GOLDAK Underground Detection Equipment

OPERATING MANUAL

MODEL 902
PIPE & CABLE LOCATOR

OPERATING MANUAL

Innovating Underground
Locating Since 1933

GOLDAK PRODUCTS

www.goldak.com

GOLDAK

CONTENTS **PAGE NO.**

A. General Description:

The Goldak Model 902 is a hand-held electronic pipe and cable locator, designed according to the classic “split-box” concept. Like its predecessors in the Model TR series, the Model 902 is used to trace underground conductive networks such as water and gas mains, telephone, cable TV and electric power cables, and any continuously conductive pipe or cable. Also, as with traditional “split-box” locators, the Model 902 may be used to electronically determine the depth of buried lines, by employing simple operating techniques.

However, the Model 902 also incorporates features that are not found in traditional locators. Designed with patented SI (super-inductive) technology, the Model 902 packs superior performance into a convenient, hand-held package that is significantly smaller than other two-box locators. Durability of the Model 902 is insured by solid construction in a tough, Xenoy housing. Also, to enhance locating convenience, sub-surface metallic structures, including valve caps, risers and manhole covers, can be found easily during tracing by pressing a single push-button switch.

B. Major Components and Accessories:

1. Transmitter.

The transmitter generates a signal which is to be used to “energize” the conductive line to be located. When a line is energized, it radiates the generated signal in a pattern which corresponds to the direction of the line, and which may be used not only to trace the line but also to determine its depth. The signal may be transferred to the line by one of two methods: **inductively** or **conductively**. Inductive transferrance does not require the line to be electrically exposed. Conductive transferrance requires that the transmitter be connected physically via

cable to the line to be traced. Section D of this manual, “Operating Procedures,” explains these transmission methods in greater detail. A detailed explanation of the transmitter features and controls follows here **(refer to Fig. 1)**:

a) The **POWER** Switch. This booted push-button switch controls the power state of the transmitter. Depressing this switch so that the adjacent “BATT” light illuminates “turns on” the transmitter, causing it to generate a signal. Depressing the switch again will deactivate the transmitter.

b) The **BATT** Indicator. This LED is lit when the transmitter is activated and the condition of the battery source is good. If this LED does not illuminate when the POWER switch is pressed, or it becomes unlit during operation, the batteries need to be replaced.

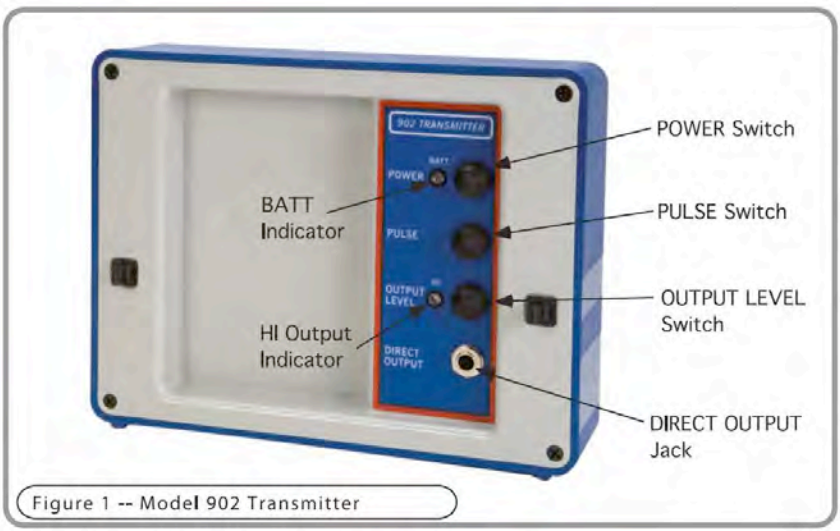

Figure 1 -- Model 902 Transmitter

c) The **PULSE** Switch. This switch controls whether the signal generated by the transmitter is continuous or pulsed at a frequency of 5 to 10 times per second. Pulsing the signal allows it to be easily identified and also conserves the transmitter's batteries. The transmitter is in “pulse mode” when the BATT indicator is flashing.

d) The **OUTPUT LEVEL** Switch. This push-button controls the intensity of the signal that is generated by the transmitter. Depressing this button so that the “HI” indicator is lit transmits the maximum amount of signal for any given signal transfer method. When the “HI” indicator is unlit, the signal output is reduced.

e) The **HI** Indicator. As explained above, this LED indicates the level of signal that is presently being transmitted.

f) The **DIRECT OUTPUT** Jack. Inserting the plug of the directconnection cable (hereafter referred to as the “DCC”) into this jack switches the transmitter into “conductive” mode. In this mode, a line may be energized directly by physically connecting the red clip of the DCC to an exposed part of the line.

2. Receiver.

The receiver is used to detect the signal generated by the transmitter, and therefore to trace the conductive line that the transmitter is energizing. While locating a line, the operator may use the receiver in either of two tracing modes: **peak** and **null**. When using peak mode, the operator searches for a maximum signal; this is the most sensitive mode. In null mode, the operator looks for places where the signal vanishes. A single pushbutton sets the receiver in an auxiliary detection mode **(locate mass)** which allows the operator to

conveniently find buried metallic masses, such as valve caps or manhole covers. Section D of this manual, “Operating Procedures,” contains more details about these locating methods and others. Specific features and controls found on the 902 receiver panel are described here **(refer to Fig. 2)**:

a) The **POWER** Switch. This push-button switch activates and deactivates the receiver. The receiver is activated (“on”) when the POWER switch is depressed so that the “BATT” light above this switch illuminates. Depressing the switch again will turn the receiver “off”.

