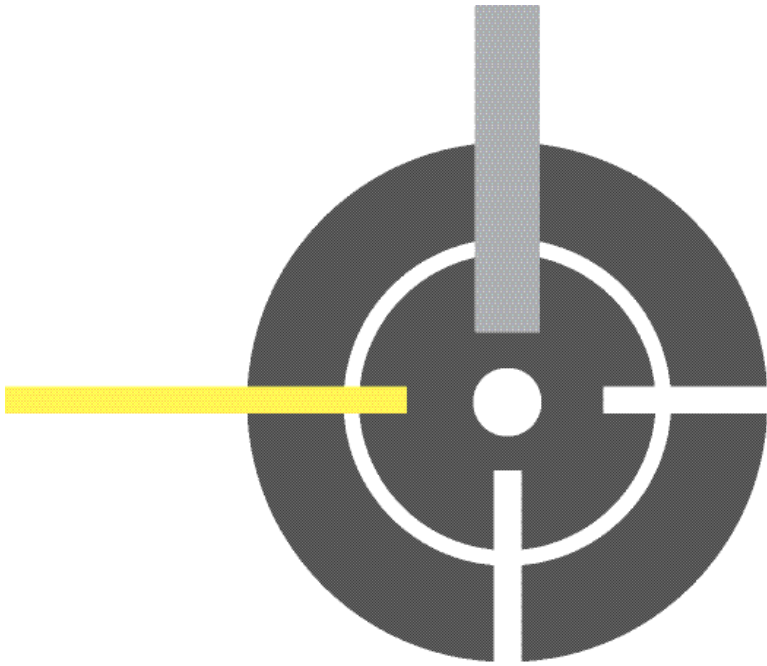




Operating Manual

Model 5600-SI
Pipe, Cable and Conduit/Duct
Locating System



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MODEL 5600-SI CABLE, PIPE AND CONDUIT/DUCT LOCATING SYSTEM OPERATING MANUAL

A. GENERAL DESCRIPTION

The 5600-SI Locating System consists of one or more special-purpose transmitters, a portable gun-type, and all of the accessories needed for easy operation. The receiver, used in combination with the transmitters, is designed to locate, trace, and measure the depth of non-metallic conduit and duct structures and most metallic lines, such as pipes, conduits, and cables.

Simplicity of operation is built into the equipment, and yet the 5600-SI is designed so that all types of pipe, cable, and conduit locating problems can be readily solved in the field. To gain experience and the confidence necessary to achieve successful locating results, the operator should read through the manual, study the illustrations, and try the instrument under controlled conditions.

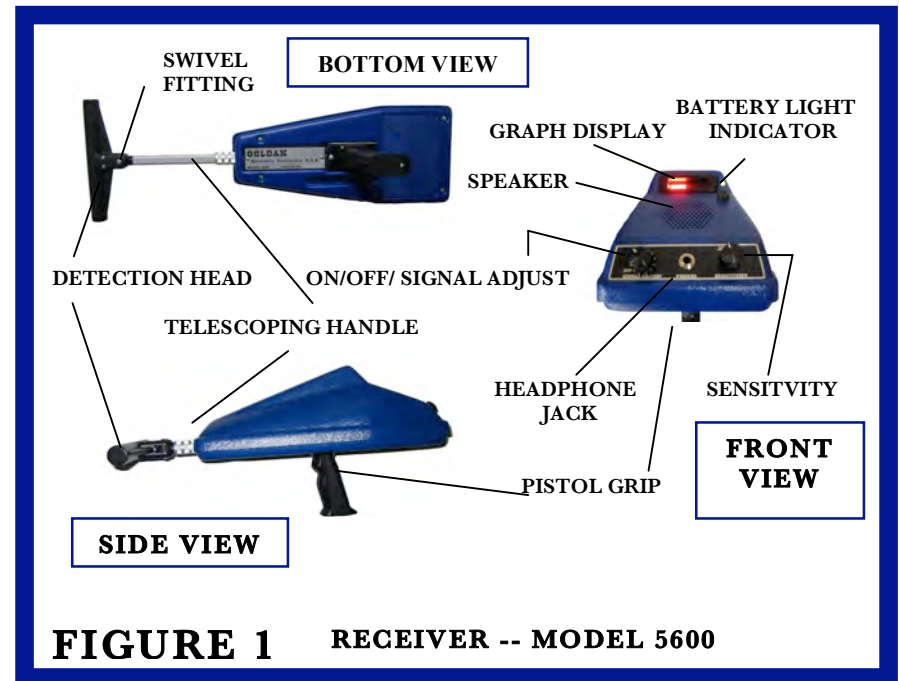
B. SYSTEM COMPONENTS

1) RECEIVER, MODEL 5600-SI

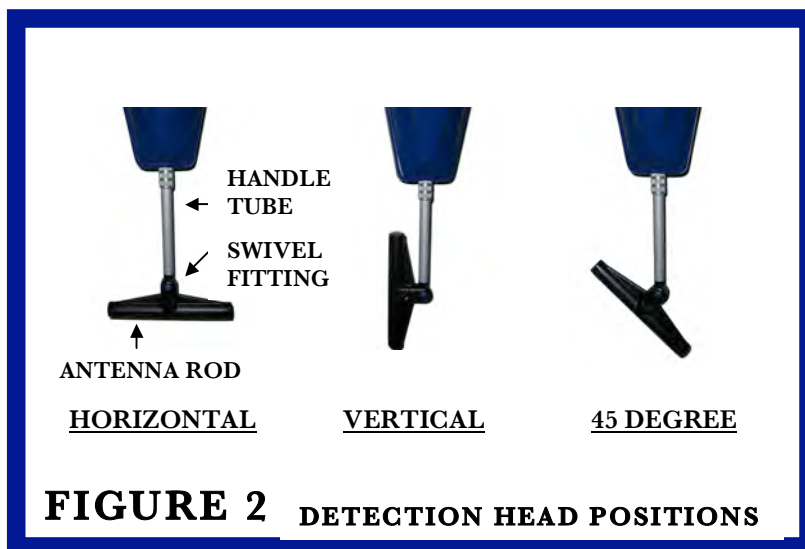
Functionally, the receiver consists of the detection head and the circuit housing, which contains the lighted graph display and the speaker, the operating controls, and the internal circuitry. Transmitted signals are received by the detection head, processed in the circuit housing, and

the output comes from the speaker and lighted graph display. The operating controls allow the operator to set the level of signal that is received. **Figure 1** shows the receiver with labeled features. The following list contains more detailed descriptions of these features.

- **On-Off Switch/Signal Adjust:** A control that combines the power switch with the gain adjustment, which allows the operator to vary gradually the amplification of detected signal.
- **Phone Jack Input:** A stereo jack transfers the audio output from the built-in speaker to an 8-ohm stereo headset. The headset is an optional accessory.



