Pipehorn®
LOCATING TECHNOLOGY

# *Model 500*
# *Dual-Frequency Pipe and Cable Locator*

## *User Manual*

Manufactured Exclusively By:
Utility Tool Company, Inc.
2900 Commerce Boulevard
Birmingham, Alabama 35210
205-956-3710

Under U.S. Pat # 3418572  Canadian Pat # 857504  Other Patents Pending

## DANGER! SHOCK HAZARD

**CONNECTING DIRECTLY TO ANY CONDUCTOR CAN BE HAZARDOUS AND RESULT IN ELECTRIC SHOCK, INJURY, OR DEATH. ONLY LICENSED OR AUTHORIZED PERSONS SHOULD MAKE DIRECT CONNECTIONS TO POTENTIALLY ENERGIZED CONDUCTORS.**

**This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

### NOTICE

This User's Manual is provided as an informational guide only and is subject to change without notice.

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**NUMBER DESCRIPTION PAGE**

## General Information

The Pipehorn Model 500 is a state-of-the-art, dual-frequency locating system designed for the professional with complex locating jobs. It is a carefully engineered, precision instrument that, with reasonable care, will give many years of satisfactory service. The Model 500 is very simple to operate, but for best results, the operator should carefully read this manual.

### The Equipment

The Model 500 consists of a receiver, two transmitters, two sets of conductive hook-up cables, a grounding spike, and an earphone, all contained in a sturdy wooden case.

**Model 500 - Complete**

The Model 500 is really two tools combined into one for attacking any locating job. It can operate as a low (audio) frequency, conductive locator and as a high (radio) frequency, inductive or conductive locator. The Model 500 is used to locate and trace all types of buried or concealed conductors such as: pipe, cable, tracer wire, traceable fiber optics, or even sewer snakes or fish tape inserted into non-conductive pipe.

**Why Two Frequencies?**

Every locating job is different. Success calls for a unique blend of equipment, experience, and persistence. In some situations, a low-frequency, conductive locator will perform better than a high-frequency, inductive locator. In other situations, the reverse is true.

The advantage of the low-frequency locator is long distance tracing and, in some cases, isolating one conductor from another. These advantages are usually most apparent on insulated conductors such as, wrapped pipe or cable. The disadvantage of low-frequency is that it must be directly connected to the pipe or cable.

The high-frequency locator traces poor conductors (cast and ductile iron) and short lengths (stubs, laterals and tracer wire) better than a low-frequency locator. It does not have to be connected directly to the pipe or cable, though this method is available. Inductive operation is much faster and easier since the transmitter is just placed over the conductor. Its inductive capabilities allow the operator to move the signal injection point to any place which is useful. Using the high-frequency inductively gives the locator unlimited range simply by moving the transmitter. Additionally, inductive locating is safer to use on live power cables and sensitive fiber optic lines. The disadvantage of high-frequency, inductive operation is that when trying to target one conductor, it can place more signal on adjacent conductors, making isolation more difficult.

**Why Two Transmitters?**

Two transmitters enable the operator to do a number of things that would not be possible using a single transmitter. First, the range of the low-frequency transmitter can be extended by placing the high-frequency transmitter down at the last known point to continue tracing. Second, the high-frequency transmitter can be used to verify the low-frequency locate. For instance, trace from a known point using the low-frequency, pinpoint the conductor, place the high-frequency transmitter down, and trace back to the known point as a crosscheck. Third, two transmitters and two frequencies can be used to identify different conductors buried close to each other. As an example, apply the low-frequency signal to the gas service and the high-frequency signal to the water; identify each conductor by its frequency.

**Advantages of The Model 500 System**

Combining a low-frequency and high-frequency locator into one unit gives the operator the necessary tools for solving complex locating jobs easier. One frequency usually performs well where the other does not. Having two transmitters offers many advantages, such as enabling the operator to trace farther. Also, verification and identification of conductors is much easier and faster. In short, the Model 500 Professional Pipe & Cable Locator is a more complete and productive tool for the experienced user.

**SAFETY FIRST!**

**DANGER! Shock Hazard. Connecting directly to any conductor can be hazardous and result in electric shock, injury, or death. Only licensed or authorized persons should make direct connections to potentially energized conductors.**

Always exercise good safety procedures when operating locating equipment. These include, hooking a transmitter directly to energized conductors only when licensed or authorized, being constantly aware of traffic and equipment operating nearby, and removing any flammable or toxic liquids and gases from the area before using a locator. **Employing proper safety practices during locating tasks will perhaps avoid an accident and may save your or another person's life .**

Use the APWA Uniform Color Code for marking buried utilities. This code is used to identify the various types of underground utilities. Make sure the color you use corresponds to the chart below for the type of utility you are marking.

| | |
|---|---|
| • Electric Power Lines or Conduits | Safety Red |
| • Communication Lines or Cables | Safety Alert Orange |
| • Storm & Sanitary Sewers | Safety Green |
| • Water | Safety Blue |
| • Gas | Safety Yellow |
| • Proposed Excavation Area | High Visibility White |

## The Manual & Terminology

This manual tells you how to operate the Pipehorn Model 500. The locator requires no calibration or adjustment and arrives from the factory ready to use. Maintenance is limited to the replacement of batteries. In this manual you will find information that will help you locate buried pipes and cables successfully. The main areas covered are:

- Description of Equipment & Principles of Operation
- System Check
- Tracing When There Is No Access
- Searching For Utilities Whose Location Is Unknown
- Tracing From an Access Point

When the following terms are used in this manual, they have the meanings specified below:

**Conductor** - pipe, cable, conduit, traceable optic fiber, tracer wire/tape, sewer snake, fish tape, or other conductor

**Tracer Signal or Signal** - the output from a transmitter, either directly or through the air, which is carried along the conductor and detected with the receiver

