

Contents

I Overview.....	2
1. System Configuration.....	2
2. Illustration.....	4
3. SURE-LOCK Signal Transmitter.....	5
4. SURE-LOCK Receiver.....	6
II Operation Procedure.....	9
III SURE-LOCK Optional Accessory.....	22
IV Warranty.....	23

I Overview

1. System Configuration

Transmitter

SURE-LOCK multi-frequency signal transmitter combines a variety of intelligent and self-monitoring features to provide high-power power with a sealed rechargeable battery. And use durable polymer polyethylene plastic shell. The wide body design makes the instrument stable under various conditions, and the upper panel of the instrument is an aluminum alloy structure that is impact resistant.

Receiver

SURE-LOCK single frequency signal receiver also combines a variety of intelligent and self-monitoring features and is controlled by a microprocessor. In all modes, it provides automatic gain control, continuous estimation and calculation of depth reading display, detection guidance, and sealing button for easy operation. Provide passive frequency selection. Its structure is ergonomic, and the use of synthetic plastic improves its strength and durability. The receiver power supply uses six commonly used durable No. 5 batteries. The instrument is completely sealed against rain and dust.

Cables and grounding pieces

Cables and grounding parts include the following components:

1. "L" shaped pointed ground nail
2. Ground aluminum plate
3. Operation Manual of Direct Connect Cable Clamp

The operation manual contains operation instructions, maintenance and repair instructions of the instrument, and portable warranty information.

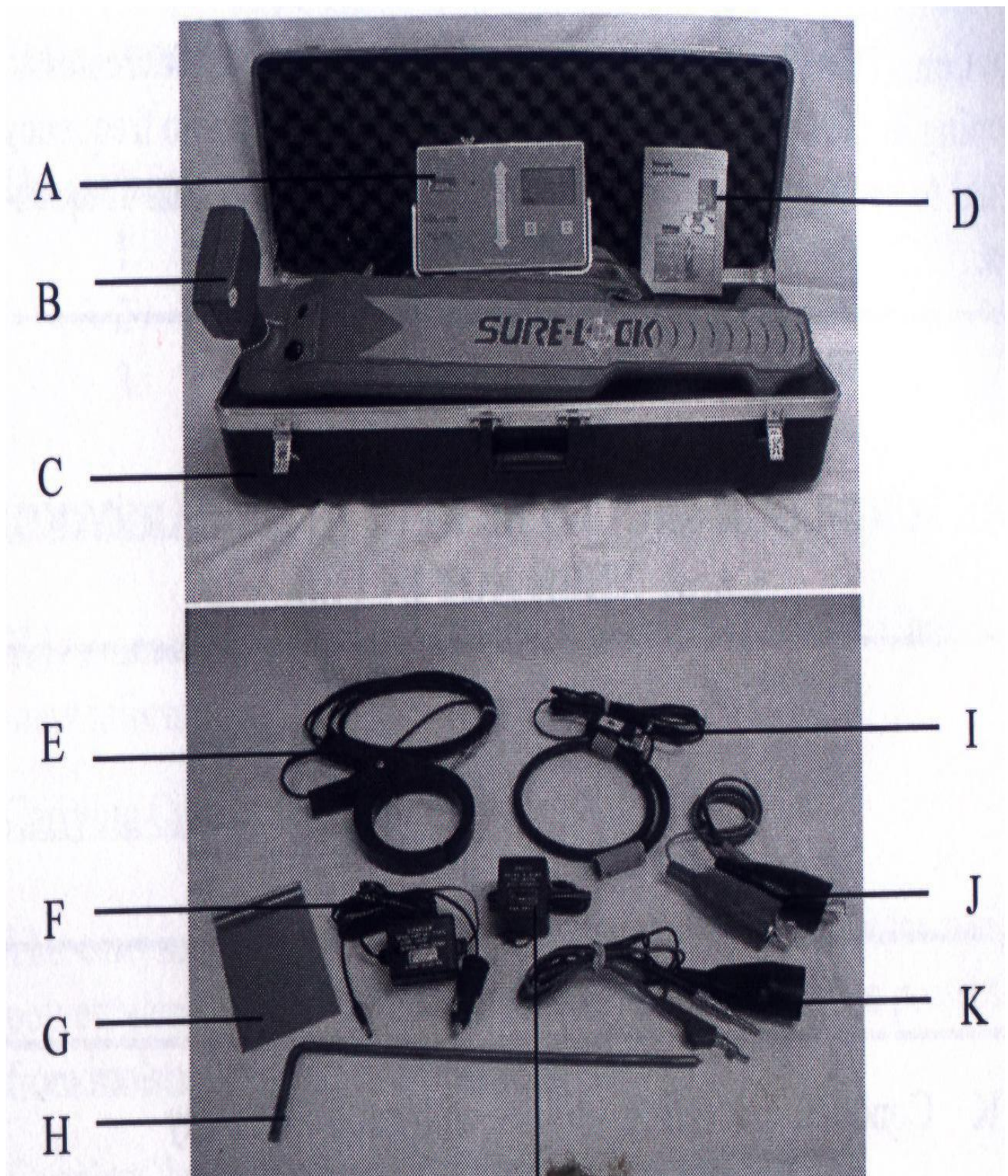
The carrying case is made of high-molecular polyethylene material with compact structure, and