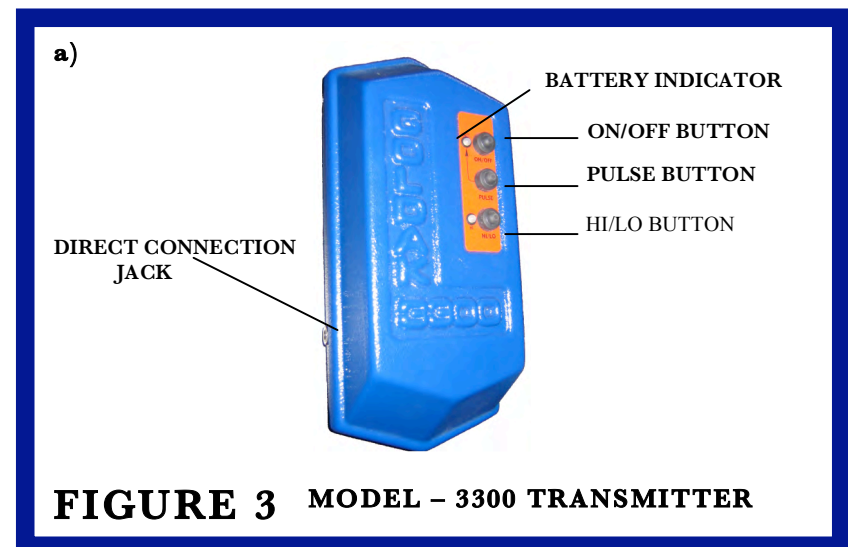
- **Sensitivity:** A two-position rotary switch which allows the receiver sensitivity to be set to “LO” or “HI”.
- **Speaker:** Provides a strong, clear tone to indicate the signal detected by the receiver.
- **Pistol Grip:** The carrying handle, molded to accommodate a strong comfortable grip, on which the receiver is balanced for convenient positioning.
- **Light Graph Display:** A visual indicator which smoothly tracks the detected signal.
- **Detection Head:** A sensitive rod-type antenna, imbedded in a molded plastic housing, which picks up the radiated signals from the transmitter. Mounted on a swivel, the antenna can be set in any of the three operating positions shown in **Figure 2**.



- **Battery Indicator:** A signal light located to the right of the graph display that continuously monitors the receiver battery level. The batteries are in usable condition when the battery indicator is green, and should be replaced when it turns red.
- **Bar Graph Segment Switch:** Allows user to have option of using one light segment or full-lighted bar graph.

2) TRANSMITTERS

The Model 5600-SI Locating System can include optional 116 kHz transmitters. The SR-116KX and the SR-2116X are both inline transmitters. The 3330 “Tape-on” and the 3350 “bullet” should be attached to a fiberglass pushrod (model 2400) or electrician’s tape. The need of a particular transmitter depends upon the type of job to be done. A list of the different style transmitters and their features follows. See Figures 3, 4, and 5 for a picture of the transmitter.



- a) **The Model 3300 “PC Energizer” (Figure 3)** generates a signal which may be coupled to metallic pipe, cable, or conduit, in order to trace the energized line with the 5600-SI receiver. Signal coupling to the line may be done either by magnetic induction from a built in antenna or clamp, or by direct conductive connection to the metallic line. A “LO/HI” push button allows the operator to set the transmitting signal strength, and a “PULSE” button enables a pulsing of the signal for battery conservation and easy identification of the signal.
- b) **The Model 3330 “Tape-on” and Model 3350 “Bullet” (Figure 4)** are also watertight transmitters designed to be attached to an electrician’s tape, sewer snake, or fiberglass pushrod. The cable/ fiberglass rod is then inserted into the sewerline/conduit/duct and the line location and depth can be easily found.



- c) **The Model SR-116KX and SR-2116X (Figure 5)** are both in-line transmitters, which can either be

taped on or attached directly to the end of a snake or pushrod. Both of the transmitters are crystallized which provides better battery life, greater depth capability, and a more stable frequency. The powerful SR-116KX is ideal for small entry points while still providing superior signal strength (up to 35ft). The SR-2116X offers even more power and is ideal for main lines.



3) OPERATING ACCESSORIES

The Model 5600-SI Locating Systems include an accessory box that contains some or all of the following items:

- a) **Direct Connection Cable (DCC). (Figure 6)** This cable is used to conductively energize a metallic line. The plug is inserted into the DCC jack of the 3300 transmitter (see Figure 3). The red heavy-duty clamp may be used to establish a ground, if necessary.

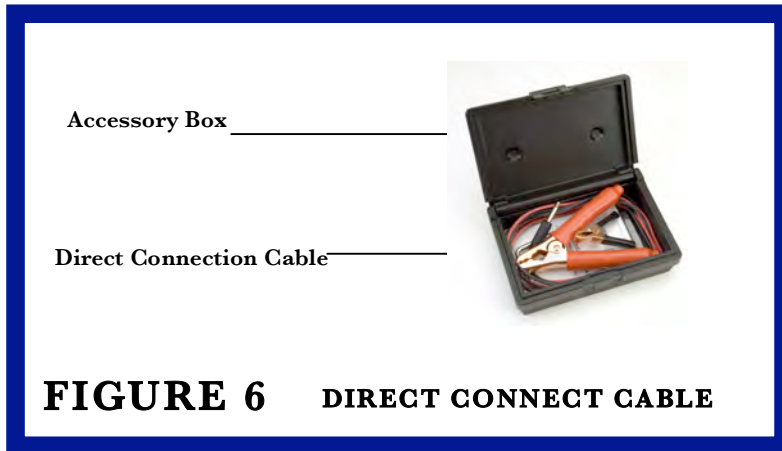


FIGURE 6 DIRECT CONNECT CABLE

- b) **Electrical Tape.** Two rolls black tape, used to attach the 3330 and 3350 transmitters to electrician's tape.
- c) **Knife.** A razor blade knife, needed to cut the electrical tape holding the transmitter to the rod after a locating task.
- d) **Batteries.** The Model 5600-SI receiver used eight alkaline 1.5 volt, size "AA", Eveready #E-91 batteries. These are included in the receiver from the factory. The transmitters require different batteries, depending on their size and power requirements. The batteries used for each are given below:

<u>Transmitter</u>	<u>Battery</u>	<u>Number Req'd</u>
3300	#E-91, "AA"	8
3330	#912, "AAA", 1.5 Volt	1
3350	#393, 1.5 Volt	1
SR-116KX	#PX28L, 6 Volt	1
SR-2116X	#912, "AAA", 1.5 Volt	4

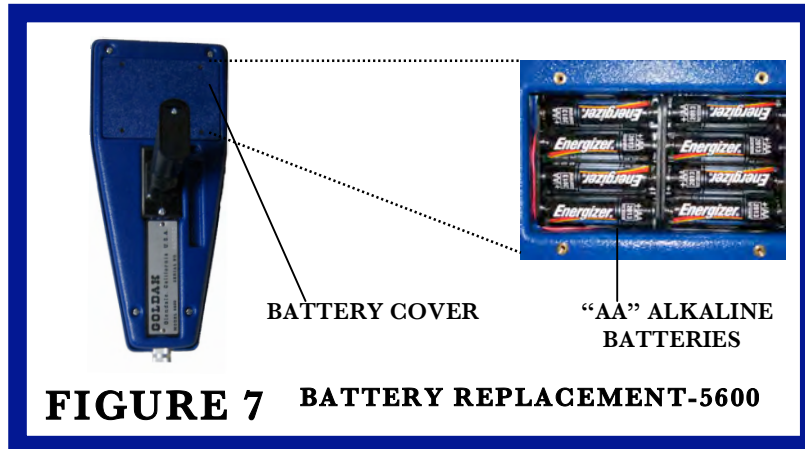
Depending on the transmitter(s) included, the corresponding batteries will also be included in the accessory box

- e) **Measuring Tape.** A 10-foot retractable tape, used for making precise measurements when determining the depth of the conduit/duct or pipe/cable.
- f) **Depth Calculator.** A circular plastic calculator that can quickly convert surface measurements for conduit/duct location into a corresponding depth.
- g) **Operating Manual.**

C. SET-UP AND ADJUSTMENTS

1) 5600-SI RECEIVER

- a) Remove the receiver from the carrying case. *Note:* The 5600-SI as it comes from the factory includes eight 1.5 volt batteries and is ready to operate.
- b) Test the batteries. Because the receiver continually monitors battery life, you must simply turn the unit on and look at the small round light to the right of the lighted graph display. The batteries are in usable condition if the light is green and should be replaced when it turns red.
- c) If the battery indicator is red or turning red, replace the batteries. Face the bottom of the 5600-SI toward you, as shown in **Figure 7**. Remove the four Phillips-head screws that hold the battery cover and open the battery compartment. Remove the eight "AA" alkaline batteries and replace them with fresh ones (preferably alkaline) as shown in the figure. Replace the battery cover and screws.