**Inductive** - place the tracer signal on the conductor with out making direct electrical contact

**Conductive** - place the tracer signal on the conductor by making a direct hook-up

**LF** - low-frequency (audio-frequency)

**HF** - high-frequency (radio-frequency)

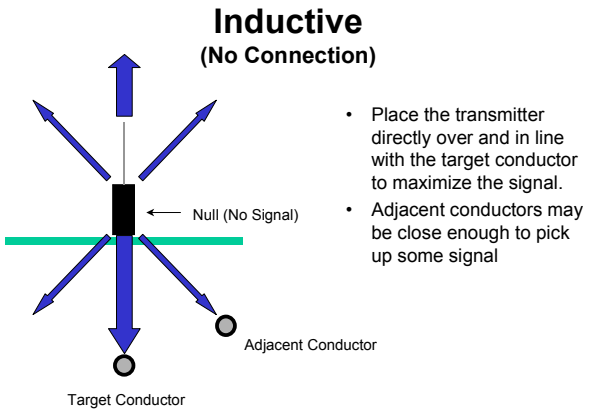
**Sensitivity** - the amount of signal the receiver is set to detect; increasing the sensitivity allows the receiver to detect weaker signals when it is farther from the transmitter or conductor.

## Quick Start Instructions

The procedures below provide the information for experienced operators of locating equipment to begin using the Model 500 immediately. Even if you have a lot of experience with locating equipment, it will benefit you to become familiar with this entire manual.

### High-Frequency Inductive Locating

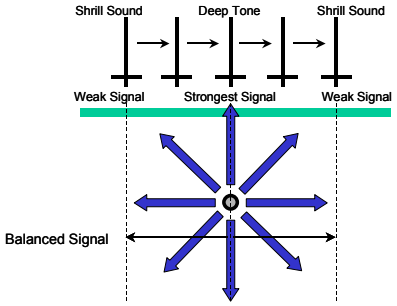
1. Place the HF (black with the tall aluminum handle) Transmitter directly over and in-line with the run of the conductor. Flick the switch to ON.




2. Move 5 to 10 steps away from the Transmitter and press the "H" on the Signal Source Switch on the right side of the Receiver to receive the HF signal. Energize the Receiver by squeezing the push button switch on the handle. Position the tee antenna at the base of the Receiver so that it is across the run of the conductor.

3. Adjust the SENSITIVITY CONTROL™ to acquire a steady, non-beeping tone. A beeping tone is the SENSITIVITY CONTROL™ saying there is too much sensitivity, turn it down. Scan left and right of the conductor listening for the shrill sound on either side and the deep tone over the conductor. When you hear the deepest tone, the Receiver is pointed at the conductor.

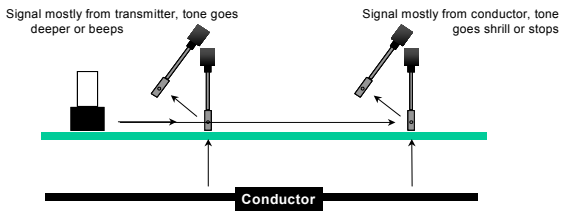
## Pinpointing with Pipehorn Language



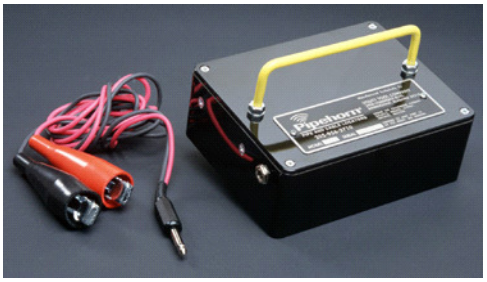

4. Pinpoint the conductor and then check for air lock by pointing the Receiver tee at the Transmitter. If the sound goes away the conductor is the source and you can begin tracing. If it does not, the signal may be coming directly from the Transmitter and you should move farther away. The tee antenna, which is at the base of the Receiver, should be positioned across the run of the conductor.

## Check for Air Coupling

- After pinpointing, raise the receiver and point it at the transmitter
- If you are too close, the signal gets stronger
- If you are far enough away, the signal gets weaker as you lift the receiver



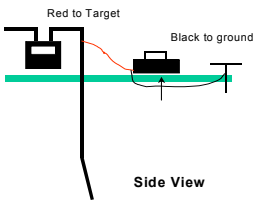
## Low-Frequency Conductive Locating



**LF Transmitter and Connector Cables**

1. Position the ground spike at 90° to the run of the conductor and as far from the connection point as the cables will allow. This will minimize tracer signal on any adjacent conductors. Connect one clip to the ground spike. Connect the other clip to the target conductor being sure to make good electrical contact. This contact and the ground are essential in placing a good signal on the target conductor.

**Conductive**
**(Direct Hook Up)**




- Must have access to metal of the target conductor (remove insulation, rust or paint)
- Connect red terminal to the target
- Connect black terminal to ground placed 90° and as far away from target conductor as possible

2. Energize the target conductor by inserting the plug into the LF (yellow

handle) Transmitter.

3. Move 4 to 5 steps away from the Transmitter and press the “L" (yellow) on the Signal Source Switch on the right side of the Receiver to receive the LF signal. Energize the Receiver by squeezing the push button switch on the handle. Position the tee antenna at the base of the Receiver so that it is across 90$^{o}$ the run of the conductor.
4. Adjust the SENSITIVITY CONTROL$^{TM}$ for a steady, non-beeping tone. A beeping tone is the SENSITIVITY CONTROL$^{TM}$ saying there is too much sensitivity, turn it down. Scan left and right of the conductor listening for the shrill sound on either side and the deep tone over the conductor. When you hear the deepest tone, the Receiver is over at the conductor.
5. Trace 20 to 30 feet carrying the HF Transmitter, pinpoint and mark "the conductor. Verify the identity of the conductor by placing the HF Transmitter down on the mark, setting the Signal Source Switch to the HF position, and tracing back to the hook-up point.
6. With verification complete, trace the LF signal while carrying the HF Transmitter. Use the HF Transmitter to extend the range or identify adjacent or crossing conductors, as needed.

