation

The HI – LO (▲▼ arrows) are used to navigate through menus while using the MENU key. Refer to the "MENU Key" section above.

Pinpoint Feature

The HI – LO (▲▼ arrows) are used to toggle the Pinpoint feature ON and OFF. The advanced Pinpoint feature allows the adjustment of the detection threshold, making it possible to narrow the detection area to a precise location (Figures 10 and 11). Refer to "Pinpoint Feature" in the "Operation" section.

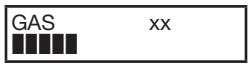


Figure 10. Sample Gas Display

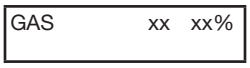


Figure 11. Gas Pinpoint Mode

EXIT Key

Mode Selection

The EXIT key is used to exit the MENU screen. (Refer to the "MENU Key" section above.)

SCAN / Specific Mode

The EXIT key may be used to toggle between SCAN and the type of marker being detected (Figures 12 and 13).

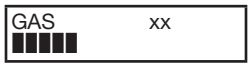


Figure 12. Sample Display

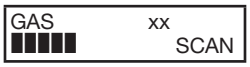


Figure 13. SCAN Mode

Operation

Note: After the Power-On Sequence the unit will default to the settings last used.

Normal Operation

To locate a known type of marker (i.e., Gas, Power, Water, etc.):

1. Press the ON key and allow the unit to complete the Power-On Sequence that shows the Firmware version and estimated battery hours. Replace batteries if necessary. (Refer to the "Maintenance" section.)
2. Press the MENU key.

   Press the ▲ or ▼ key to select the VOLUME level desired.
3. Press the MENU key again to access the MODE Select menu.

   Use the ▲ or ▼ key to select the desired mode.
4. Press the MENU key again to select the POWER Save menu.

   Use the ▲ or ▼ key to set an automatic shut off time or to turn the Power Save Timer off.
5. Press the MENU key again to view the estimated BATTERY HOURS remaining.
6. Press EXIT to begin searching for the selected type of marker.

Note: These settings will be saved and used the next time the unit is turned on.

Scan Operation

To locate all compatible markers using the SCAN mode:

1. Perform steps 1 through 6 under “Normal Operation” above.
2. Press EXIT to enter the SCAN mode and locate all compatible markers.
3. Press the EXIT key repeatedly to toggle between the SCAN mode and a specific marker type mode.

Note: In SCAN mode, the EML100 will display the readings for the strongest signal being received.

Pinpoint Feature

The Pinpoint feature is used to adjust the gain of the EML100 to more closely locate a marker.

Gain adjust:

- To eliminate noise or pinpoint markers, reduce gain by pressing the LO gain button.
- Display indicates gain setting relative to 100%.
- Continue pressing LO gain to reduce gain.
- Press the HI gain button to restore gain to 100%.

Note: Press the LO gain button away from the marker peak signal for best pinpoint result.

Note: The Pinpoint feature will work in both normal operation and SCAN modes.

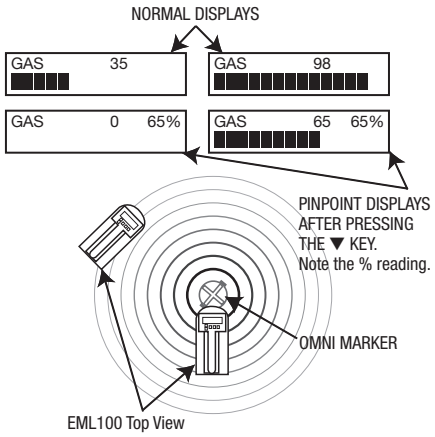


Figure 14. Pinpoint Feature

To activate the Pinpoint feature:

1. Select a marker mode as described in “Normal Operation” above.

   When a marker has been detected, the display will show a reading similar to the “Normal Displays” shown in Figure 14.

2. Without moving the EML100, press the ▼ key to enter the Pinpoint feature. Press the ▲ key to return to the normal display.

   The Bar Graph on the display will disappear temporarily and a percentage number will appear in the upper right corner. This percentage indicates the amount of gain remaining.

3. Continue searching the area, and the Bar Graph will reappear as the EML100 is moved closer to the marker.

4. Use the Pinpoint feature as needed until the exact location of the marker is known.

Note: Activating the Pinpoint feature adjusts the gain horizontally and vertically. If a marker is buried too deep, or has marginal signal strength, a reading may not be possible using the Pinpoint feature even if the EML100 is directly over the marker. Reset the gain by pressing the ▲ key if no markers are being detected.

Figure 15 shows samples of the displays that may be shown in various modes.

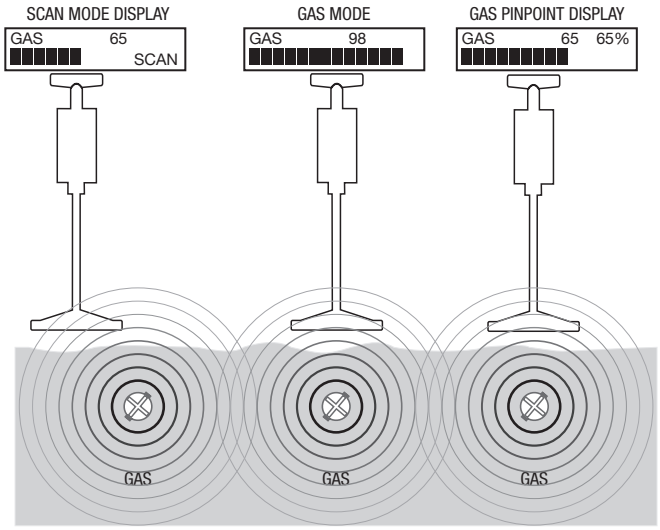


Figure 15. Mode Display Samples

EML100 Marker Search Pattern

A search pattern should be used when locating markers. All marker locators are dependent on the type of marker, depth of marker, and external noise as to how broad a footprint can be detected. The highest probability of locating a marker of unknown type and depth requires a tight search pattern.