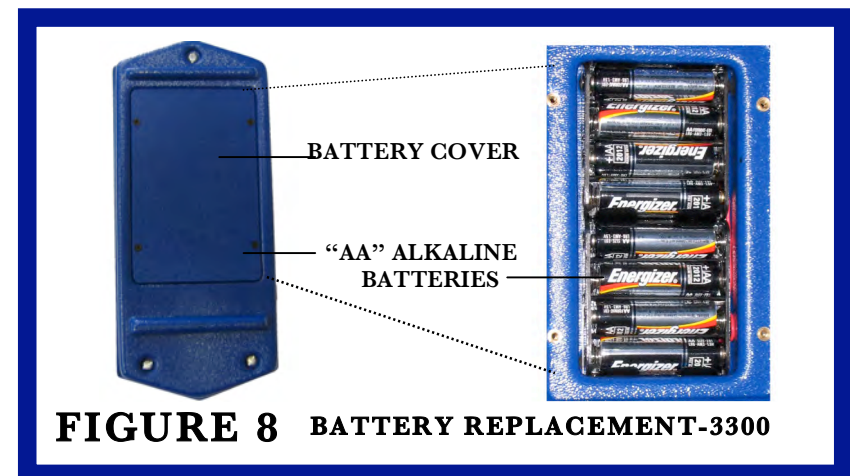
- d) Verify that the batteries are good by turning on the 5600-SI and observing that the battery indicator is green. You should hear a short, loud beep and see the graph display flash when you turn on the unit.

2) TRANSMITTERS

a) MODEL 3300 “PC Energizer” TRANSMITTER

1. Remove the transmitter from the carrying case. *Note:* The 3300 as it comes from the factory includes batteries and is ready to operate.
2. Test the batteries. Because the transmitter continually monitors battery life, you must simply press the on/off button and look at the small round light directly above the button. The batteries are in usable condition if the light is green and should be replaced when it turns red. Before checking the battery monitor, make sure the “PULSE” button is off and the “HI/LO” light is on. The 3300 consumes the most power inductively in this mode, and will subject the batteries to a more taxing test.

3. If the battery indicator is red or turning red, replace the batteries. Face the button of the 3300 toward you, as shown in **Figure 8**. Remove the four Phillips-head screws that hold the battery cover and open the battery compartment. Remove the eight “AA” alkaline batteries and replace them with fresh ones (preferably alkaline) as shown in the figure. Replace the battery cover and screws.



b) MODEL 3330,3350, and SR-116KX TRANSMITTERS

1. Model 3330 “Tape-on” Transmitter Set-up. Unscrew the end cap of the “tape-on”. Insert the size “AAA” battery into the tube and screw in the end cap as shown in **Figure 9a**. The “tape-on” should now be transmitting a signal through the air. To verify this, turn on the receiver and turn up the “SIGNAL ADJUST” knob so that the indicator dot is straight up. Walk the receiver around the transmitter. If you receive a strong signal, the 3330 is working.

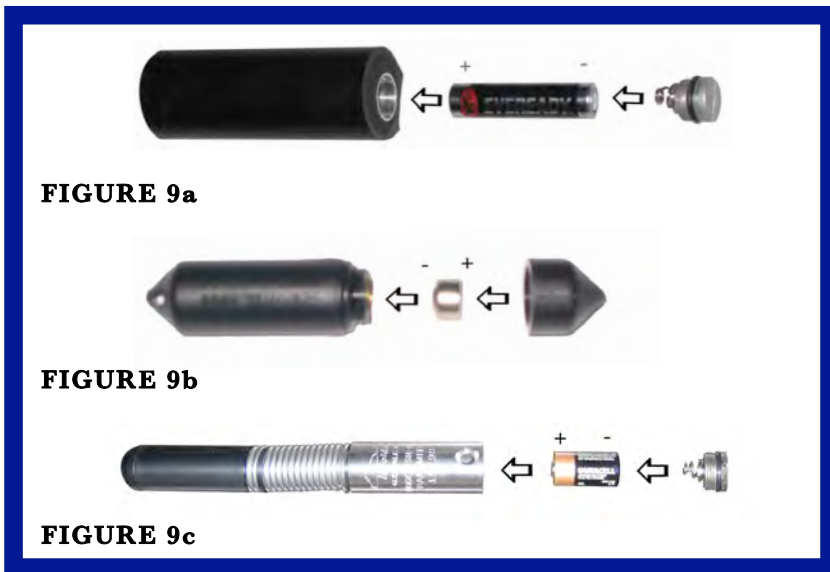


FIGURE 9a

FIGURE 9b

FIGURE 9c

2. Model 3350 “Bullet” Transmitter Set-up. Insert the #393 battery into the “bullet” transmitter as shown in **Figure 9b**. The 3350 should now be transmitting a signal through the air. You can verify the transmitter is on with the 5600-SI receiver as explained in (1) above.
3. Model SR-116KX Transmitter Set-up. Unscrew the end cap of the SR-116KX transmitter with a flat head screwdriver. Insert the #PX28L battery into the in-line transmitter before placing it onto a snake or pushrod, as in **Figure 9c**. Make sure to verify that the transmitter is responding before placing into the non-metallic conduit/duct. You can verify the signal the same way you verify the “tape-on” in (1).
4. Model SR-2116X Transmitter Set-up. Unscrew the back end of the transmitter either by hand or using a wrench.

Place four size “AAA” batteries into the SR-2116X following the +/- graphics in the transmitter. Once again verify the signal the transmitter has signal, then place onto the end of your snake/pushrod.

D. LOCATING PROCEDURES

a) PREPARATION FOR METALLIC LINE LOCATING

In order to trace a metallic line with the 5600-SI receiver, the line first must be energized with a signal that the 5600-SI receiver is capable of detecting. Once this is accomplished, the 5600-SI can easily locate and trace the line because of its direction and signal level distinguishing capabilities. The 3300 transmitter generates this signal and enables two methods of energizing the line: **inductively** and **conductively**. When finding metallic lines, the 3300 should always be set to energize the line in one of these two modes.