the molding technology and lining can effectively prevent moisture, shock and impact

Coupling clip (optional accessory). Using a coupling clip is a connection method that activates the target conductor and generates a magnetic field or current. One coupling clip can be used in conjunction with the transmitter to activate the target conductor and apply the signal; another coupling clip can be used in conjunction with the receiver to very accurately identify the target conductor for the selected signal. When used in this way, the coupling clip can distinguish the target conductor from many interference conductors very accurately, because the coupling clip can effectively keep the signal away from the interference conductor.

The use of coupling clips is a unique method that can strengthen the difference between the loaded signal and the signal under the conventional signal loading method. The use of coupling clips is also an effective means to distinguish the target conductor from other interfering conductors. But it can not be used on all devices to be tracked. Because the coupling clip is not grounded when used, the signal transmission direction on the conductor must be bidirectional. If the traced conductor is a blind end, or there is an insulating connection, or the insulating flange is near the applied signal, the coupling clip will not work. Conductor here "Breakpoints" form an open loop, and audio signals cannot be transmitted. High-frequency signals will also weaken a lot.

2. Illustration



A. Transmitter

- B. Receiver
- C. Carrying Case
- D. Manual
- E. Coupler clamp, 4 "(optional accessory)
- F. Ground aluminum plate
- G. Ground nail
- H. Flexible soft clip, 10 " (optional accessory)
- I. Wire clamp
- J. Wire clamp with copper clamp (optional accessory)

3、SURE-LOCK Signal Transmitter

Technical Parameter

1. Output Power: 81KHz
2. Output Jack: Separate Output Jack
3. Output Mode: Conduction (direct connection) type and / or induction type have automatic impedance matching function
4. Output power: 0.6 ~ 3 watts automatic impedance matching, impedance range from 5 ohms to 10K ohm
5. Battery type: D-type alkaline battery
6. Continuous working time: between 80 and 100 hours.
7. Battery status: continuous indication
8. Optional accessories: including coupling clip and cable clip.
9. Working temperature: -32 °C ~ 65 °C
10. Dimensions: 23.5cm long × 14cm high × 15.2cm wide
11. Weight: 3.6 kg

12. Structure: It can adapt to all kinds of severe weather, comply with IP54 and NEMA3S standards, and can resist vibration and impact

When the SURE-LOCK pipeline detector is transported and carried, it is stored in a black hard case made of lightweight polymer materials.

4、SURE-LOCK Receiver

Technical Parameter

1. Active frequency: 8.1K, 81K, 480KHz; 8.1K, 81K have left and right arrows and depth readings;
2. Passive frequency: 50 ~ 60Hz without left and right arrow indication and depth reading;
3. Dynamic range: 124dB, typical situation
4. Depth range: continuous depth reading, maximum sounding 7.3 meters, automatic calculation of depth reading
5. Left and right indication: LCD arrow display, sound prompt
6. Type of sound response (passive mode): adjustable tone
7. Gain adjustment: fully automatic
8. Liquid crystal display: automatic backlight illumination, digital signal strength indicator, power indicator, operating frequency mode, estimated depth / calculated depth, self-test status, volume, signal lock, left and right arrows
9. Operation interface: two membrane sealing buttons
10. Battery type: 6 AA alkaline batteries
11. Battery life: 90 ~ 120 hours. No operation for 60 minutes, automatic shutdown
12. Battery status: continuous display
13. Optional accessories: Optional accessories include coupling clips, of which type 91 coupling clips are suitable for 8.1KHz, 58 type coupling clip is suitable for 81KHz, universal type can be used in two frequency ranges.