Swing the locator in a comfortable 0.6 to 0.8 m (2 to 2-1/2 ft) arc, keeping the antenna portion level to the ground. The speed of the swing and walk should be moderate to allow full detection potential. For best results, perform some sort of zigzag pattern as shown below. The edges of the swing should come to the same point in allowing 100% coverage of the area (Figure 16).

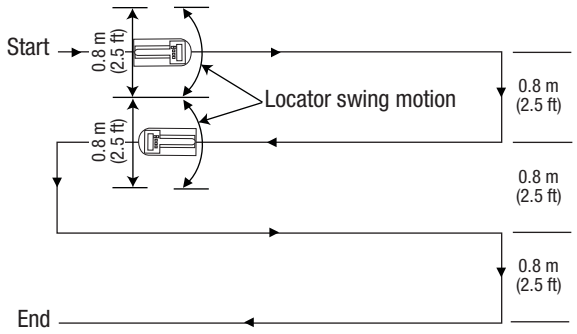


Figure 16. Search Pattern

A wider search pattern can be used, but the larger the spacing between passes the greater the chance of not locating a marker.

A benefit of using the EML100 in SCAN mode is that the search path can be done once tightly to insure that all markers are found and identified. Compared to a marker locator only able to detect one marker type at a time, the search pattern would have to be repeated for each marker type.

Specifications

Battery

EML100 ..... (12) 1.5 volt AA
Battery Life (nominal) ..... 20 hrs

Physical

Length ..... 77.8 cm (30.7 in)
Width ..... 19.8 cm (7.8 in)
Height ..... 32.5 cm (12.8 in)
Weight (with batteries) ..... 2.04 kg (4.5 lb)

Operating and Storage Conditions

Operating Temperature ..... –20 °C to 50 °C (–4 °F to 122 °F)
Storage Temperature ..... –40 °C to 70 °C (–40 °F to 158 °F)

Maintenance

The only service required for maintaining proper operation is the periodic replacement of the batteries in the transmitter/receiver unit.

Battery Replacement

To replace the batteries:

1. Loosen the four captive screws on the left side of the unit and remove the battery compartment cover (Figure 17).
2. Replace the (12) AA 1.5 V batteries. Observe polarity (Figure 18).
3. Replace the cover and tighten the screws. DO NOT OVERTIGHTEN SCREWS.

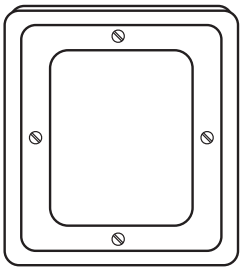


Figure 17. Battery Cover

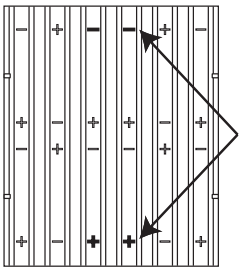


Figure 18. Polarity

Cleaning

Periodically wipe with a damp cloth and mild detergent; do not use abrasives or solvents.

Compatible Markers

Uni Marker™ Electronic Marker

The Uni Marker tool provides an economical way to electronically mark buried facilities. This passive electronic marker provides a unique electronic frequency when activated by a marker locator. It is packaged in a rugged polyethylene case that ensures years of useful life (Figure 19).

Application	Color	Cat. No.	UPC No.
Power	Red	170	60771
Water	Blue	171	60772
Sanitary	Green	172	60773
Telephone	Orange	173	60774
Gas	Yellow	174	60775
Cable TV	Orange/Black	175	60776
Non-Potable	Purple	178	11059

Figure 19.

Omni Marker™ Electronic Marker

The Omni Marker tool provides an improved method to electronically mark and locate underground facilities. Unlike other marking devices that use just a single coil, this marker contains three orthogonal tuned circuits. When excited by any standard marker locator, these passive circuits produce a uniform, spherical RF field in every direction. Because of its unique patented design, the Omni Marker tool offers benefits that are superior to any other electronic marking system (Figure 20).

Application	Color	Cat. No.	UPC No.
Power	Red	160	60765
Water	Blue	161	60766
Sanitary	Green	162	60767
Telephone	Orange	163	60768
Gas	Yellow	164	60769
Cable TV	Orange/Black	165	60770
Non-Potable	Purple	168	11050

Figure 20.

Omni Marker and Uni Marker Signals

These markers each emit a distinct type of signal as shown in Figures 21 and 22. The Omni Marker tools produce a uniform, spherical RF field in every direction, while the Uni Marker tools emit dipole field signals primarily up and down.

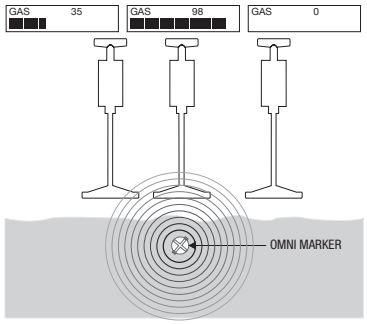


Figure 21. Omni Marker Signal

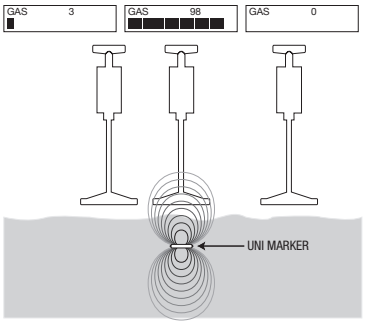


Figure 22. Uni Marker Signal