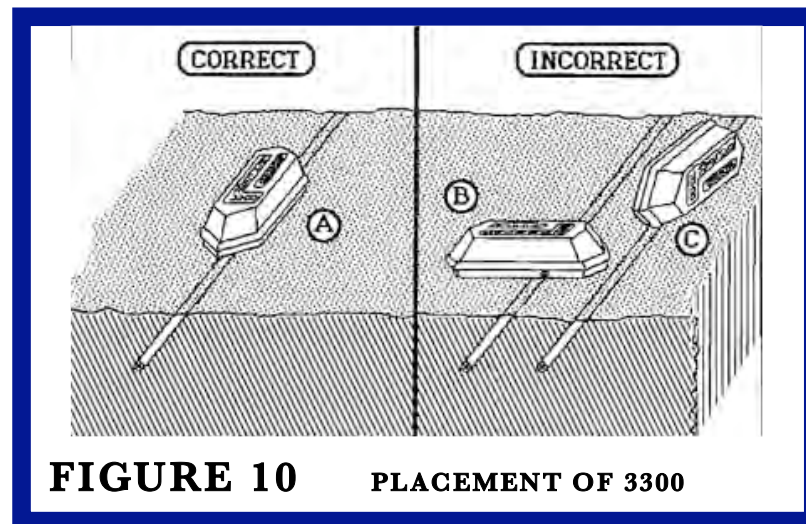


FIGURE 10 PLACEMENT OF 3300

1. Energizing a Line Inductively Using the Model 3300

This Method of energizing the line has the distinct advantage of requiring no mechanical connection to the line to be traced. Therefore, the 3300 can energize a buried line without the need to uncover it. If the location of part of the desired line is known, simply position the transmitter on or over that part of the line as shown in **Figure 10A**. Make sure that nothing is plugged into the DCC jack, as this will not allow the built-in antenna to transmit energy. Also, note that for proper signal transfer to the line, the 3300 must be set bottom-down and lengthwise with the line. Both positions **B** and **C** will not allow energy to enter the line. In **B**, the 3300 is bottom-down but not lengthwise with the line; in **C**, the 3300 is not bottom-down.

2. Energizing a Line Inductively Using the SI (Super-Inductive) Antenna

i) Description

The 5600-SI carrying case may be used to extend the inductive capabilities of the 3300 transmitter. When the 3300 is combined with the carrying case in the manner described below, the entire case generates an inductive field far superior to that of the 3300 alone as well to that of any pipe locator transmitter previously known. As result, inductive tracing distance is dramatically increased.

ii) Super-Inductive Usage

Operating the super-inductor is both simple and convenient. Turn on the 3300 transmitter and place it in its normal storage position in the carrying case. The “PULSE” and “HI/LO” buttons on the 3300 control the

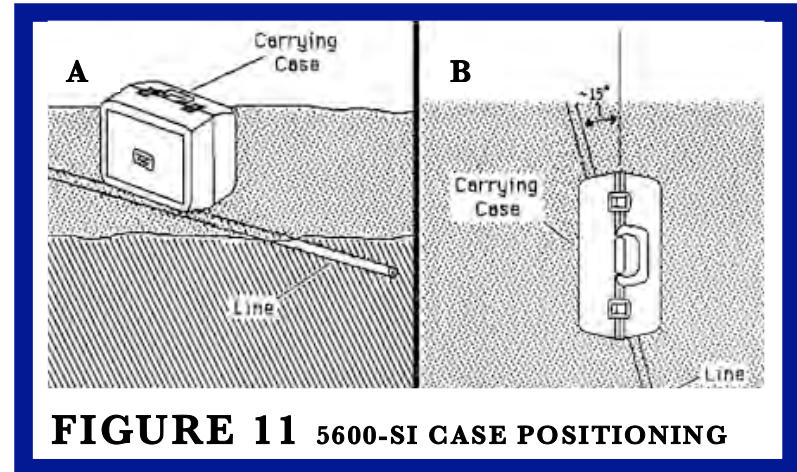


FIGURE 11 5600-SI CASE POSITIONING

energizing signal from the super-inductor. For instance, depressing the “PULSE” button on the 3300 will cause the super-inductor signal to pulse as well. Also, setting the 3300 to “HI” will cause a corresponding maximum signal output. Close and latch the carrying case the super-inductor is now transmitting. Place the carrying case lengthwise over the underground pipe, cable, conduit or other metallic lines to be energized, as shown in **Figure 11A**. If the operator wishes to minimize the air signal along the line, he/she may rotate the carrying case about 15 degrees with respect to the line, as shown in **Figure 11B**. The line is now energized and ready for tracing.

a) The super-inductor features several advantages over other inductive transmitters. The most obvious advantage is *substantially increased tracing distances* compared to that of any other inductive transmitter. Not as obvious is the fact that the super-inductor can *strongly energize deeper lines* more effectively than other inductive transmitters. Also, the super-inductor is *more efficient* than other transmitters; that is, it produces a stronger energizing signal for a given battery drain. Because the super-inductor provides these advantages, it operationally compliments the 3300. The operator can use the super-inductor to couple signal to deeper lines and trace over a wide expanse, while using the 3300 by itself for tight signal coupling in small tracing areas.

b) In general, for *power considerations* it is always best to use the “PULSE” mode when using the super-inductor or even the 3300 by itself. Using the “PULSE” typically reduces battery drain 30% to 40% compared to transmitting continuously.

c) As with the 3300, the super-conductor should not be placed within a few feet of large metallic or ferromagnetic masses when trying to energize a line, since performance will be significantly reduced.

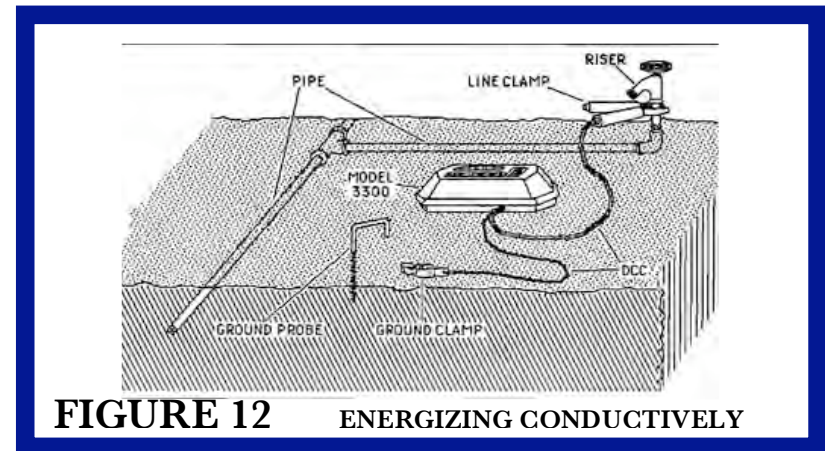
3. Energizing a Line Inductively Using the GC-2 Clamp

Sometimes it may be difficult to isolate a line for the purpose of energizing it for tracing. Perhaps the line has no electrically exposed access point; or it is bundled with a number of other lines, making it hard to energize using the normal inductive method. The GC-2 inductive clamp makes it possible to induce a signal into a specific line without significantly energizing surrounding lines. Also, because the clamp works inductively, using the GC-2 requires no electrically exposed portion of the line. To use the GC-2 clamp, simply plug it into the 3300 jack (same jack for the DCC), and encircle the target line with the clamp. Turn on the 3300 and proceed with locating.

4. Energizing a Line Conductively Using the DCC

Although this method requires direct mechanical connection to the line, energizing conductively has two important advantages over the methods given above. The foremost advantage is increased tracing distance, since electrical contact with the line enables more efficient signal transfer. The second is the avoidance of signal spread to other lines that the operator does not desire to trace.