## Description of the Equipment & Principles of Operation

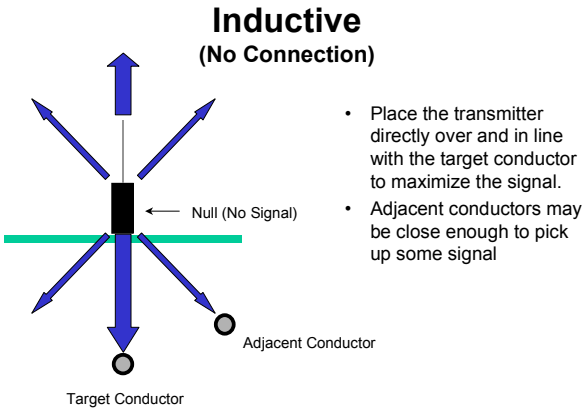
### HF Transmitter

The HF transmitter is the black box with the aluminum handle, red and black terminals on top, and ON/OFF switch . The HF Transmitter is supplied with the conductive hook-up cables shown.

**HF Transmitter & Cables**

**HF Transmitter Inductive Operation**

The HF Transmitter places a radio frequency tracer signal on the conductor by one of two methods, inductively or conductively. When operating INDUCTIVELY, the HF Transmitter puts a signal on conductors that are nearby without direct electrical contact. The closer and better aligned the HF Transmitter and the target conductor are, the stronger the signal on the target conductor. For the strongest inductive signal, place the HF Transmitter directly over the target conductor with its long side in-line with the run of the conductor, as shown.

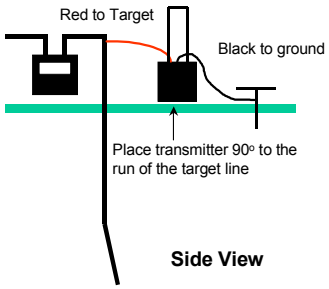



**HF Transmitter Conductive Operation**

Operating CONDUCTIVELY, the HF Transmitter usually places a stronger tracer signal on the conductor to which it is attached than when operated inductively. However, the signal does not confine itself totally to the target conductor. In fact, in certain circumstances, the signal received above ground can be stronger over adjacent conductors such as when the adjacent conductor is much more shallow than the target.

The ground spike should be positioned as far from the target conductor as possible at a right angle to the target conductor's run. If possible, do not allow an adjacent conductor to run between the target and the ground. Use the white set of hook-up cables and connect either hook-up terminal to the target conductor and the other to the ground spike. Do not ground to another conductor as this might nullify the benefits of direct hook-up. <u>You may connect the HF and LF Transmitters simultaneously to the same conductor, but you must use separate grounding points.</u>

## Conductive
**(Direct Hook Up)**



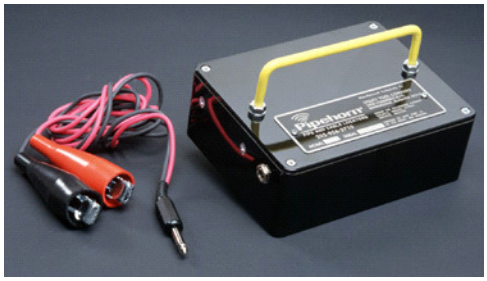

- Must have access to metal of the target conductor (remove insulation, rust or paint)
- Connect red terminal to the target
- Connect black terminal to ground placed 90° and as far away from target conductor as possible

**HF Transmitter Conductive Setup**

When operating conductive, the HF Transmitter continues to broadcast a signal through the air. Therefore, it may be helpful to place the HF Transmitter at a 90° angle to the run of any adjacent conductors to minimize signal induction in them.

**LF Transmitter**

The LF Transmitter is the black box with the yellow handle. It is supplied with the conductive hook-up cables pictured below. It is energized by inserting the phone plug on the cables into the phone jack located on the side of the LF Transmitter. This Transmitter operates only in the conductive, direct hook-up method. One side of the cable should make good contact with the target conductor and the other side should connect to the ground spike or other suitable ground.



**LF Transmitter & Cables**

**LF Transmitter Conductive Operation**

Only licensed or authorized persons should make direct connections. Meters, pedestals, cathodic protection test points, and valves are all suitable access points to hook-up. DO NOT MAKE CONNECTIONS TO LIVE ELECTRIC CABLES. Also, make certain that the owner of the conductor has authorized direct hook-up for purposes of locating and tracing before you hook-up.

The ground spike should be positioned as far as possible from the target conductor at a right angle to the target conductor's run. If possible, do not allow an adjacent conductor to run between the target and the ground. It is preferable not to ground to another conductor, such as a water pipe, since it will then pick up the tracer signal and may cause confusion. Use the long set of hook-up cables with the phone plug. First, connect either clip to the ground spike and then the other clip to the target conductor. Always grasp

the clips by the insulated handles and do not allow the clips to touch each other. After you have connected to the ground and target conductor, insert the plug into the LF Transmitter to energize (turn on) the Transmitter.

Good contact with the target conductor and ground is essential to successful locating using the LF Transmitter. Paint or rust at the contact point can prevent the tracer signal from energizing the target conductor. Look for the best spot to make electrical contact with the target conductor. Use the sound from the LF Receiver to indicate whether good contact has been made with the target conductor. If the sound is weak or jittery, it is likely that good electrical contact has not been made.