14. Working temperature: $-32^{\circ}\text{C} \sim 65^{\circ}\text{C}$
15. Dimensions: 77.5cm high $\times$ 14cm thick $\times$ 32cm wide
16. Weight: 1.98 kg
17. Structural features: high temperature, high density structure, can adapt to all kinds of bad weather, in line with IP54 and NEMA3S standards
18. Ruggedness: can withstand a drop of about one meter

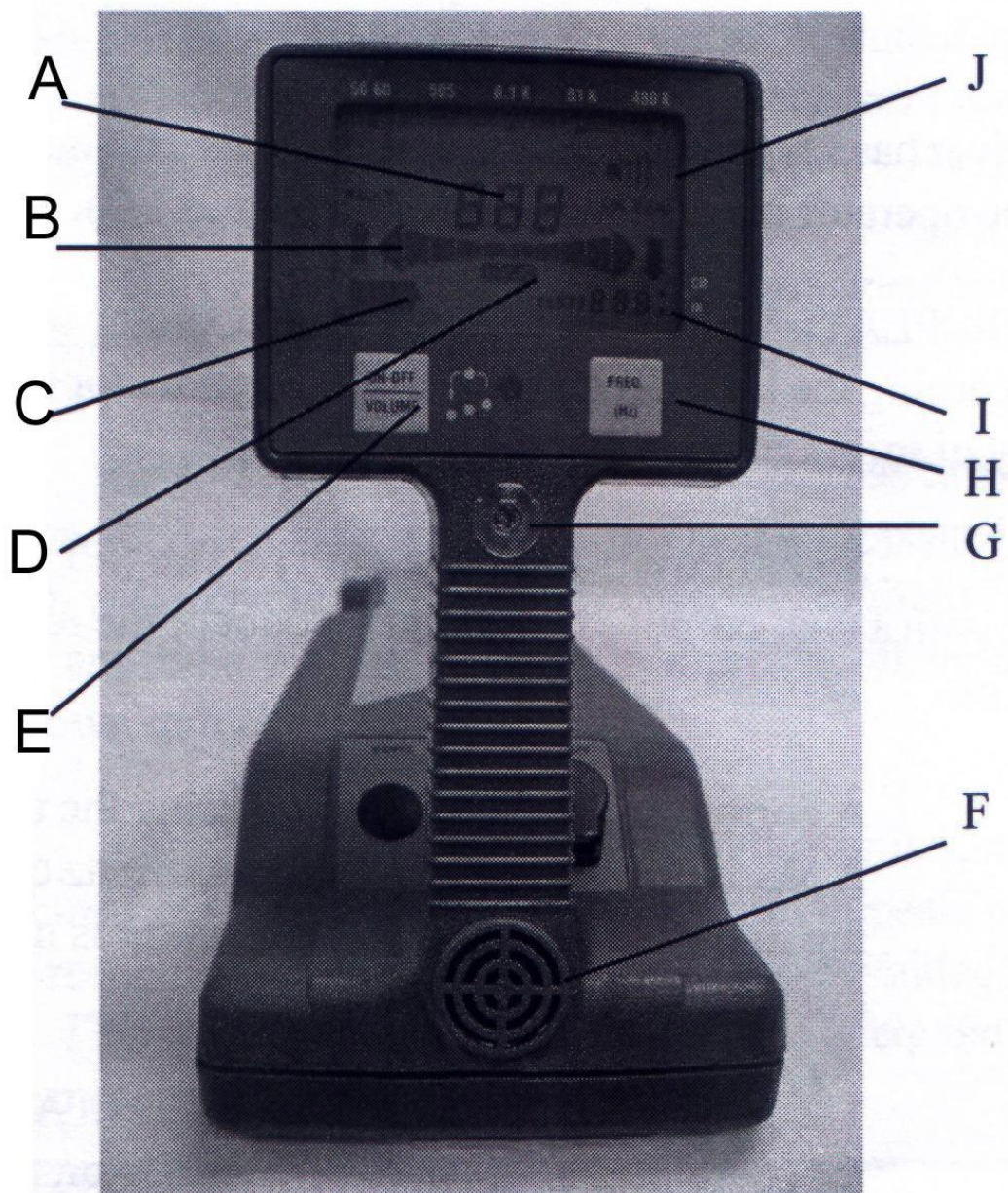


Fig. 1-3 Signal Receiver

A. A. Signal strength digital indication (SPI)

- B. Left and right arrow simulation instructions
- C. Battery level display
- D. Instrument switch button and volume adjustment
- E. Lock indication
- F. Speaker
- G. Bubble level
- H. Frequency selection button
- I. Display of estimated depth value / calculated depth value
- J. Volume indication