Figure 12 shows a simple diagram of the hook-up. Plug the direct connection cable (DCC) into the jack and set the 3300 down. Place the line clamp on the exposed portion of the line to be traced, as shown. One of two things may be done with the ground clamp, depending on the amount of signal that is to energize the line. For strong, long-tracing signal, the ground clamp should be connected to a ground probe that is firmly planted in the ground. For less energizing of the line, simply set the ground clamp aside. Do not short the ground clamp to the line clamp or the line to be energized. Having connected the 3300 to the pipe thus, the operator also may set the signal level by using the “HI/LO” push button switch.



b) TRACING METALLIC LINES

Once the line is energized, two methods of tracing it are available. The first is tracing by “nulls”, locations in the signal field around the pipe for which no signal is received by the 5600-SI. The second is tracing by “peaks”, locations in the field where the 5600-SI receives maximum signal. More detail about both of these methods follows below.

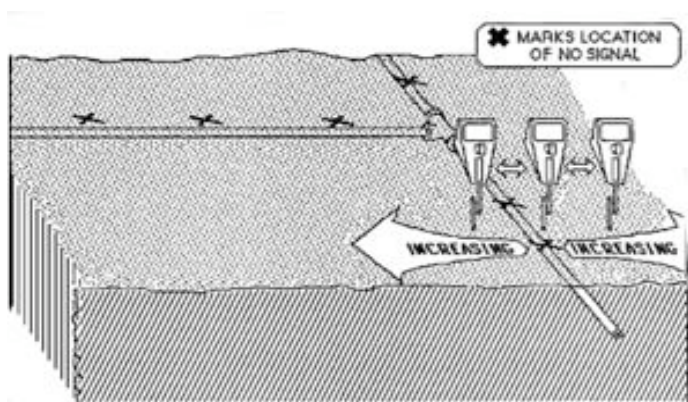


FIGURE 13 LOCATING A LINE BY “NULLS”

1. Tracing By Using Signal “Nulls”

i) Put the detection head of the 5600-SI receiver into the vertical position as shown in (Figure 13). When tracing a line, the detection head will point at the line when a “null” (no signal) is received.

ii) Set the “SENSITIVITY” control to “LO” and turn “SIGNAL ADJUST” control so that the graph display

reads half-scale. If the graph display cannot be set to half-scale on “LO” then set the sensitivity to “HI”.

iii) Walk in the direction for which the display reading increases. If the display reading becomes full-scale, then reset the reading to half-scale using the signal adjust.

iv) Continue walking until the signal level sharply decreases, and no signal is detected. You have found a “null”, which indicates that the detection head should be pointing at or near the line. Turn up the signal adjust until signal is detected again, and continue moving in the same direction until a null is once again obtained. Repeating these steps will allow you to reduce the null width to an inch or two.

v) Having narrowed the null to a single spot, mark that spot on the ground. Now move away from that spot and locate the null at other spots on the ground. As you trace the null spots, you will be tracing the course of the line. The metallic line rests directly below the line of null spots

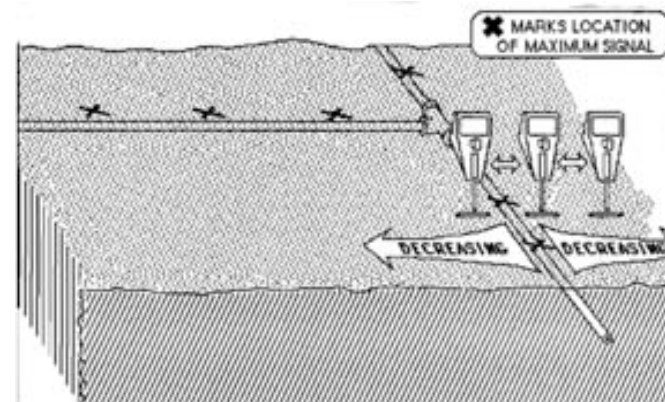


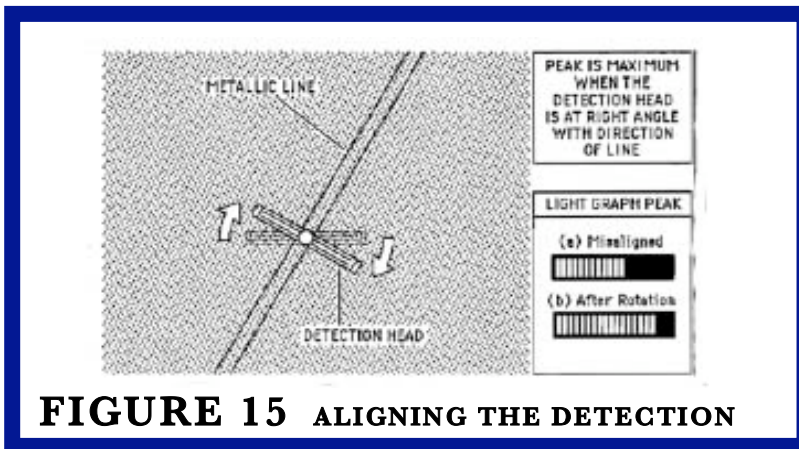
FIGURE 14 LOCATING BY “PEAKS”

2. Tracing By Using Signal "Peaks"

i) Put the detection head of the 5600-SI receiver into the horizontal detection head near to and parallel with the ground (**Figure 14**). When tracing a line, the aluminum handle tube will point at the line, centering the receiver over the line, when a "peak" (maximum signal) is received.

ii) Set the "SENSITIVITY" control to "LO" and turn the "SIGNAL ADJUST" control so that the graph display reads half-scale. If the graph display cannot be set to half-scale on "LO" then set the sensitivity to "HI".

iii) Walk in the direction for which the display reading increases. If the display reading becomes full-scale, then reset the reading to half-scale using the signal adjust.

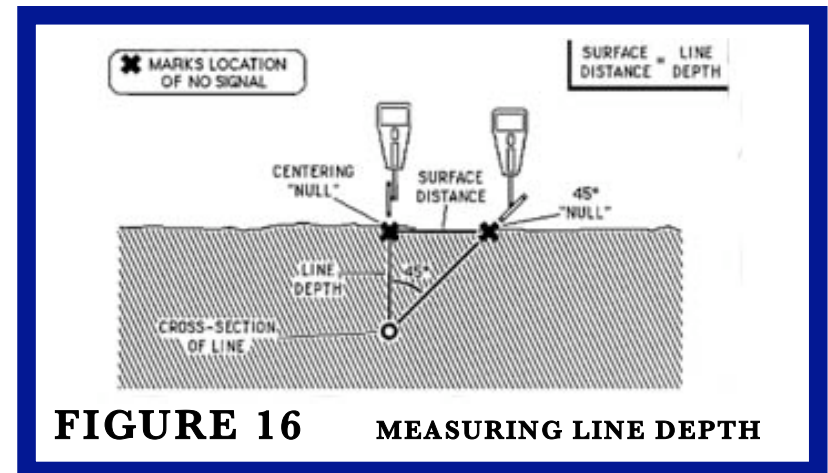


iv) Continue walking until the signal level begins to decrease again. You have just walked past a "peak".

Position the detection head over the spot where the peak is. Now the handle tube should be pointing at the line.

v) Next rotate the receiver for the maximum peak over the line. This will position the detection head so that it is at right angles with the direction of the line, as shown in **Figure 15**. With the detection head in that position, you are receiving the maximum signal possible for that location.

vi) Having aligned the receiver thus, mark that spot on the ground. Now move forward or backward from that spot and locate the peaks at other spots on the ground. As you trace the peaks, you will be tracing the course of the line. The metallic line rests directly below the line of peaks that you locate.



d) MEASURING THE DEPTH OF THE METALLIC LINE

At any time during the tracing, you may need to know the depth of the line being traced. Although there is only one method to find the depth of the line with the 5600-SI receiver, it is fast and easy. The method takes advantage of the field nulls that are created around the line when it is energized.