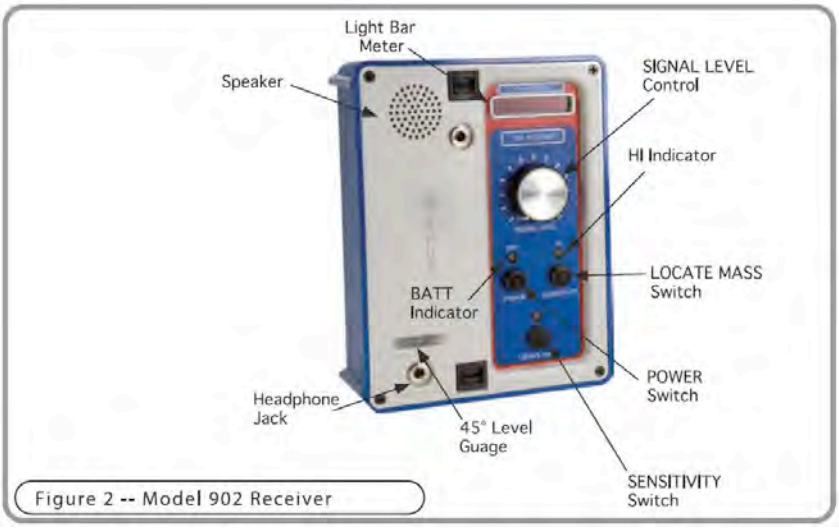

Figure 2 -- Model 902 Receiver

b) The **BATT** Indicator. When the condition of the batteries in the receiver is good, this LED shines when the receiver is activated. If this indicator does not shine when the POWER switch is pressed, or it stops shining during operation, then the batteries need to be replaced.

c) The **SENSITIVITY** Switch. Using this button will toggle the sensitivity of the receiver between a low and a high state. That is, this switch controls the receiver's overall sensitivity to the signal produced by the 902 transmitter. The LED indicator above this switch monitors what the present sensitivity mode of the receiver is. (NOTE: This switch does NOT control the sensitivity of the receiver while in "locate mass" mode.)

d) The **HI** Indicator. This LED indicates the present sensitivity of the 902 receiver when in normal tracing mode. The indicator will be lit to correspond to a state of high sensitivity. Likewise, the LED will be darkened in the low sensitivity mode.

e) The **LOCATE MASS** Switch and Indicator. Pressing this switch so that the LED indicator directly above it illuminates changes the 902 receiver from a line tracer to a metallic mass locator. Examples of buried masses that the receiver is able to find in this mode are valve caps and manhole covers. Using the instrument in this mode disables normal receiving functions.

f) The **SIGNAL LEVEL** Control. This knob is the most important control on the 902 receiver from an operating standpoint. While in tracing mode, use this knob to gradually adjust the sensitivity of the receiver to the transmitted signal. When tracing in "peak" mode, use this control to set the point of maximum signal on the response meter; in "null" mode, use it to adjust the width of the signal null.

g) The Light Bar Meter. This solid-state LED bar meter provides a visual indication of the level of signal presently being received. As described above, the response meter will indicate both peaks and vanishing points in the signal surrounding the line being traced.

h) Speaker. A water-resistant, small but powerful mylar speaker delivers a strong audio output corresponding to the signal received by the 902. In tracing mode, the sound will track the LED meter response; however, in mass-locating mode, the speaker delivers a continuous tone, the frequency of which will rise when the receiver is brought near to a metallic mass.

i) **Headphones** Jack. All sound normally supplied by the speaker will be channelled to headphones when the headphone plug is inserted here.

j) **45° Level Guage.** When making a determination of line depth, the operator will often find this small level helpful. Oriented at a 45° angle with respect to the antenna, the bubble in the level will center itself when the antenna is positioned at 45° compared to level ground. **See section D** of this manual for more information on determining line depth.

3. Direct-Connection Cable (DCC).

Included with every Model 902 instrument, this accessory consists of a phone jack wired to two separate copper clamps. Use this cable to inject the transmitter signal directly into a specific line, thus conductively energizing it. To accomplish this, connect the red clamp to the exposed line, and optionally attach the black lead to some ground if increased tracing distance is desired.

4. Ground Rod.

This U-shaped rod, also included with every 902, simply gives the operator a means of establishing a solid ground for conductive tracing. To use the ground rod, push it into some soil, and clip the black lead of the DCC to it.

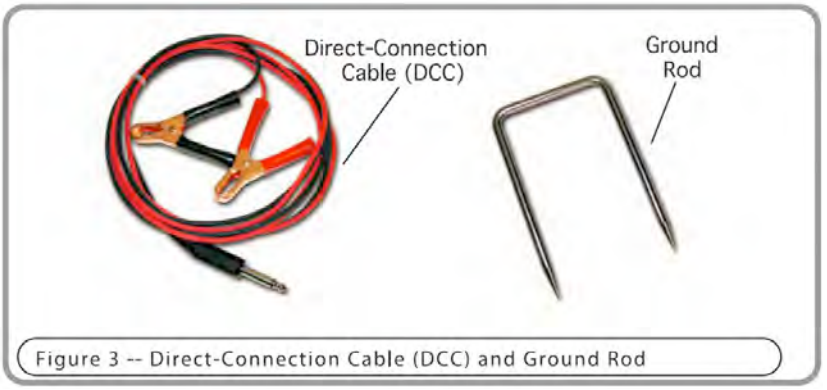

Figure 3 -- Direct-Connection Cable (DCC) and Ground Rod

5. GC-2 Cable Clamp.

This accessory is useful when the operator wishes to energize a specific line, but there is no electrically exposed area to make a conductive hook up. If the GC-2 is clamped around a specific line, it will inductively energize the line with a focused signal. The line will become considerably more energized than surrounding lines, and therefore easily traceable. The Model GC-2 clamp is sold separately.

6. Headphones are also sold separately from the Model 902. Any set of headphones may be used with the Model 902 Locator, provided it has a standard quarter-inch plug. We recommend a comfortable “walkman” style of headphones, which comes with a quarter-inch plug adapter.