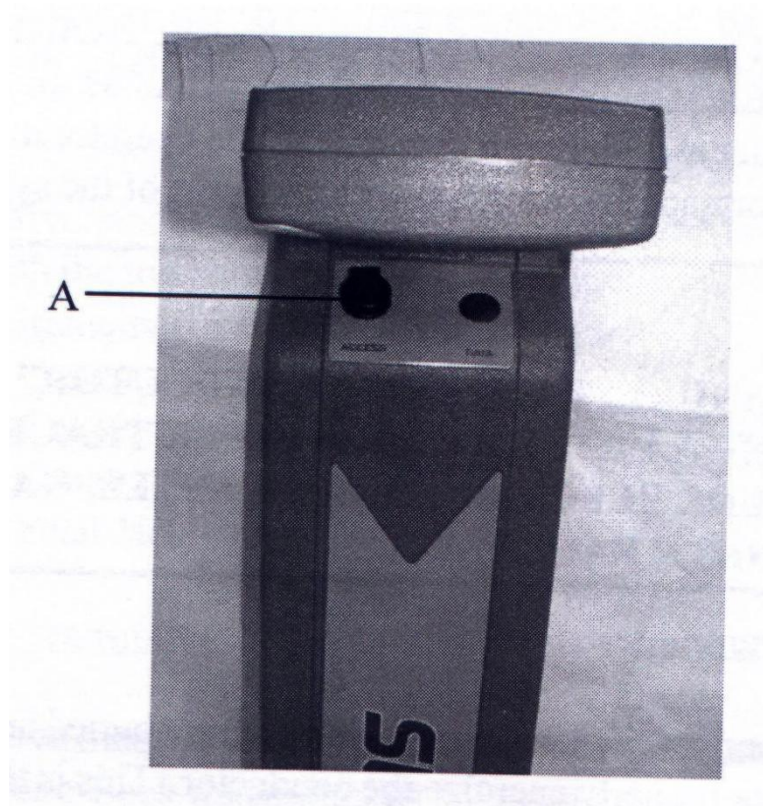


Fig 1-4 Receiver additional interface

- A. Accessory Jack

II Operation Procedure

1. Basic operating procedures

This manual is described in terms of transmitter and receiver. SURE-LOCK intelligent pipeline locator works as a whole system, the operator must understand the importance of each component and their correct operation.

Note: The conductor in the manual refers to any metal structure object, including power lines, cables, gas pipelines, water pipes, tracers, etc.

SURE-LOCK launcher

The transmitter is the most important component required for the positioning of the buried conductor. It gives a certain induced voltage to the buried conductor. This is also the main function of the SURE-LOCK transmitter. However, the operator must understand the function of the transmitter in the entire system and learn to choose the best mode of operation. Many problems encountered by operators on site are caused by improper operation or unreasonable working position of the transmitter.

The following are several working modes for the transmitter to load the conductor signal:

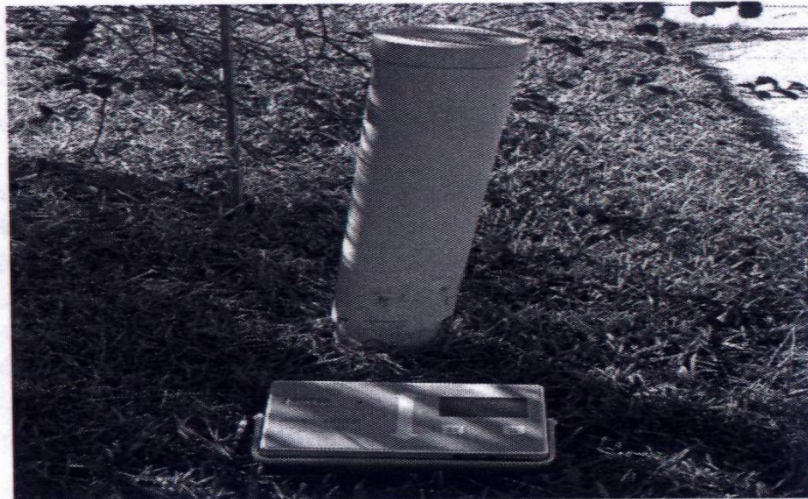
1. Induction mode or non-direct connection mode
2. Conduction mode or direct connection mode
3. Coupler clamp