1. Mark the place where you desire to measure the line depth. Locate this mark using the “null” or “peak” method of tracing described above. **Figure 16** shows this location being found using the “null” method.
2. Set the detection head to the 45 degree position as shown in **Figure 2**.
3. Hold the receiver vertical and move it to the right or the left of the center mark until a “45 degree null” is located. Be sure that the null is narrow, so that the results of the surface measurements will not be inaccurate. Make a mark at the 45 degree null.
4. Now measure the distance between the two marks; that is, between the center mark and the 45 degree null mark. This is the surface distance, which by triangle geometry is also the line depth.
5. To confirm the depth measurement, it is often wise to repeat the above procedure on the other side of the center mark. This will give you two measurements which can be compared and averaged.

2) LOCATING NON-METALLIC CONDUIT AND DUCT STRUCTURES

Because non-metallic conduit and duct structures are not conductive, they cannot be energized by the 3300 transmitter like metallic lines can. Therefore, different techniques must be used to locate and trace conduit and duct structures. Rather than energizing the entire line, the operator must insert a small, self-contained transmitter into the conduit or duct. Then the operator may locate points in the line by locating and finding the depth of the transmitter. Although some of the locating procedures are similar to those for finding metallic lines, there are several differences, which the operator should note.

a) PREPARATION FOR LOCATING CONDUIT AND DUCT LOCATING

The unique features of these transmitters allow the system to be versatile for performing many locating tasks. Environmental parameters will determine which transmitter is best for the task to be done.

1. MODEL 3330 “TAPE-ON” AND 3350 “BULLET”

Both of these transmitters usually enter a conduit or duct through an opening of one inch diameter or greater. The “Bullet” transmitter can get it much smaller access points and still make tight bends and turns. The “Tape-On” transmitter is a little larger but is also able to get into small access points, and the “tape-on” allows for more depth than the “Bullet”. Both of these transmitters are prepared by taping them to a fiberglass rod. To prepare either one for a task, first insert the battery into the transmitter.



TRANSMITTER	ADVANTAGES	APPLICATIONS
3330 "TAPE-ON" 	POWERFUL, RANGE UP TO 25 FEET; GROOVED FOR EASY TAPING TO PUSH ROD	FOR NON-METALLIC SEWER MAIN LINES 3" OR LARGER OR PLASTIC CONDUIT 2" OR LARGER
3350 "BULLET" 	SMALL; LOW PROFILE; DEPTH UP TO 10 FEET	FOR NON-METALLIC SEWRLINES. GREAT FOR SMALL ENTRY 1 1/2"-2 1/2". PLASTIC CONDUIT 3/4"

Figure 17 ADVANTAGES AND APPLICATIONS

Refer to **Figure 19** for an illustration of how to tape on the transmitter onto the electrician's tape or fiberglass push rod. Begin by setting the transmitter on the rod about 3 feet from the front end. If using the "Tape-on", make sure that the groove mates with the rod. Wrap several layers of tape around the middle of the transmitter. This tape build-up will serve as a bumper against the inside of the line. Finally, tape entirely over the transmitter in an overlapping manner as shown. The transmitter is now ready for insertion into the conduit.

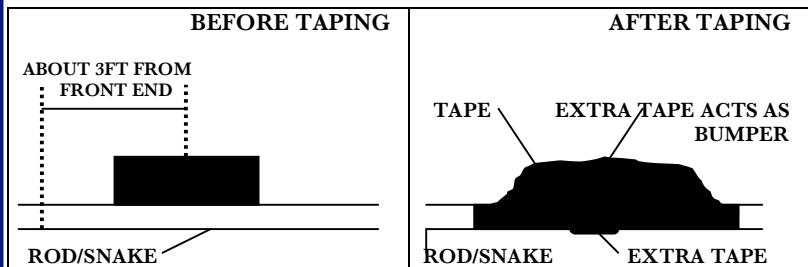


FIGURE 19 ATTACHING THE TAPE-ON

2. MODEL SR-116KX AND SR-2116X

Both of these transmitters are used typically as In-Line transmitters. Using them "in-line" (on the tip of either a of a pushrod or snake) creates many advantages for tracing. The in-line transmitters allow for smaller access points without sacrificing depth and power.



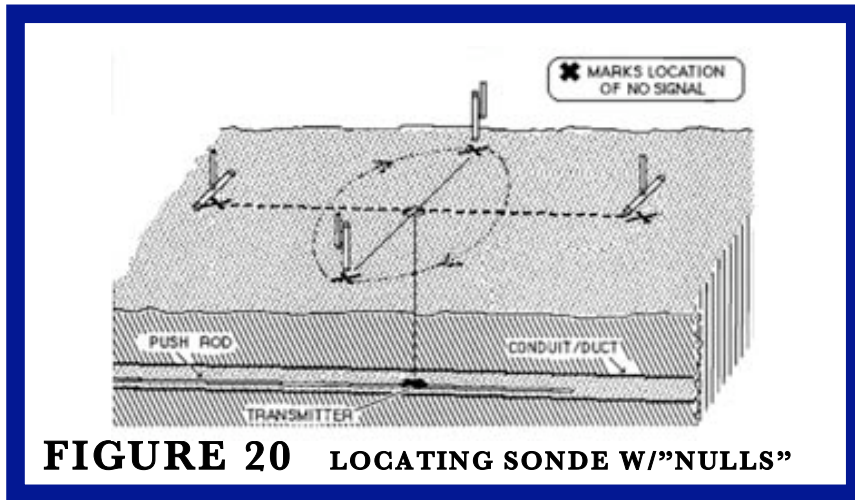
TRANSMITTER	ADVANTAGES	APPLICATIONS
SR-116KX 	POWERFUL, RANGE UP TO 35 FEET; SMALL ENTRY POINTS; NO NEED TO TAPE-ON	FOR NON-METALLIC SEWERLINES. GREAT FOR SMALL ENTRY 1 1/2" -2". PLASTIC CONDUIT AS SMALL AS 3/4".
SR-2116X 	MOST POWERFUL ON THE MARKET; RANGE UP TO 45 FEET AND 60+ FEET WITH THE 12V OPTION.	FOR NON-METALLIC MAIN LINES OR EMPTY ELECTRICAL CONDUIT 3" OR LARGER.

Figure 18 ADVANTAGES AND APPLICATIONS

b) LOCATING THE TRANSMITTERS

When the transmitter is inside the conduit or duct and the operator wishes to pinpoint its exact position, two locating techniques are available, as shown in **Figures 20 and 21**. The first is locating by "nulls", points where no signal is detected. The second is locating by the "peak", the point at which maximum signal is detected.