7. Carrying Bag.

There are two kinds of carrying bag available for the 902 locator, both constructed from rugged nylon canvas. The smaller bag comes with the instrument originally and contains only enough room to carry the instrument and its basic set of accessories. The larger bag has additional pouches specifically tailored to house the GC-2 cable clamp, a set of headphones, and other miscellaneous items. The larger bag is sold separately.

C. Modes of Operation:

1. Transmission Modes.

There are two modes of signal transmission for the Model 902 Pipe and Cable Locator: inductive and conductive. Two discrete output levels may be selected for either mode, and the operator may choose to pulse the signal in either mode of transmission for easier identification.

a) Inductive Transmission. In inductive mode, the 902 transmitter produces a radio signal capable of penetrating air, ground, and other media in order to energize a nearby conductive line. Having been effected by the transmitted signal, the line then conducts the signal along its path. The signal pattern surrounding the line corresponds to the path of the line itself. Therefore, the operator may use the 902 receiver to trace the direction of the line and to determine its depth from the signal pattern surrounding it. Although energizing a line inductively can be convenient and sometimes necessary, this method typically is less precise than conductive transmission in its ability to isolate a desired line.

b) Conductive Transmission. To activate this mode of transmission, the operator inserts the plug of the direct-connection cable into the DIRECT OUTPUT jack on the transmitter control panel. Connecting the clip of the DCC directly to some exposed part of the line will channel the radio signal into the line through the cable. The line then conducts the signal exactly as it does if it is inductively energized, and the receiver can trace the line the same as well. However, in this mode, energizing is much more precise as well as more efficient. Therefore, one can generally expect longer and more reliable traces when using conductive transmission. This is the preferred method of transmission, and should be used in most cases when a portion of the line to be traced is exposed.

2. Receiving Modes.

As for the transmitter, there are two general modes of location for the 902 receiver: **line tracing** and **mass locating**. For line tracing, the operator may choose between two discrete levels of receiver sensitivity.

a) Line Tracing. This mode is used exclusively to detect the signal generated by the 902 transmitter, and therefore to locate lines which the transmitter is energizing. When tracing, one may choose to use either of two methods: peak or null. The operator selects the method solely by how he positions the receiver with respect to the line being traced. Peak method is selected by holding the receiver so that the plane of the face of the receiver is perpendicular to the surface above the line being traced. Holding the receiver so that the face lies parallel to this surface causes the signal to vanish when the energized line is located; this is null method. In line tracing mode, the operator may ascertain line depth by using simple techniques.

b) Mass Locating. At any time when the operator is using the 902 receiver for line tracing, he may choose to activate mass locating mode. In this mode, the receiver sounds a continuous tone and indicates detection of a metallic mass with a notable shift in the frequency of the audio tone. The frequency heard will rise when a conductive mass is detected, and lower when a strictly ferrous mass is detected.

3. Two-Box Modes.

The transmitter and receiver may be configured together to enable location of "unknown" lines, lines which have no known point at which to energize them. One method of finding unknown lines involves having two operators, each holding one of the locator boxes and moving together in the area that a line is suspected to be found.

D. Operating Procedures:

1. Energizing a Line to be Traced.

The Model 902 is an "active" locator. This means that the 902 receiver is designed to detect lines that have been energized by the signal generated from the 902 transmitter. Therefore, the operator must prepare to trace a specific line by first energizing it. Following are the methods for energizing lines.

a) Inductive Energizing

Using this method, the operator can energize the desired line without having to make any physical contact with it. Placed correctly upon the ground or pavement below which the line to be traced lies, the transmitter radiates its radio-frequency signal to the line **(Fig. 4)**. Once effected

by the radiated signal, the metallic line behaves like a large antenna, retransmitting the signal through the ground and air in a pattern that corresponds to its path. The line carries the signal on its path for several hundred yards, depending on its depth, the mineralization and conductivity of the ground, and the transmitter power setting. To use inductive energizing, follow these steps:

i) Make sure that the DCC is removed from the direct-output jack on the transmitter. If it is not, the transmitter is in conductive mode and will not radiate a signal through the air.

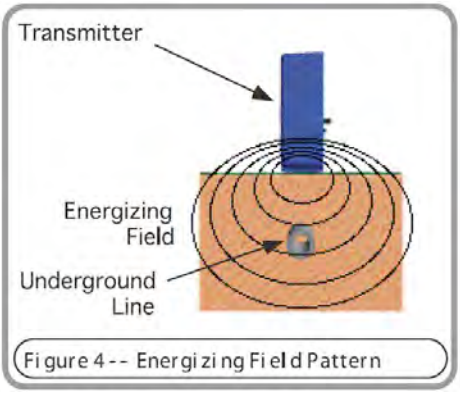

Figure 4 -- Energizing Field Pattern

ii) Turn on the transmitter. You have activated the transmitter if the green BATT light is glowing. If you have depressed the POWER button and the light does not glow, you probably need to change the batteries.

iii) Select a power setting on the control panel of the transmitter. Using the OUTPUT LEVEL switch, select either low or high output power. High output is indicated when the HI light is glowing. At this time, you may also want to set the PULSE switch. If the BATT light blinks, the energizing signal will pulse as well. Such a signal is often easier to identify while tracing.

iv) Place the transmitter on the ground at a known location directly above the line that you want to energize. As depicted in **Figure 5**, it is important to place the transmitter vertically and in the direction of the underground line. Since the transmitter radiates a signal directionally, this orientation over the line will optimize the signal transfer into the line. With improper placement or orientation, it is possible to cause little or none of the signal from the transmitter to actually energize the line.

NOTE: It should be known that when placed over a line to energize it, the transmitter radiates signals from the sides and top as well as from the bottom. Signals radiated through the bottom are used to energize the line. Those coming from the sides and top travel a short distance through the air and are attenuated.