SURE-LOCK transmitter induction working mode

This mode is the simplest and easiest mode in which the transmitter is not directly connected to the conductor. However, in order to avoid detection errors, operators need to fully understand how the transmitter works in this mode.

There are two methods of operation in induction mode:

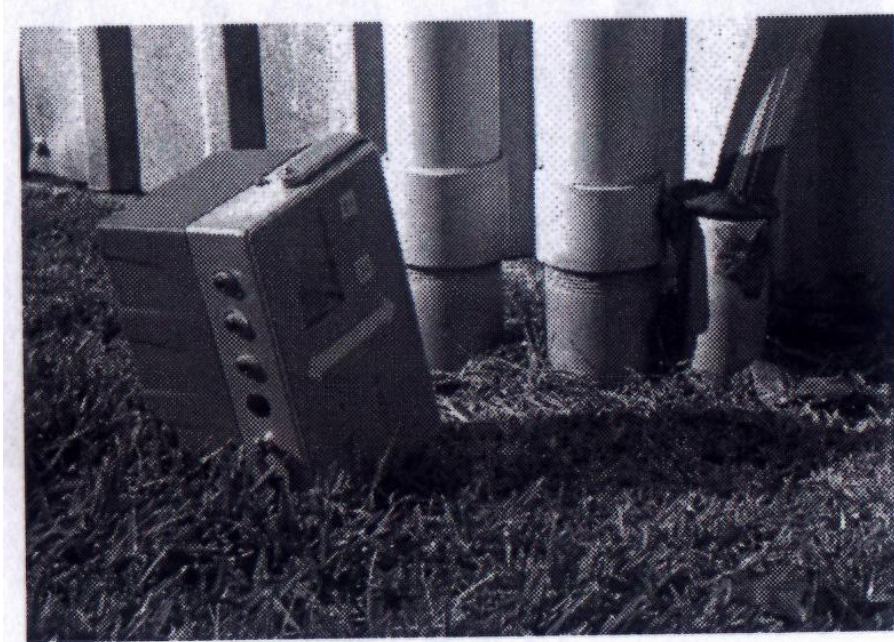
1. Single operation scan



1. Double operation scanning single operation scanning working mode

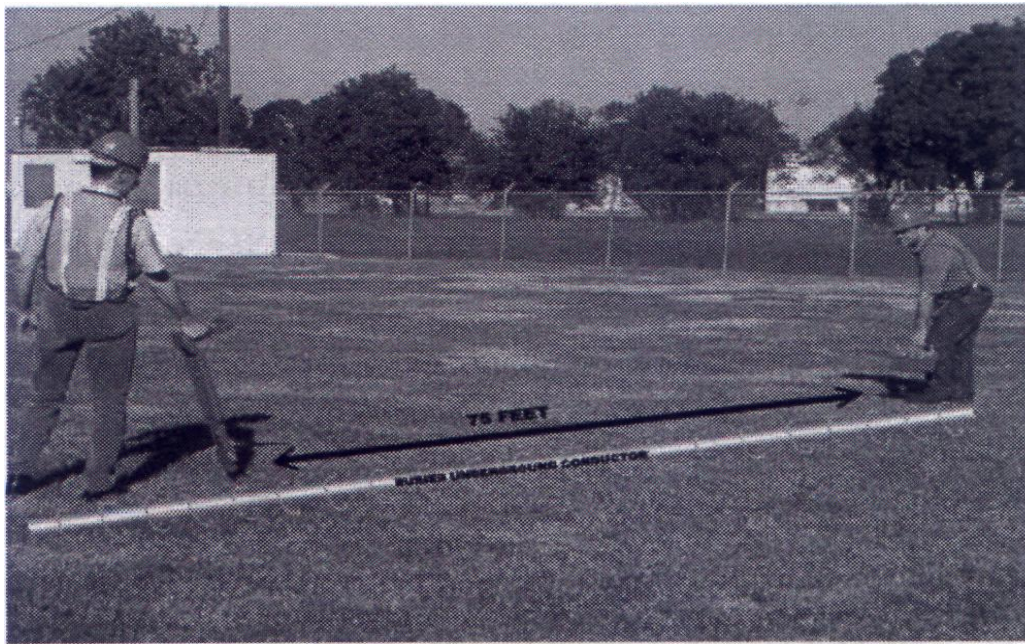
When an operator scans, the operator needs to know a particular point of the conductor to be detected, which can be called a starting point. This starting point can be a valve chamber, a riser, a bracket, an access door, and so on. As shown in Figure 2-1. After determining the starting point, turn on the transmitter and place the transmitter above the conductor to be detected. The direction of the arrow is the same as the direction of the conductor.