**LF Transmitter Conductive Setup**

**Receiver**

The Model 500 Receiver picks up the tracer signal that the LF or HF Transmitter has placed on the conductor. The ON/OFF push button switch on the handle energizes the Receiver. The Signal Source Switch on the right side of the Receiver selects which Transmitter signal to detect (LF or HF). When the black (H) half of the switch is pressed, the Receiver will detect the HF signal from the HF Transmitter. When the yellow (L) half of the switch is pressed, the Receiver will detect the LF signal from the yellow handled LF Transmitter. The only control is the SENSITIVITY CONTROL™, which is located on the left side of the Receiver. The tee antenna picks up the tracer signal.


**Model 500 Dual Frequency Receiver**

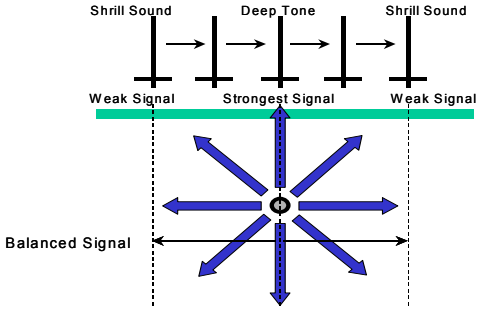
**Receiver Operation**

Hold the tee antenna at the base of the Receiver crosswise 90° to the run of the conductor. In this position it will pick up maximum signal from the pipe or cable. The Receiver looks for the peak (strongest) signal. This is the preferred method of pinpointing. Using the null (no sound) method, can produce multiple, inaccurate pinpoints.

The Model 500 Receiver produces a tone when it detects the selected tracer signal. This tone changes to indicate the strength of the signal at the

tee antenna. The SENSITIVITY CONTROL™ tells the operator when to adjust the sensitivity of the Receiver. If there is no sound, increase the sensitivity by turning the control clockwise. If the sound is beeping, decrease the sensitivity by turning the control counter-clockwise. Always maintain a solid, non-beeping tone from the Receiver.

## Pinpointing with Pipehorn Language




As the tee moves, the tone changes. When the tee antenna is directly over or closet to the conductor, moving it to the right or left causes the sound to become higher or more shrill, eventually going away. Moving the tee toward the conductor causes the sound to go lower to a deep tone. Sound becoming shrill, the signal getting weaker. Sound going deep, the signal getting stronger.

A beeping tone is the SENSITIVITY CONTROL™ alerting the operator to decrease the sensitivity of the Receiver. Scanning the tee across the conductor, the operator will hear a Shrill, Deep, Shrill tone pattern with the Deep tone being the strongest signal directly over the conductor

## Pinpointing on a steep bank

When pinpointing, the Receiver will always be pointed at the conductor. On a slope this can lead to different marks (point A or B below) depending on how the Receiver is held. Keeping the Receiver vertical (plumb), particularly when pinpointing, will give consistent indications. Swinging the Receiver as you scan may lead you to interpret the signal incorrectly.

**Equipment Checks**

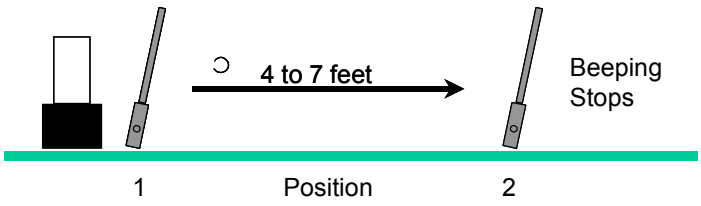
Perform a System Check before you use your Pipehorn. This System Check provides more information about the condition of your Pipehorn than a simple battery check.

To check the high-frequency transmitter, turn the transmitter on and place it on the ground in an area where it will not be over a conductor. Place the receiver tee antenna against one of the narrow ends of the transmitter. The cross member of the tee should be parallel to the ground and 90° to the end of the transmitter. Set the receiver SENSITIVITY CONTROL™ to minimum by turning the SENSITIVITY CONTROL™ knob fully counter-clockwise. The SENSITIVITY CONTROL™ should be left at this setting throughout the process of the System Check. Press and hold the receiver on/off switch. The receiver should begin to beep, but do not adjust the sensitivity. Pull the receiver away from the transmitter in a straight line while keeping the tee close to the ground. You should be able to go approximately 4' 0" distance from the transmitter before the receiver stops beeping. But the receiver should stop beeping before you reach 7'0" or so.

# System Check

**HF Transmitter**

- Place the transmitter on the ground but not over a pipe or cable and switch it "On".
- Set receiver to HF with sensitivity at minimum (fully counter-clockwise)
- Starting at position 1 below, move away from the transmitter. If you can move 4 to 7 feet with a beeping tone (position 2), the system is ok.

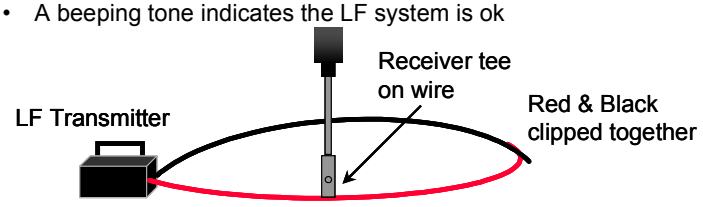


To check the LF Transmitter operation, first move to an area where you will not be over a conductor. Then clip the leads of the LF conductive cables together and lay them on the ground in a circular pattern. Plug the cables into the LF Transmitter to turn on, or energize, the Transmitter. Place the Receiver tee antenna across the red or black wire in a 90$^{o}$ position. With Receiver SENSITIVITY CONTROL™ set to minimum, fully counter-clockwise, press the on/off switch. The Receiver should begin to beep.