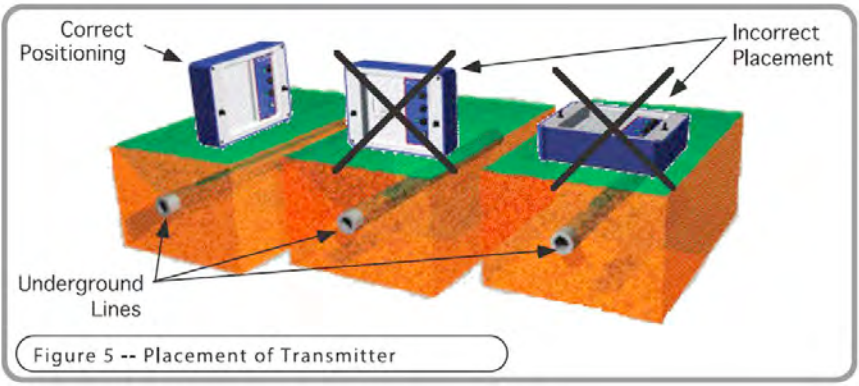

Figure 5 -- Placement of Transmitter

If the transmitter is aligned perfectly with the underground line, the signals emerging from the sides will travel along the path of the line. This can cause some confusion when working close to the transmitter. To avoid such confusion, offset the transmitter 10° or 15° from the general direction

of the line **(Figure 6)**. The signal entering the line will still be nearly optimized, and line tracing near the transmitter box will be much truer.

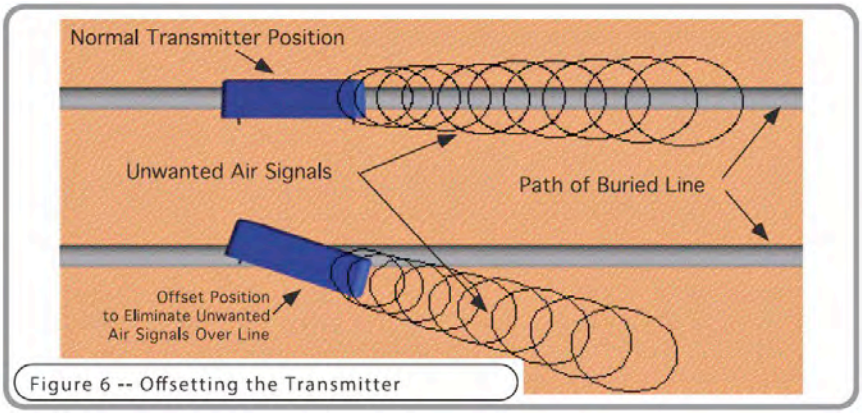

Figure 6 -- Offsetting the Transmitter

b) Conductive Energizing

Unlike the inductive method, this energizing method requires the line to be exposed so that a direct connection can be made to it. However, conductive energizing presents significant advantages over inductive energizing, and is therefore the preferred method. Since the signal enters the line directly through the DCC, unwanted air signals are minimized. Using a ground with the DCC will maximize the energizing efficiency, so that tracing distance can increase dramatically. More details concerning the application of the DCC for direct hookup follow here and are depicted in **Figure 7**:

i) Insert the plug of the DCC into the DIRECT OUTPUT jack on the control panel of the transmitter. This will automatically deactivate the inductive antenna.

ii) Clip the red clamp on the DCC to an exposed portion of the line that you wish to trace. Make sure that you make good electrical contact with the line.

iii) If you choose to use the ground rod, insert it into the ground several feet away from the line. Clip the black clamp of the DCC to the ground rod, again insuring sound electrical contact. NOTE: Grounding the DCC while using the transmitter conductively is recommended, since this will dramatically increase the strength of the signal on the line.

iv) If you choose not to use a ground, stretch out the black cable and let it lay freely on the ground. Although the magnitude of the signal carried on the line will be small, it usually will be strong enough for short traces very close to the transmitter. Working without a ground is often helpful when tracing indoors or in other confined areas.

CAUTION: Do not connect the red and black clips together when using the DCC. Although short-circuiting the output leads will not result in immediate damage to the transmitter, it will quickly drain your batteries and cause the internal circuitry to heat up. If such internal heating is allowed to occur for an extended period of time, eventual damage may occur.

2. Tracing an Energized Line.

As the energized line carries the signal from the transmitter, a cylindrical pattern of energy forms around the line **(Figure 8)**. In general, the strength of the signal is strongest at the center of this cylinder and gradually decreases away from the center. The 902 receiver employs a directional antenna, so

that it can detect the signal in different response modes depending on how it is positioned. By manipulating the receiver over the line and properly interpreting the results, an operator can perform several locating tasks with high accuracy.

a) Peak Detection Method

Tracing a line by finding maximum points of signal, or "peaks", is the most intuitive method of tracing, although not the most accurate. Both location and direction of a line can be determined simply by positioning the 902 receiver so that it indicates a maximum relative response. The following steps illustrate how this is accomplished.

i) After having energized a pipe or cable, turn on the receiver. At first, set the sensitivity to low (HI light off); also, make sure that the LOCATE MASS feature is deactivated (LOCATE MASS light off).

ii) If you are using inductive energizing, walk down the line 20 or 30 feet, moving further out of range of air signals coming from the transmitter. If you are using conductive energizing, you may begin tracing close to the transmitter.

iii) Hold the receiver vertical and in the approximate direction of the line as shown in **Figure 8**. Adjust the SIGNAL LEVEL control so that the receiver responds to the signal from the line at around 3/4 scale.