An error that the operator must avoid is that when the transmitter is in induction mode, other conductors in the area to be detected will also generate an induced voltage. In this case, the conductor generates an induced voltage due to an electrical signal, which not only transmits To the target conductor, but also to other conductors around the transmitter. These conductors may be overhead wires, telephone lines, barbed wire, guardrails, rails, or other public facilities. If the operator suspects the interference of these conductors, he can choose the direct connection mode to directly transmit the signal to the target conductor



Signals from other conductors can also cause interference and affect the accuracy of detection. Operators should try to the emitter is connected to the conductor directly or with a coupler clamp, if it cannot be connected, see Figure 2-2 Operation, the signal of the interfering conductor is the weakest, the effect of the measurement is the smallest. Place the SURE-LOCK transmitter directly above the interference conductor. At this time, the induced current generated by the interference conductor will be minimum.

When working in induction mode, another error that deserves attention and needs to be avoided is the phenomenon of air coupling. The transmitter radiates to the surroundings. When the distance between the transmitter and the receiver is too close, the signal generated by the transmitter directly reaches the receiver through the air. To avoid this, the transmitter and receiver should be kept at a distance of 75 feet (23 meters). However, if the detection requires a close distance, the conductor cannot be induced by direct connection. Please refer to the following steps. The side of the transmitter is 1 ~ 2 feet (30 ~ 60 cm) away from the conductor. 11 meters). The elimination of air coupling will be described in detail in the receiver section. Once the conductor generates an induced voltage, the operator should scan the ground with the receiver beyond the recommended distance. The receiver moves in a certain area, observe the display, and pay attention to the sound changes.



Double operation scan working mode

Another method of detecting the conductor is to work with two operators at the same time. This mode is usually used for turning on the transmitter and without knowing the starting point or end point of a given conductor.

Receiver, two people work at the same time, one takes the transmitter and the other takes the receiver. Two people move at the same time to ensure that the transmitter and receiver are as

Figure 2-4 Work, keep a certain distance between the two. When moving, to avoid air coupling, the operator holding the transmitter must note that the arrow on the transmitter is parallel to the conductor to be detected. When moving to the position shown in Figure 2-5, place the transmitter above the conductor, and then complete the next detection work according to one person's operation procedure. Note Once the conductor is detected, please determine whether it is the conductor to be detected, which can be judged by detecting the valve, junction box, and bracket.

SURE-LOCK conduction mode (direct connection mode)

Whenever possible, the conduction mode is the best working mode. Directly connecting the conductor with the wire clamp can eliminate many interferences in the induction mode, for example, the induced current and air coupling phenomenon of other conductors.

Using the conduction mode, the target conductor can be distinguished from other conductors, and the receiver can better receive the signal emitted by the target conductor. SURE-LOCK direct connection can be connected with cables or grounding devices. These grounding devices can be grounding wires, grounding aluminum plates, grounding nails, bridges, etc.

Note: When the transmitter is connected to the power transmission line, be sure to turn off the power first.

Make sure that the transmitter is turned off before connecting the cable clamp to the conductor equipment. The transmitter of SURE-LOCK can output a voltage of 100V, which is enough to produce electric shock. Please be extra careful.

When conducting the signal to the conductor in the direct connection mode, you must first insert the wire clip into the corresponding jack on the transmitter. The red cable should be connected to the conductor to be detected, and a strong signal can be generated when it is in good contact. To make metal-to-metal contact better, dust, rust and paint should be removed.

The black cable is connected to a suitable grounding conductor through a clip, such as a subway pile or a grounded aluminum plate.