# System Check

**LF Transmitter**

- Stretch out LF Conductive Cables and clip red to black leads to form a circle
- Plug jack into LF Transmitter to energize the leads
- Set the receiver to LF with sensitivity at minimum (fully counter-clockwise) and energize the receiver
- Place the tee antenna on the cable oriented across the lead
- A beeping tone indicates the LF system is ok




Replace the Receiver battery if the speaker volume is low. If your Pipehorn does not perform to these parameters then replace batteries in the receiver and transmitter and perform System Check again. If the batteries are good and the locator does not pass these checks, it may be in need of service or calibration.

This System Check not only verifies the condition of your batteries but also the performance of your Pipehorn. This should be a routine check made each day before you begin using your Pipehorn. Knowing if your Pipehorn is operating to standards before you begin your locate will save you time and money

## Tracing When There Is No Access To The Conductor

### Starting From a Known Point

Use the following steps to begin tracing a conductor from a known starting point such as, a meter, valve, pedestal, or line marker, where access to the conductor for direct hook-up is not possible or prohibited.

### 1. Apply the HF Transmitter Signal

Place the HF Transmitter directly over the conductor with its long side in-line with the run of the conductor, as shown at right. Careful alignment and placement of the HF Transmitter will maximize the signal on the conductor. Place the HF Transmitter switch in the ON position.

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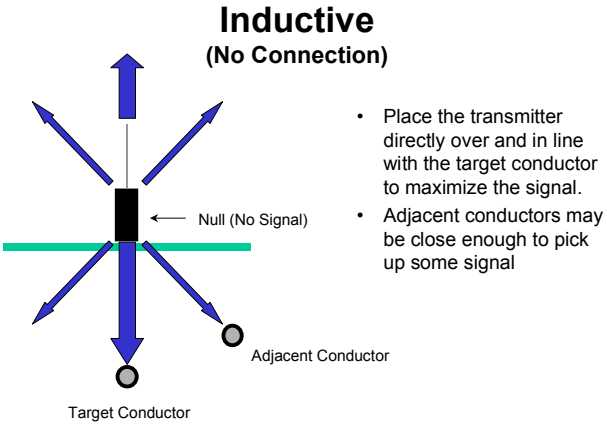
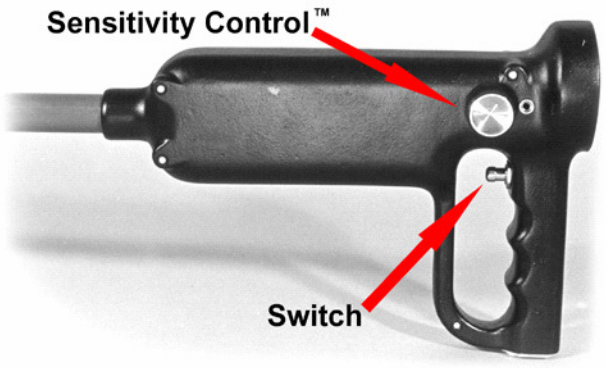


**2. Set Up & Energize Receiver**

Move 5 to 10 steps away from the HF Transmitter in the direction of the suspected run of the conductor. While facing the HF Transmitter, position the Receiver tee antenna near the ground. Hold the tee antenna level and across the suspected run of the conductor. Press the "H" on the Signal Source Switch to receive the HF tracer signal and press the ON button.

**3. Set Proper Sensitivity**

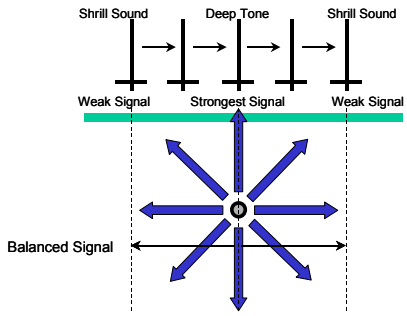
While pressing the on/off switch adjust the SENSITIVITY CONTROL™ for a non-beeping tone. Scan to the left or right. If the tone gets more shrill or goes away, the tee antenna is moving away from the conductor. Move the Receiver in the opposite direction. If the tone gets deeper or starts beeping, the tee antenna is moving toward the conductor and picking up a stronger signal. If the tone starts beeping, reduce the sensitivity slightly to get a non-beeping tone and continue moving the Receiver in the same direction toward the stronger signal.



**4. Pinpoint the Conductor**

When scanning the tee antenna over the conductor, the sound will change from shrill to deep and back to shrill. The deepest tone indicates when the tee antenna is directly over the conductor. The Pipehorn® Receiver is extremely sensitive to small changes in signal strength. It converts them into a change in sound. It is this feature which enables you to accurately pinpoint the conductor.

## Pinpointing with Pipehorn Language




**5. Determine Source of Signal**

After pinpointing the conductor, raise the Receiver tee and point it at the HF Transmitter. If the signal does not get significantly weaker, then the signal is coming through the air from the HF Transmitter and not from the conductor underground. There may be no conductor or you may be too close to the HF Transmitter. Move farther away from the HF Transmitter to pinpoint

**6. Verify the Conductor Pinpointed**

Place the HF Transmitter on the mark just pinpointed and then trace the conductor back to an identifiable marker or meter to verify your locate.

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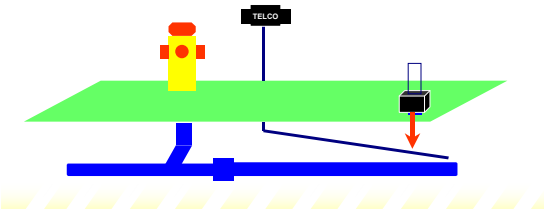
## Verify the Locate

- Mark conductor out away from starting point and move transmitter out to that point
- Trace the conductor back to its source




**7. Trace the Conductor's Path**

Walk away from the HF Transmitter tracing the path of the conductor by sweeping the tee antenna to the right and left. Always keep the tee antenna level and listen for the Shrill, Deep, Shrill sound change. The deep tone indicates the strongest signal. Trace as far as necessary adjusting the SENSITIVITY CONTROL™ to maintain a non-beeping tone.