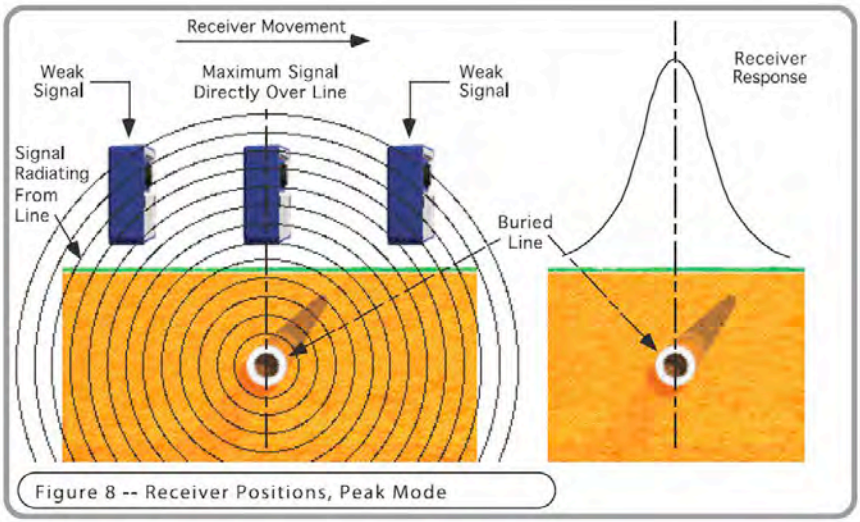

Figure 8 -- Receiver Positions, Peak Mode

iv) Now move the receiver back and forth, causing the meter and sound response to increase and decrease and "peak" over the line. Continue peaking over the line as you walk in the direction of the line; the line will be directly below where the signal response is maximum as you walk.

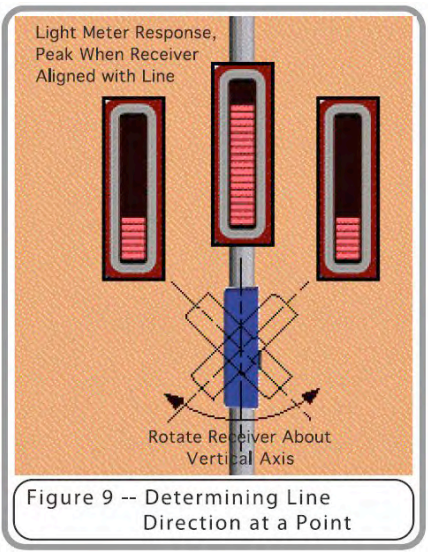

Figure 9 -- Determining Line Direction at a Point

v) As you distance yourself from the point at which the transmitter is energizing the line, the signal intensity will continue to diminish. Thus, the receiver response will decrease as well. To gradually increase the relative

sensitivity of the receiver, turn the SIGNAL LEVEL control in the clockwise direction, keeping the response between 1/4 to around 3/4 scale. When the signal from the line has faded so that it is no longer detectible, push the SENSITIVITY button so that the HI light glows. You may then continue tracing as before.

vi) At any time while tracing, you may determine the direction and depth of the line. To determine the direction, rotate the receiver left and right as shown in **Figure 9**. Notice that rotating the receiver will cause a peak response as well. When the response is maximum, the receiver box is parallel to the direction of the line. For information on determining line depth, see part (c) of this section.

vii) If, while tracing, the signal suddenly vanishes along the direction you are moving, then the line either ends at that point or it has turned to the right or the left. **Figure 10** depicts a simple way to determine if the line has turned. Walk back up the line about four feet and then walk in a circle either right or left. Keep the side of the receiver box pointed toward the center of the circle. If a lateral turn exists, the receiver will peak over the line, giving the direction of the turn. If the line simply ends, then no other strong peaks will be detected.

viii) If, during tracing, the signal gradually fades and the receiver is set to its highest sensitivity, then you may continue tracing by bringing the transmitter closer and reenergizing the line at a point you have already located. Usually, you would use inductive energizing when moving the transmitter closer, but connecting to a nearby part of the line that is exposed is preferred.

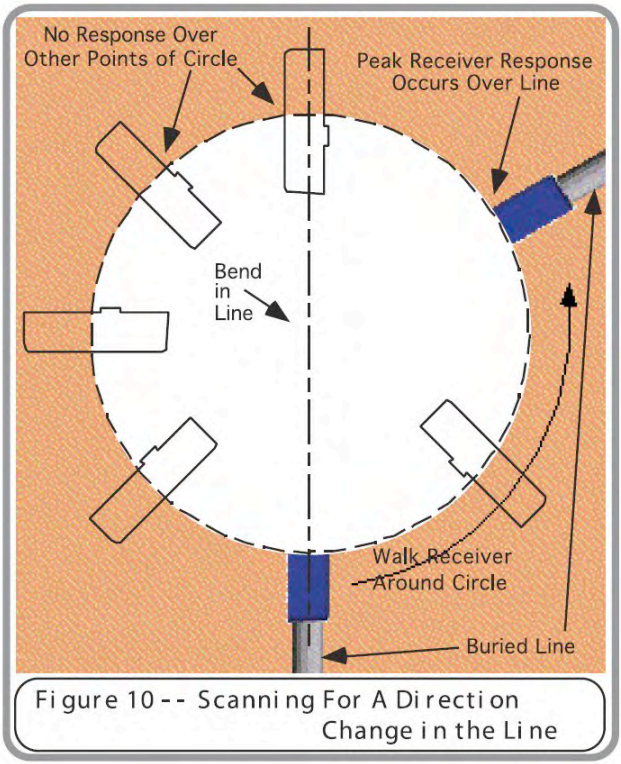

Figure 10 -- Scanning For A Direction Change in the Line

b) Null Detection Method

Also called “centering,” tracing a line by finding points where the signal vanishes (“nulls”) is an alternate method to peaking. Because the receiver relies on a directional antenna, positioning it so that the front panel perfectly faces the line will cause it to detect no signal. Using nulls over the line, the operator can ascertain the precise location of a line below the surface, as well as determine its depth.