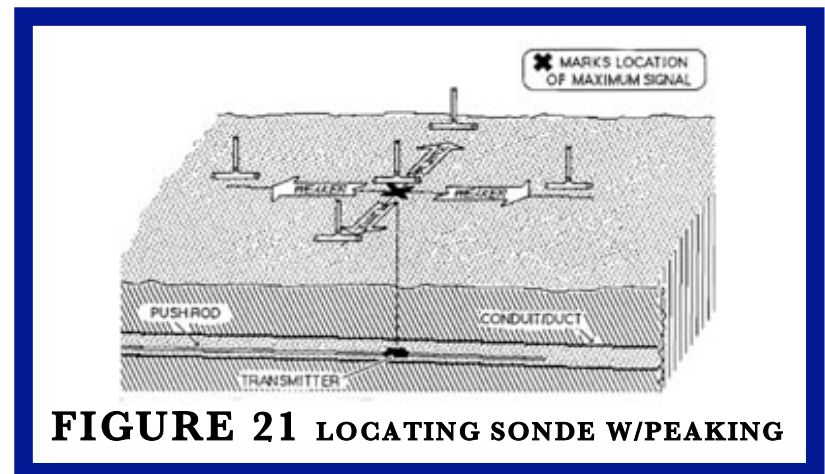
1. LOCATING BY "NULLS"

- i) Put the detection head of the 5600-SI receiver into the vertical position as shown in **Figure 2**. Position the 5600-SI antenna vertically with the detection head near the ground (**Figure 20**).
- ii) Set the "SENSITIVITY" control to "LO" and turn the "SIGNAL ADJUST" control so that the graph display reads full-scale. If the graph display cannot be set to full-scale on "LO" then set the sensitivity to "HI". (Caution: If you are standing over the transmitter you may be in a null area. If no signal is received or the signal is erratic, move a few steps to the right or left. You will then receive a signal and a reading on the lighted graph display.)
- iii) Proceed to locate as shown in **Figure 20**. With the detection head vertically positioned, walk in a square or circle in the signal area created by the transmitter. As the figure shows, you will receive two nulls (no signal areas) when you are on either side of the transmitter. Mark

those positions on the ground with X's and draw a straight line between the X's as shown. (Note: The width of the null can be adjusted with the signal adjust and sensitivity controls. The null should be made as narrow as possible for most accurate results.)

iv) Change the position of the receiver antenna to a horizontal or flat position. Stand three to five feet from the line just marked (thin solid ground line shown in **Figure 20**). Hold the detection head parallel to the line (in the same direction) and walk parallel to the line. You will receive a null or no signal point somewhere along your path. Mark this position on the ground with an X as shown in **Figure 20**. Repeat this procedure on the other side of the line.

v) Again, draw a line from X to X. You will notice that this second line crosses the first line. The point where the two lines meet is directly above the location of the conduit and transmitter.



2. LOCATING BY “PEAKS”

i) Put the detection head of the 5600-SI receiver into the horizontal position as shown in **Figure 2**. Position the 5600-SI vertically with the detection head near to and parallel with the ground (**Figure 21**).

ii) Set the “SENSITIVITY” control to “LO” and turn the “SIGNAL ADJUST” control so that the graph display reads the half-scale. If the graph display cannot be set to half-scale on “LO” then set the sensitivity to “HI”. (Caution: If you do not appear to be receiving a signal you may be in a null area. Move a few steps to the right or left to receive a strong signal.)

iii) Proceed to locate as shown in **Figure 21**. With the detection head horizontally positioned, walk in the direction from which the display reading increases. If the display reading becomes full-scale, then reset the reading to half-scale using the signal adjust.

iv) Continue walking until the signal level begins to decrease again. You have just walked past a “peak”. Position the detection head over the spot where the peak is. Now the handle tube should be pointing at the transmitter.

v) Next rotate the receiver for maximum peak over the line. This will position the detection head so that it is parallel with the transmitter antenna, as shown in **Figure 22**. With the detection head in that position, you are receiving the maximum signal possible, and the orientation of the transmitter is the same as that for the detection head.

vi) Having aligned the receiver thus, mark that spot on the ground with an X. After pinpointing, leave the signal adjust control at its present position and, keeping the detection head parallel to and over the conduit or duct, move ten to fifteen feet to the right or left. This assures you are at the maximum signal area. The conduit/duct and the transmitter will be directly below the X.

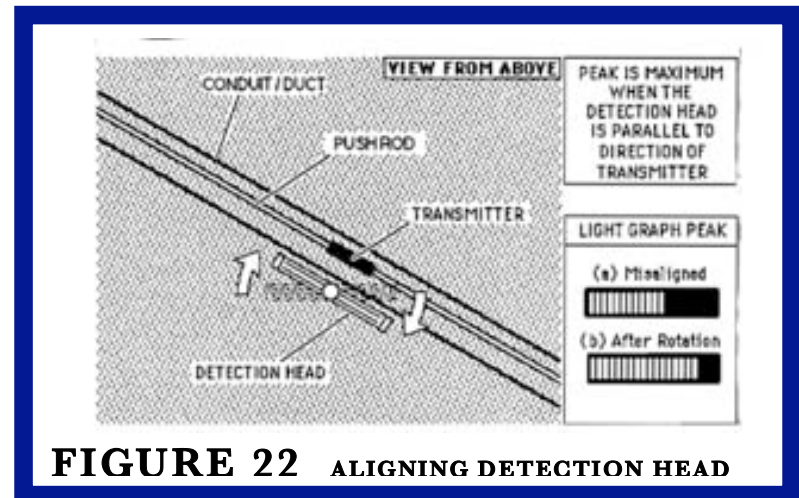


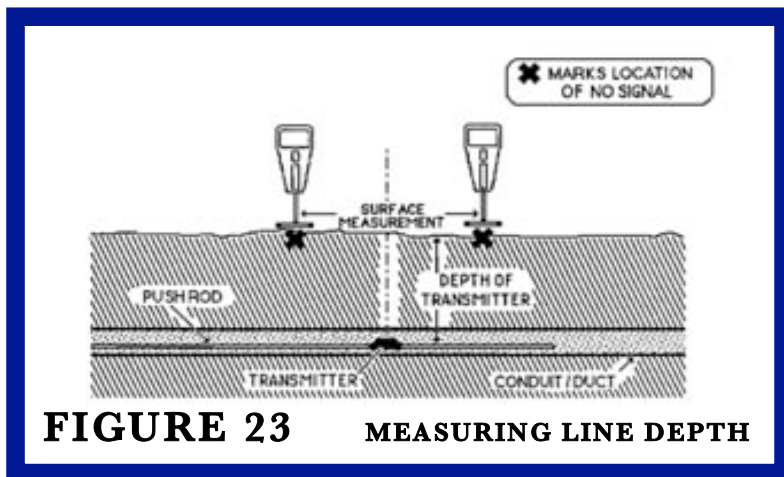
FIGURE 22 ALIGNING DETECTION HEAD

c) TRACING CONDUIT AND DUCT STRUCTURES

Tracing a conduit or duct may be done using the nulling or peaking methods described in Section (b) and shown in **Figures 20 and 21**. Having inserted the transmitter into the conduit, locate its position by either the signal peaks or nulls. Mark the location with an X, and insert the transmitter into the conduit ten to twenty more feet. Locate the transmitter further into the conduit and locating. By lining up the series of marks you will draw a line on the ground directly over the conduit or duct.

d) MEASURING CONDUIT AND DUCT LINE DEPTH

To Measure the depth of any conduit or duct structure using the 5600-SI, refer to **Figure 23** for position of the receiver. The receiver should be held directly over and parallel to the duct or conduit. The line drawn previously to pinpoint the transmitter (2nd line) should be used for depth calculations (see dotted line in **Figure 20**). Holding receiver as shown in **Figure 23**, start at one end of the line and walk to the other end. You will receive two nulls (no signal areas). Mark each of these; measure the surface distance between marks. Then refer to the depth calculator to convert the surface measurement into the actual depth of the non-metallic duct or conduit.