**8. Weak or Confusing Signal**

When the SENSITIVITY CONTROL™ is fully clock-wise or the tone becomes jittery or unclear, reposition the HF Transmitter at the last location where you had a strong, clear signal and continue tracing.

**Searching For A Conductor Whose Location Is Unknown**

Since the conductor's location is unknown and there is no point of access, use the HF Transmitter inductively for all searching operations.

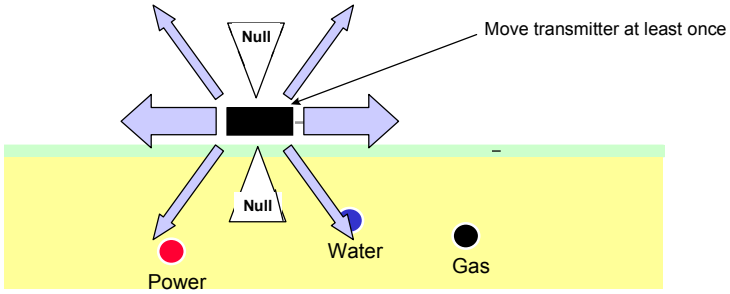
**A. When There Is One Operator**

This search will detect conductors running between the HF Transmitter and the Receiver.

1. **Position the Transmitter**

Lay the HF Transmitter on its side with its nameplate facing up. Place the HF Transmitter switch in the ON position. This will "flood" the area with signal.

- Place transmitter on its side, “flooding” the area with signal
- Can work closer to the transmitter
- Set a reference signal and scan




**2. Set Up & Energize the Receiver**

Move 5 to 10 steps away from the HF Transmitter in the direction you expect the conductor to run. Press the "H" on the Signal Source Switch to receive the HF tracer signal and press the ON button. While facing the HF Transmitter, position the Receiver tee antenna near the ground. It is very important to hold the tee antenna level to the ground and the Transmitter and perpendicular to the suspected run of the conductor.

**3. Set Proper Sensitivity**

Set the SENSITIVITY CONTROL™ for a high, shrill sound and do not re-adjust until the sweep is complete.

**4. Locate Conductor(s)**

Without moving the tee antenna closer to or farther away from the HF Transmitter, sweep the tee antenna several yards to the right and left across the ground searching for areas of deeper tones. Using this method, when the tee antenna crosses over a conductor, the sound from the Receiver will go lower to a deep tone, indicating a stronger signal. If you set up over a conductor, as you begin to sweep to the right or left, the sound will go away. If a deeper tone is not heard, relocate the HF Transmitter to the right or left of its present position and repeat the searching process. After locating the deeper tone areas, re-adjust the SENSIVITY CONTROL™ to pinpoint the conductors with the Shrill, Deep, Shrill tones. The deepest tones will be over the conductors. Mark these deep tone areas for

pinpointing later.

**5. For Full Coverage**

Re-locate the HF Transmitter at least once several steps to the right or left in order to provide complete coverage. This is because any conductor which is directly underneath the HF Transmitter will not be detected.

**6. Conductors Running in Different Directions**

Re-position the HF Transmitter in order to sweep the area for conductors that are running at 45° and 90° to the original locating position.

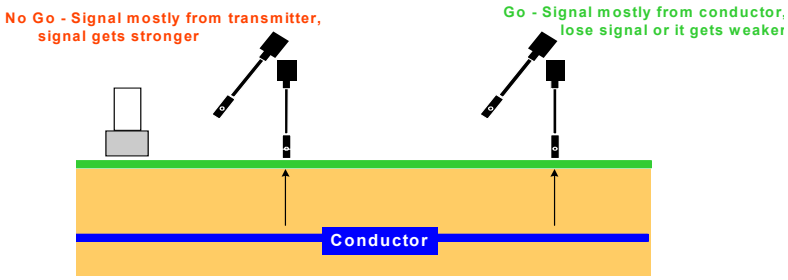
**7. Pinpoint A Conductor**

Place the HF Transmitter upright in a deep tone area where you have previously marked and in line with the suspected run of the conductor. Pinpoint the conductor on the other side of the search area in the normal manner, scanning left and right listening for the Shrill, Deep, Shrill. Swap the positions of the Receiver and HF Transmitter and pinpoint in the original deep tone area.

**8. Determine Source of Signal**

After pinpointing a conductor, raise the Receiver tee and point it at the HF Transmitter. If the signal does not get significantly weaker, then the signal is coming through the air from the HF Transmitter and not from the conductor underground. You may be too close to the Transmitter. Move farther away from the HF Transmitter to pinpoint. Repeat this pinpointing and signal source checking for each of the deep tone areas.

- After pinpointing, raise the receiver and point it at the transmitter
- If you are too close, the signal gets stronger
- If you are far enough away, the signal gets weaker as you lift the receiver

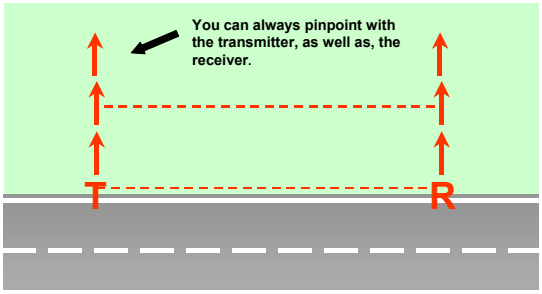



## B. When Two People Are Available

Two people can perform a search over a broad area quicker than one person but executed properly, one-person and two-person searches will produce the same results.