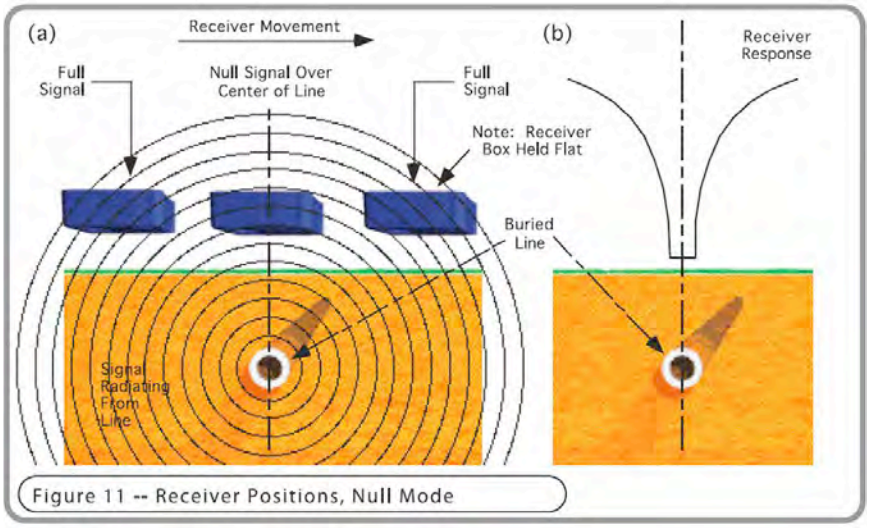

Figure 11 -- Receiver Positions, Null Mode

i) Turn on the receiver and prepare for tracing as described in steps (i) and (ii) of section (a), Peak Detection Method.

ii) Hold the receiver flat with respect to the surface above the line **(Figure 11a)**. Set the SIGNAL LEVEL control between half and full scale. This will insure that the signal is detected strongly when the receiver is not directly over the line.

iii) Now slowly move the receiver back and forth over the line. The response will be full everywhere in the vicinity of the line, except directly above it. At this point the response will vanish sharply **(Figure 11b)**. As you walk along the line, it will always be located directly below the point where the signal disappears.

iv) As with the peak method, the signal on the line will gradually diminish as you continue to trace. Notice that as you trace further away from the transmitter, the null becomes wider and less sharp. To sharpen the null, continue to advance the SIGNAL LEVEL control. If this control has been set all the way clockwise and you wish to sharpen the null more, press the SENSITIVITY button so that the HI light glows, and continue tracing as before.

v) If the null suddenly disappears, this could indicate that the line has ended or turned. To determine if the line has turned, you may follow the procedure described in section (a)(vii) above, using nulls instead of peaks over the line.

vi) Please note that the null method will not indicate the direction of the line at a single point. As long as the receiver is held flat to the surface, it will indicate a null over the line regardless of how the box is rotated.

vii) If you have traced beyond a detectible range, you may continue your trace by re-energizing the line at a point closer to where you are locating.

c) Determining Depth of a Line

Using the null detection method described above, the operator can make a surface measurement and determine the depth of an energized line. The procedure requires two null points to be marked.

i) Locate the point at which you want to measure the depth of the line.

ii) Using the null method, pinpoint the spot on the surface directly above the line and mark it.

iii) Turn the receiver to the 45° position. Use the level on the face of the receiver marked “45° LEVEL GUAGE” to set this position. The receiver will be properly positioned when the bubble in the level is directly in the center.

iv) Now move the receiver away from the first null mark at a right angle from the direction of the line **(Figure 12 & 13)**. You will locate a null as you move the receiver horizontally. Hold the receiver so that the bottom edge of the bottom of the box sets on the ground when finding this 45° null to obtain accurate results.

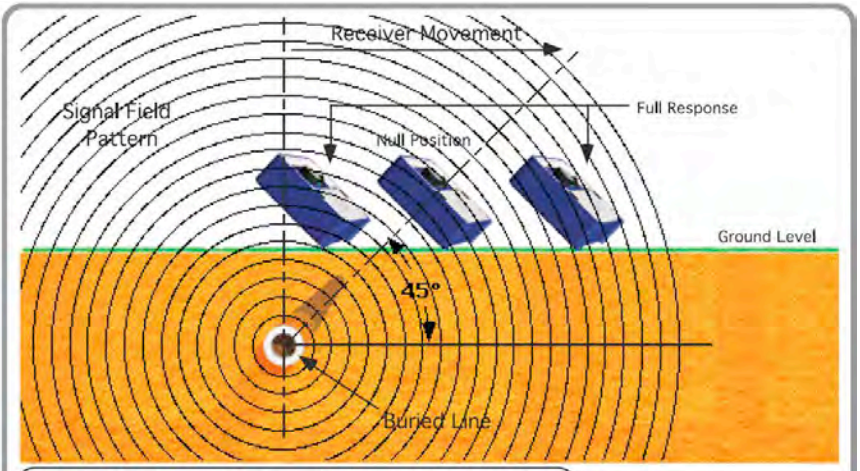

Figure 12 -- Measuring Depth With 45° Null

v) When you have obtained a sharp 45° null, mark the ground there. Note that for accurate results, you should mark the ground directly below the top edge of the bottom of the receiver, in order to account for the physical dimensions of the receiver box.

vi) Measure the distance between the two null marks **(Figure 9)**. By triangulation, this surface distance will be the same as the depth to the center of the line. For excavation or trenching purposes, this means that the actual top of the pipe or conduit will be shallower than the measured depth by half of the pipe's diameter. For example, for a 12-inch diameter pipe, the actual depth to the top of the pipe will be 6 inches less than the measured depth.