3. SPECIAL LOCATING TASKS

a) LOCATING PROBLEMS WITHIN DUCTS

Once the tasks of locating the conduit/duct transmitter and tracing out the duct have been mastered, located a

problem in the duct is simple. Using one of the tape-on transmitters attached to a electrician's tape or push rod, trace out the duct until the problem is reached. In other words, trace the duct until the electrician's tape or rod cannot be pushed any further down the duct. Locate the transmitter at this spot and mark it with an X. Determine the direction of the line as described in **Figure 22**. Because the transmitter was attached to the rod three feet from the end, measure three feet down the line from the X, and mark there with a circled X. The problem is directly below the circled X. Determine the depth of the transmitter. This depth is also the depth of the conduit or duct.

b) LOCATING A BREAK IN A NON-METALLIC LINE

In most cases when a break in a non-metallic duct occurs, the duct collapses at the break. This prevents the electrician's tape or push rod from advancing any further beyond the break. Therefore, in most cases the break as an obstruction, and follow the procedure given in section (a).

E. OPERATING NOTES AND SUGGESTIONS

1) Technical Notes

a) Battery Life: The 5600-SI receiver and the 3300 transmitter are both powered by 8 size "AA" alkaline batteries. These provide approximately 30 hours of service for the 5600-SI before they need replacing. For the 3300, the batteries should provide a minimum of 30 hours of service before needing replacement.

The hours of operation for the conduit and duct transmitter batteries are as follow:

<u>Transmitter</u>	<u>Battery Life (hours)</u>
3330 "Tape-on"	25
3350 "Bullet"	10
SR-116KX	6
SR-2116X	10

2) Operating Suggestions for the Model 3300

a) **Metallic Masses:** Avoid setting the 3300 transmitter down on or within a foot of large masses of metal to energize a pipe or cable. This will load the transmitter and make it difficult or impossible to pick up the line with the receiver.

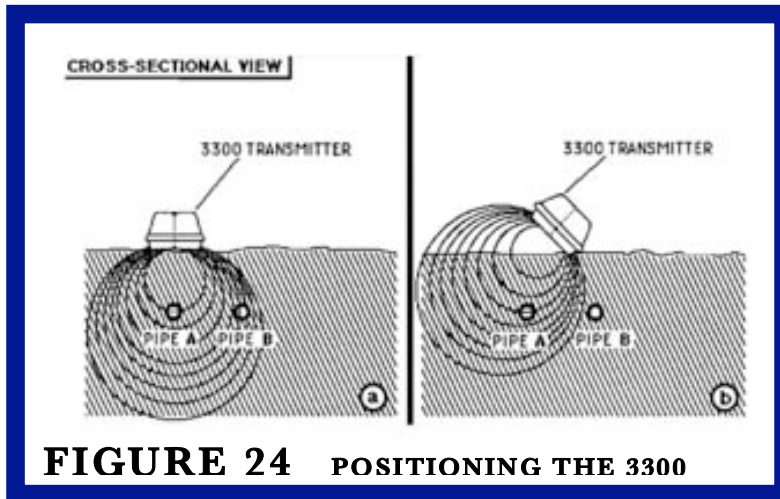


FIGURE 24 POSITIONING THE 3300

b) **Nearly Parallel Lines:** When two pipes are in close proximity of each other and only one is to be energized for tracing, use the direct connection method whenever possible. This method minimizes the spread of excessive

signal through the air and from one pipe to another. However, if direct connection with the pipe is impossible in this situation, then energize the desired pipe inductively as shown in **Figure 24**. **Pipe A** and **Pipe B** are close enough to each other that normal placement of the 3300 transmitter to energize **Pipe A** also energizes **Pipe B** (**Figure 24a**). The operator, locating 20 or 30 feet down the line, consequently may be tracing **Pipe B** instead of **Pipe A**, the desired line. To avoid this problem, **Pipe A**, as shown in **Figure 24b**. The radiated signal "points" at **Pipe A**, and no signal reaches **Pipe B**.

c) **Touching Lines:** When water and gas pipes and electrical cables are in contact at a common point such as a water heater or a ground connection there will be some transfer of signal from line to line. The operator should be aware that in this case, the receiver may locate a line other than the desired one. For example, the 5600-SI may trace a gas line instead of a water line that was intentionally energized.

d) **Air Signals:** When energizing a line inductively, the 3300 transmits a signal through the air which the 5600-SI can easily detect. This phenomenon can become confusing when the operator tries to trace a line within a 15-foot radius of the 3300; therefore, if possible, line tracing should be done outside of that radius. If the operator finds himself without a choice, then three things can be done to minimize the effect of air-radiated signals:

1. Use conductive energizing. This method creates no air-radiated signals that the 5600-SI can detect.
2. Turn the "SIGNAL ADJUST" control on the 5600-SI down as low as it can be used for the "peaking" method and work with minimal signal levels.

3. If the 3300 is Oriented directly with the line, then the air signals will be maximized along the line. To avoid this, rotate the transmitter 10 or 15 degrees off the direct line.

3) Operating Suggestions for Conduit and Duct Location

a) **Use of a push rod.** The tape-on transmitters, the 3330 and the 3350, and be attached to either an electrician's tape or a fiberglass push rod since a rod (**Figure 25**) can be fed down a line in a small fraction of the time of an electrician's tape.

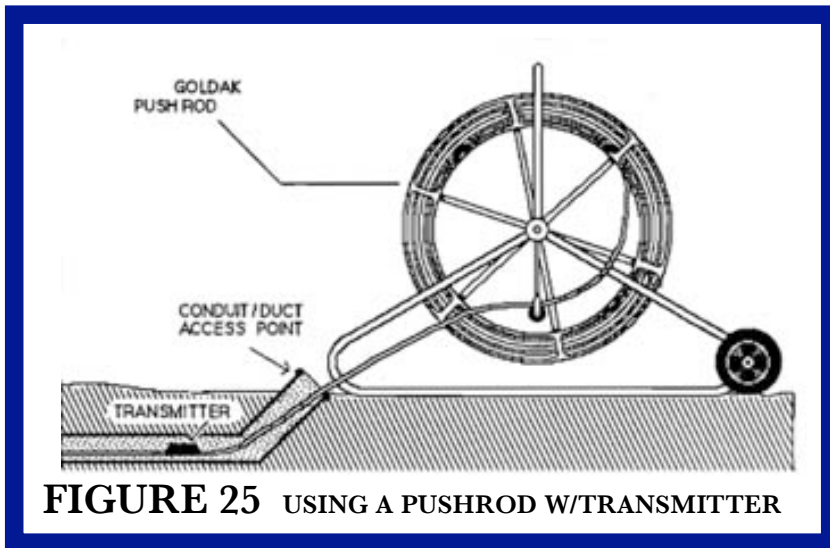


FIGURE 25 USING A PUSHROD W/TRANSMITTER

F. TECHNICAL ASSISTANCE AND SERVICING

Should the Model 5600-SI Cable, Pipe and Conduit/Duct Locating System or any of the accessories require repair or servicing aside from normal product maintenance, we suggest that you contact the factory at the following address:

GOLDAK INC.
547 West Arden Avenue
Glendale, CA 91203
Phone: 818-240-2667
Fax: 818-244-6818
E-mail: 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 & fax number