### 1. Set Up the Search

This search will detect conductors running between the HF Transmitter and the Receiver. Starting over an area where there are no conductors, one person holds the HF Transmitter near the ground, its long side parallel to any conductor running between the Transmitter and Receiver. Place the HF Transmitter power switch in the ON position. The other person moves 8 to 10 steps away from the HF Transmitter and positions the Receiver tee near the ground and crosswise to a conductor running between the HF Transmitter and Receiver. Place the Signal Source Switch in the "H" position and adjust the SENSITIVITY CONTROL™ for a high, shrill sound.




### 2. Sweep the Area for Deep Tones

Maintain a constant distance between the Receiver-Transmitter alignment. Move together across the area where the conductors are suspected to run. Do not adjust the SENSITIVITY CONTROL™ during the sweep. When the operators sweep together over a conductor, the tone from the Receiver will go deeper or begin beeping, indicating a stronger signal when you are over or near a conductor.

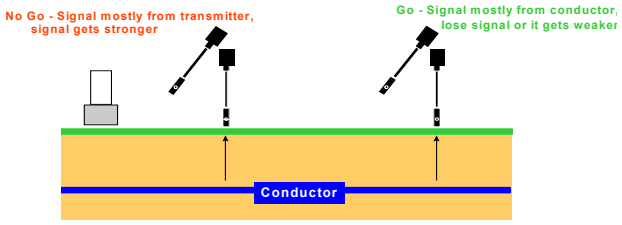
**3. Pinpoint Each Conductor**

After locating the deep tone areas, sweep back to the first deep tone area, set the HF Transmitter down and pinpoint with the Receiver. Adjust the SENSITIVITY CONTROL™ to pinpoint with the Shrill, Deep, Shrill tones. The deepest tone will be directly over the conductor. Check the direction the conductor is running by rotating the tee antenna and listening for the deepest tone. Then rest the tee antenna on the ground and pinpoint the conductor with the HF Transmitter by moving it left and right of its initial position, listening for the deepest tone from the Receiver. If the tone begins to beep, the person operating the Receiver must reduce the sensitivity to a steady tone. At this point the HF Transmitter should be placed on the ground and the Receiver used to pinpoint the conductor. Once the conductor has been pinpointed with the Receiver, the Transmitter should be moved left and right to find the lowest tone. Then rotating the HF Transmitter to find the strongest signal will indicate the path or direction of the conductor.

**4. Determine Source of Signal**

After pinpointing the conductor, raise the Receiver tee and point it at the HF Transmitter. If the signal does not get significantly weaker, then the signal is coming through the air from the HF Transmitter and not from the conductor underground. When this is the case move farther away from the HF Transmitter to start pinpointing.

- After pinpointing, raise the receiver and point it at the transmitter
- If you are too close, the signal gets stronger
- If you are far enough away, the signal gets weaker as you lift the receiver



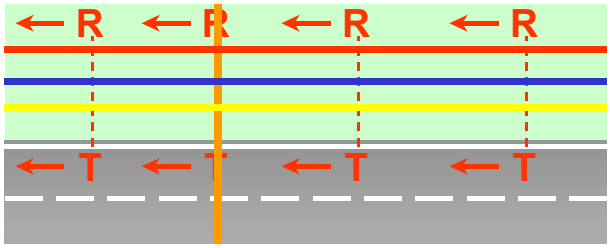

**5. Conductors Running in Different Directions**

Set up and sweep the area for conductors that are running at 45° and 90° to the original locating position.

## Searching & Sweeping

(look for lines running in other directions)

- Set up at 90 degrees and sweep
- Sweep the two diagonals, as well




## Tracing From An Access Point

**General Guidelines**

When you have access to the conductor, the Model 500 may be used inductively, conductively, or a combination of inductively and conductively. All of the capabilities of the locator are available for use. Inductive locating with the HF Transmitter will do the job in most cases. Since it is faster and easier to work inductively, try it

first. However, if you want to trace a long distance, or the target conductor is deep with shallow adjacent conductors, or the target conductor is in a congested area but can be isolated, try the LF Transmitter conductively. The HF Transmitter can be used to verify the results of the LF locate or to trace and identify an adjacent conductor, as explained below. You may connect the HF and LF Transmitters simultaneously to the same conductor; but you must use different grounds for each transmitter. Good electrical contact is essential to applying a tracer signal conductively. Remove any rust, paint, or other insulating substances from the point of contact with the conductor.

Conductors, such as deep high-pressure gas mains, communications cables that can be isolated from one another, and other insulated continuous pipes and cables, are generally good candidates for LF locating. Tracer wire and tape which may have breaks, poor conductors like cast iron with partially insulating couplings are better candidates for HF locating. Actual field experience will be your best teacher in learning which frequency is best suited for a particular application in your area

Only licensed or authorized persons should make direct connections. DO NOT HOOK DIRECT TO LIVE POWER CABLES. Make certain that the owner of the conductor has authorized direct hook-up for purposes of locating.

**Apply LF Signal to the Target Conductor**

The ground spike should be positioned as far from the target conductor as possible at a right angle to the target conductor's run. Do not ground over an adjacent conductor. Do not allow an adjacent conductor to run between the target and the ground. It is preferable not to ground to another conductor such as a water pipe since it will also have a strong tracer signal. Use the long set of cables with the phone plug. Always grasp the clips and plug by the insulated handles. First, connect either clip to the ground spike and then the other clip to the target conductor. Then insert the phone plug into the jack to energize the LF Transmitter.