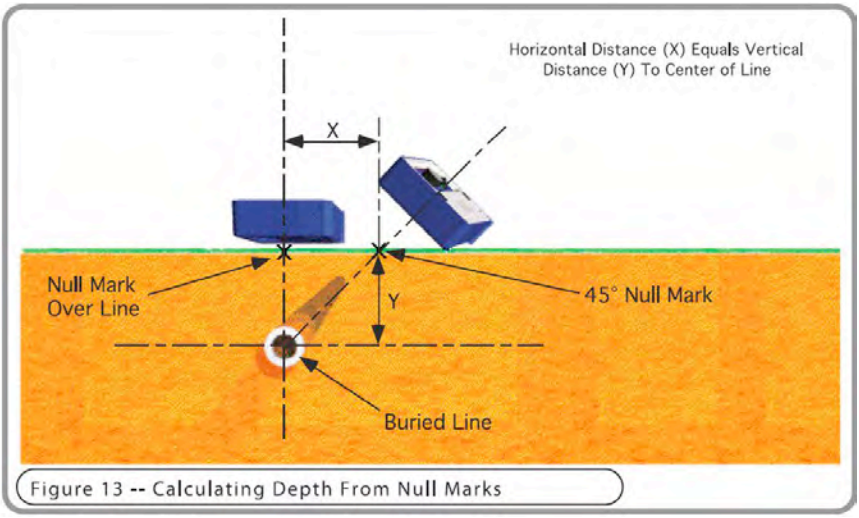

Figure 13 -- Calculating Depth From Null Marks

vii) It is good practice to repeat the depth measurement on both sides of the line. The symmetry of the signal pattern around the line can often be effected by ground conditions, laterals and other service lines. If the measurement is the same on both sides, then the depth has been accurately found. If not, then the more accurate measurement will be that which renders the best defined nulls.

3. Finding Lines of Completely Unknown Location.

It is possible to use the receiver and the transmitter in conjunction to survey areas for unknown lines. This procedure involves carrying both the transmitter and receiver together at a fixed distance and orientation, and setting the receiver controls so that the receiver is just out of range to detect air signals coming from the transmitter. This is a two-person operation.

a) One person carries the activated transmitter, and the other carries and controls the receiver.

b) Each person must keep the boxes in line with each other and at a constant distance from each other as shown in **Figure 14**. A horizontal separation of 30 or 40 feet is recommended.

c) Set the transmitter for low inductive output, and set the receiver to low sensitivity, advancing the SIGNAL LEVEL control so that the response is just below the threshold of detecting the air signal from the transmitter.

d) Each person should now walk parallel to each other, making sure that the 902 boxes remain in line with each other and at a constant distance from each other. If the

two cross over a line that is at a right angle to the direction they are walking, the transmitter will energize the line while the receiver detects the newly energized line.

e) At this time, the person carrying the transmitter should move the transmitter back and forth across the line, causing a maximum response at the receiver. Thus the transmitter may be centered over the line. If the transmitter is placed on this spot, it will continue to energize inductively the newly found line. Using the receiver, trace the line and determine depth as you normally would.

f) NOTE: This method of finding an unknown line works only if the operators cross the line at a roughly right angle. Therefore, the operators may choose to sweep the area in question in several directions, to assure that they cross all unknown lines.

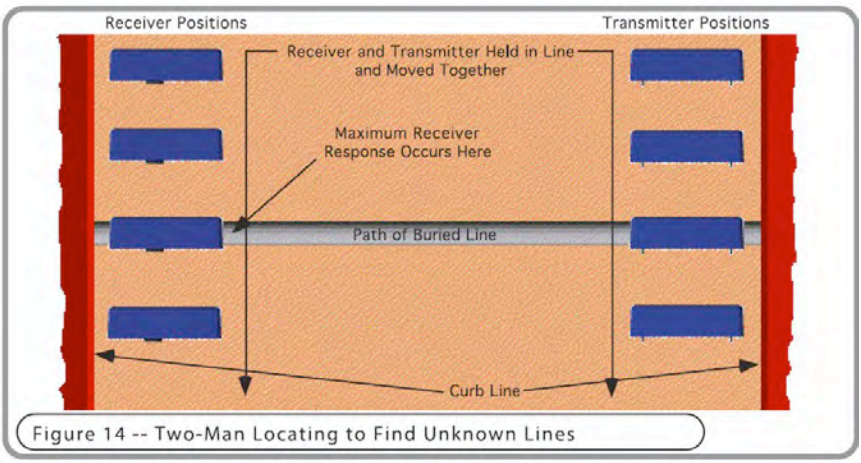

Figure 14 -- Two-Man Locating to Find Unknown Lines

4. Locating Hidden Valve Caps and Manholes.

The 902 receiver incorporates a feature that makes locating masses of metal buried below the surface simple and convenient. Activating the LOCATE MASS button reconfigures the receiver antenna, making it sensitive to nearby metallic masses, such as manholes and valve caps. A continuous tone emerges from the receiver which changes frequency when brought near a metallic mass. Details on using this feature follow here **(see Figure 15)**.

a) At any time while you are tracing a line, you may press the LOCATE MASS button. Once set to locate masses, the receiver outputs a continuous tone.

b) Move with the receiver held flat to the surface beneath which you a searching for a mass. In this mode, the receiver is only sensitive to about 18 to 24 inches, so you must search with the receiver held close to the surface.

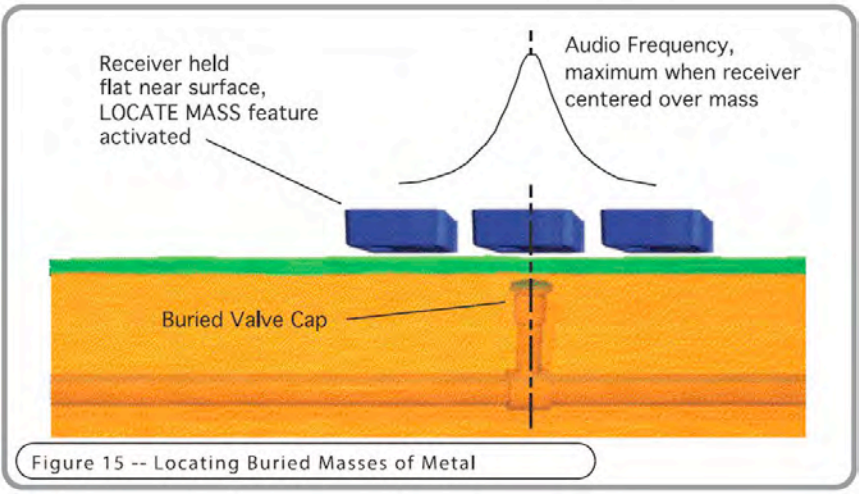

Figure 15 -- Locating Buried Masses of Metal

c) When the receiver passes over a mass, the frequency will increase. The rise in frequency depends on the proximity of the buried mass. A sharp increase indicates a shallow mass, probably no more than 6 inches deep. A slight increase indicates a depth probably greater than a foot. In either case, the center of the mass will be found below the point of highest frequency.