The farther the better. The subway pile or grounding aluminum plate should be firmly fixed in the soil. If it is difficult, it can be laid flat on the ground. It is recommended to wet the ground, because there must be a good grounding when detecting. The operator should pay attention to the direction of the grounding cable, the grounding conductor. If the conductors are too close, these conductors will also be induced, and the detection will be disturbed, Figure 2-6.



If you select other objects such as barbed wire as the grounded object, the object will also be sensed, which will affect the operation. Pay attention to the importance and function of grounded objects in direct connection mode.

Note: The signal on the ground wire is as strong as the signal on the conductor.

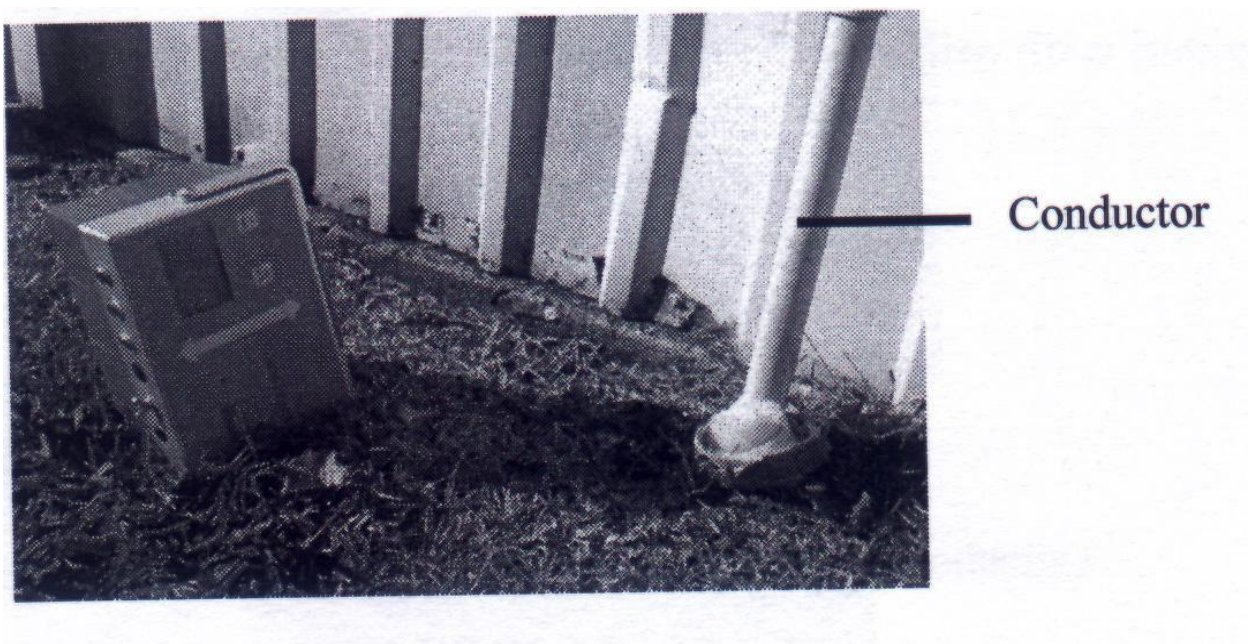
When using the direct connection mode to transmit the signal to the conductor, the operator can receive the signal with the receiver according to the single-person working mode. Because it is directly connected to the conductor, the inductive antenna on the transmitter does not function and air coupling does not occur.