**Set Up & Energize Receiver**

Carrying the HF Transmitter with you for later use, move 4 to 5 steps away from the LF Transmitter in the direction of the suspected run of the conductor. While facing the LF Transmitter, position the tee antenna near the ground. Hold the tee antenna level and across the suspected run of the conductor. Press the "L" (yellow) on the Signal Source Switch to receive the LF tracer signal and squeeze the ON button.

**Set Proper Sensitivity**

Adjust the SENSITIVITY CONTROL™ for a steady, non-beeping tone. Scan to the left or right. If the sound gets higher (shrill) or goes away, the tee antenna is moving away from the conductor. Move the Receiver in the opposite direction. If the tone gets deeper or starts beeping, the tee antenna is moving toward the conductor and picking up a stronger signal. If the tone starts beeping, reduce the sensitivity slightly to get a steady, non-beeping tone and continue moving the tee antenna in the same direction toward the stronger signal.

**Pinpoint the Conductor**

When scanning the tee antenna over the conductor, the sound will change from shrill to deep and back to shrill. The deepest tone indicates when the tee antenna is directly over the conductor.

**Determine Source of Signal**

After pinpointing the conductor, raise the tee and point it at the LF Transmitter. If the signal does not get significantly weaker, then the signal is coming through the air from the LF Transmitter or cables and not from the conductor underground. When this is the case, move farther away from the LF Transmitter to start pinpointing.

**Verify the Conductor**

Begin walking away from the LF Transmitter along the path of the conductor while sweeping the tee antenna to the right and left. Always keep the tee antenna level and listen for the shrill, deep, shrill sound change. The low or deep tone indicates the strongest signal. Trace the conductor away from the LF Transmitter about 30 feet to an area away from adjacent conductors. Place the HF Transmitter over the tar-

get conductor, set the Receiver for HF, and verify the locate and the identity of the conductor by tracing the HF signal back to the LF Transmitter or a known point. With the conductor identified and verified, select LF (yellow) on the Receiver and trace as far as necessary adjusting the SENSITIVITY CONTROL™ to maintain a steady, non-beeping tone.

**Weak or Confusing Signal**

When the SENSITIVITY CONTROL™ is fully clock-wise or the tone becomes jittery or unclear, use the HF Transmitter to extend the range of the LF Transmitter. Simply place the HF Transmitter down over the last known point and continue tracing an unlimited distance, moving the HF Transmitter when necessary. Alternatively, if you can find a closer access point ,move the LF Transmitter to that access point and reconnect.

**Using the HF and LF Transmitters Together**

When you are tracing using the LF Transmitter, use the HF Transmitter to extend the range of the LF Transmitter, identify an adjacent or crossing conductor, inject the signal on the target in a different manner, or locate all utilities in an area. Also use the HF Transmitter to verify the results of the LF Transmitter by placing it down over the target out away from the access point and tracing the HF signal back to the LF Transmitter.

## Maintenance

The Pipehorn Model 500 was carefully calibrated at the factory and no further internal adjustments should be required. With reasonable care it should give many years of trouble free service.

### Batteries

The Receiver and Transmitters contain batteries for their power source and you should change them periodically. How often the instrument is used determines battery life. If the sound becomes weak, the operating distance decreases, or if the instrument becomes inoperative, it is likely the result of dead batteries. You should install fresh batteries as necessary. Change the batteries once every six months to be certain that the instrument will be ready to operate when needed.

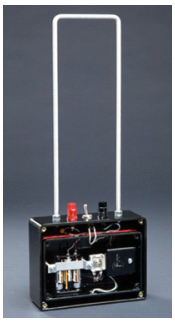
NOTE: The usual reason for an inoperative unit is that the power switch was not returned to the OFF position when work was completed. Operators should be very careful to turn the unit OFF after each job.

HF Transmitter:
6 - Alkaline “AA” cells (9 volts)

LF Transmitter:
8 - Eveready #E93 alkaline C cells or equivalent. (NEDA 14A)

Receiver:
1 - Eveready #522 or alkaline 9 volt equivalent. (NEDA 1604A)

To replace the HF or LF Transmitter batteries, remove the four corner screws and lift the cover plate as shown on the next page.



**HF Transmitter**

**LF Transmitter**

To replace the Receiver battery, remove the plate at the bottom of the hand grip.

**Warranty**

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, BEYOND THOSE STATED BELOW.

Utility Tool Company, Inc. warrants the equipment it manufactures to be free from defects in workmanship or material, under normal and proper use and service by the original user, for three years from the date of original shipment from the factory. Batteries and other expendable items are not included in this Warranty. Unauthorized repair, alteration, or improper maintenance will void this Warranty. Alteration or removal of the serial number will also void the Warranty. Utility Tool Company will not be obligated under this Warranty if the equipment has been misused, misapplied, or accidentally damaged.

If a product is found defective under this Warranty, Utility Tool Company will, at its option, repair or replace the unit free of charge at Utility Tool Company's factory. The unit should be returned to the factory prepaid with customary shipping precautions. Utility Tool Company's obligations under this Warranty are limited to the repair or replacement of defective parts which are not the result of alteration, misuse, abuse, or accidental damage, or at the option of Utility Tool Company, the refund of the purchase price. Utility Tool Company assumes no other liabilities, contingent or consequential, to any equipment found defective under this Warranty.

**Repair Service**

For fast service (usually less than 48 hours), return the unit in its wooden carrying case prepaid to:

Utility Tool Company, Inc.
2900 Commerce Blvd
Birmingham, Alabama 35210
Phone (205) 956-3710

If you have questions or suggestions regarding our equipment or a particular application, contact our applications support group at the number listed above between 8:00am and 4:30pm Central Time. Thank you for purchasing Pipehorn equipment. We value your business and want to keep it. Please return your Warranty Card and fill in the following for your records:

Pipehorn Model 500 Serial Number _____

Date Of Purchase _____