d) When locating a large mass, such as a manhole, it may be helpful to find the edges of the mass rather than the center. To locate the edges, scan the area around the mass, marking locations where a sharp frequency rise occurs. If you mark 3 or 4 evenly spaced locations around the perimeter you may use these to trace the outline of the manhole. Also, these markings will help you more accurately visualize the center of the manhole.

e) The SIGNAL LEVEL control may be adjusted in this mode to provide a visual response on the light bar meter. Generally, an increase in the light bar meter reading will correspond to a frequency rise due to the presence of a mass.

f) NOTE: The SENSITIVITY button has no function in mass-locating mode, and may be left on either setting.

E. Miscellaneous Notes and Suggestions:

1. Energizing Lines.

a) When energizing a line inductively, avoid setting the transmitter directly on the line or within a foot of large masses of metal. The transmitter will continue to function under these conditions, but the energizing efficiency might be reduced considerably.

b) For long tracing runs, periodically bring the transmitter closer to the area you are working and re-energize the line. This will insure a solid tracing signal.

c) Signals entering a line at one point may be transferred to another line through a common point. Erroneous conclusions may result. This kind of transfer may occur, for instance, when energizing a gas service that feeds into a water heater. At the heater the gas service may be electrically common with the incoming water pipe; the water pipe might carry the signal as well, thereby leading the operator to false conclusions while tracing. The operator should be aware of the possibility for false signals.

2. Tracing Lines.

a) Remember to be aware of airborne signals when working close to the transmitter. Either offset the transmitter over the line as described, or energize the line from a point further from where you are working.

F. Instrument Maintenance:

1. Battery Replacement.

Both parts of the Model 902 Locator are powered by four alkaline “C” size batteries each (Eveready # E-93). When the transmitter and receiver are on, the power supply of each is constantly monitored by its own BATT light. When the BATT light on an instrument no longer glows when the instrument is on, the batteries need to be changed for that instrument. To change the batteries of either instrument:

a) Lay the instrument on a table with the front panel facing upward.

b) Using a regular size phillips-head screwdriver, remove the four screws at the corners of the face panel.

c) Holding the face panel with your fingers, flip the instrument over onto your lap or onto the table and lift the blue shell off of the face panel.

d) Remove the two phillips-head screws that hold the battery strap into place and remove to battery strap. (At this time, be very careful not to change any of the circuit board controls unless you are a trained technician.)

e) Remove the old "C" cells and replace them, making sure to follow the polarity instructions on the bottom of the battery well.

f) Turn on the instrument briefly to confirm that the BATT light glows. If it does not, check to make sure you inserted the batteries correctly.

g) Replace and screw down the battery strap.

h) Carefully drop the shell over the face panel and make sure that the handle on the shell is right side up. Hold the face panel in with your fingers, flip over the instrument, and replace the four phillips-head screws.

2. Mechanical Care.

a) Although the Model 902 Locator has been designed to be rugged and can withstand a reasonable amount of shock, it should be handled with care. Heavy shock can cause minor changes in the radio-frequency tuning, which is undesirable although it will not render the instrument useless. In general, care for the Model 902 as you might care for a portable AM/FM radio.

b) We do not recommend the addition of large metallic objects to the shells or faces of the instrument. Both the transmitter and receiver are tuned at the factory to compensate for the batteries, circuit boards and other metal in the instruments. Adding metal will detune the instrument and should not be done unless a trained technician is present to retune the instrument.

3. Troubleshooting.

If problems arise when attempting to operate the Model 902, the operator may perform some simple troubleshooting with little technical knowledge.

a) If the BATT light does not glow when the receiver or transmitter is activated, it may simply mean that the batteries need to be replaced. In this case, you may verify that the transmitter has been activated by pressing the OUTPUT LEVEL button. If the HI light comes on,

then the transmitter is probably working properly, but the batteries are low. You may verify activation of the receiver by pressing either of the SENSITIVITY or LOCATE MASS buttons. If the status light accompanying the button glows, then the receiver is probably operating on low batteries.

b) Cold weather can effect the performance of the alkaline batteries in either the receiver or the transmitter. At freezing (32°F or 0°C), typical alkaline battery capacity can be cut by 50%. Although the transmitter and receiver will still work despite this decline in capacity, overall performance will decrease. One way to solve this problem is to install cold-weather batteries. Eveready produces such a line of batteries called “Litheon” batteries.

c) If new batteries have been installed and the BATT light still does not come on, check to be sure that the batteries have been installed with the correct polarity. CAUTION: If all the batteries are in reverse polarity, the internal circuitry may become damaged. Therefore, if the light does not come on, immediately turn off the instrument.

G. Servicing:

For more technical information about the Model 902, or if servicing and repairs are necessary, contact the factory at the following address:

Goldak, Inc.
15835 Monte Street, Unit 104
Sylmar, CA 91342
818-367-0149
fax: 818-833-7694
email: sales@goldak.com
website: www.goldak.com

We will inform you of any local repair stations in your area, or advise you to ship the instrument directly to the factory. If you ship product, we suggest you:

a) Pack the instrument carefully and securely.

b) Include any accessory items normally used with the instrument.

c) Include a note with the instrument stating the nature of the problem(s) you have encountered in using the instrument.

d) Include a contact name, telephone number and fax number.

GOLDAK Underground Detection Equipment

GOLDAK
PRODUCTS

Goldak, Inc.
15835 Monte St., Unit 104 ▪ Sylmar, CA 91342
818-367-0149
818-833-7694 fax
www.goldak.com