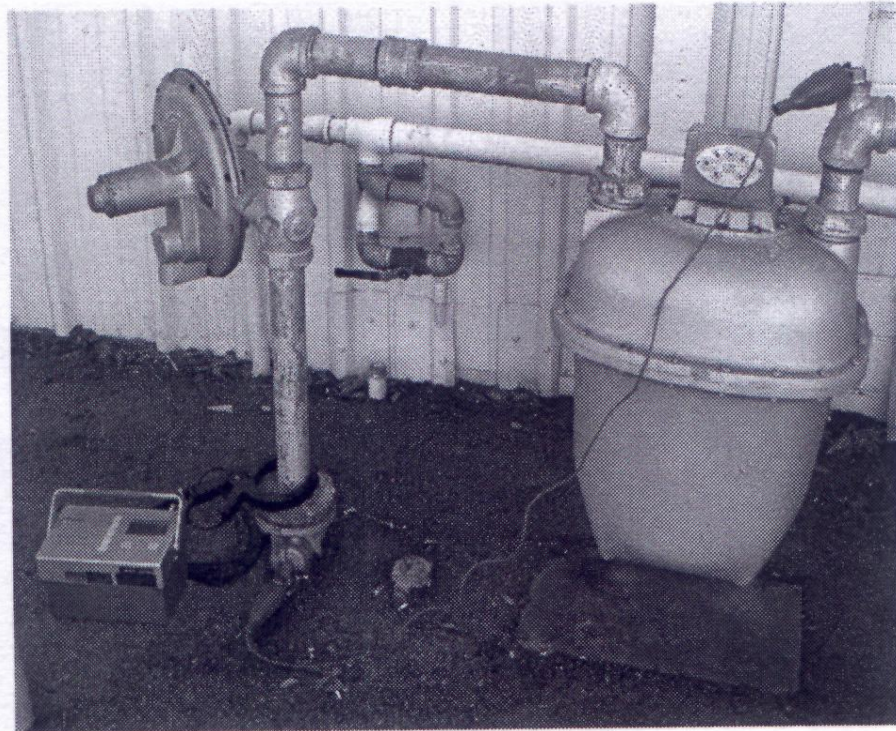
Personnel can be closer to the transmitter.

Use of coupler clamps

Another method of directly connecting conductors is to use coupler clamps. This device is used for the transmitter to directly transmit the signal to the conductor, or another clamp is used to connect the receiver to determine the conductor. These conductors have been sensed at the transmitter position. The use of coupler clamps is a very accurate way to detect and identify the target conductor because of its strong anti-interference ability.

1. The use of single coupler clamps, please refer to the use of clamps in this manual before use.





- a. Insert the clamp into the relevant output jack of the transmitter;
 - b. Turn on the power
 - c. Clamp the target conductor well, the joint of the clamp cannot be connected with the conductor touch;
 - d. Turn on the receiver and start working.
2. Work with double coupler clamps, this method is very useful for sensing or identifying other conductors on the conductor
- Effect, for example, manhole-manhole, manhole-cable cover, etc. Use two couplings
- When closing the clamp, both the transmitter and receiver are required.
- a. Clamp the first clamp on the target;
 - b. Insert the clamp on the output jack of the transmitter and turn on the transmitter;
 - c. Insert another clamp into the auxiliary jack on the front of the receiver and open the receiver.

Compared with the traditional tool tracking conductor, the coupler clamp is an excellent tool for separating signals. The coupler is an effective means to distinguish the tracking conductor from other conductors in the area, but it cannot be used in all detection work. Because no grounding device works in conjunction with the coupler, the signal must travel from one end of the conductor to the other. If the tracer conductor is empty, or the conductor is insulated or there is an insulating flange near the connection point, the coupler will not work properly. These insulating parts destroy the integrity of the conductor and prevent signals from propagating in the conductor loop.



在



In this case, the loop of the conductor must be closed. The coupler clamp is used in conjunction with the wire clamp. The wire clamp acts as a bridge to connect the two ends of the conductor. This bridge is used for the above-mentioned circuit disconnection. The cable can be connected on both sides of the insulation connection, or an insulation flange, such as a cathodic protection insulator near the gas meter on the gas pipeline, as shown in Figure 2-7. Note that the bridge must be allowed to be used at both ends at this time, and the bridge should be removed in time after the detection work is completed.

If the connection point is at the end or dead end of the conductor, as shown in Figure 2-8, the signal should be transmitted to the empty end of the conductor using a grounding pile / grounding plate, and the coupler clamp can It worked.

The coupler clamps work normally. When connected, the clamps should form a complete loop. The coupler clamps work normally without gaps.

Use of SURE-LOCK receiver

Correct understanding of the use of the transmitter is very important to correctly judge the signal of the receiver. As a highly intelligent device, SURE-LOCK pipeline locator can provide high measurement accuracy in various field environments.

1. After a proper induction signal is generated on the conductor
 - a. Turn on the receiver and select the frequency that matches the transmitter.
 - b. Confirm that the battery power can complete the operation to be performed. When the battery is tested, the battery power is 20% of the battery power.
 - c. The operator slowly moves the receiver detection conductor, and pay attention to observe the display on the receiver panel, as well as the sound indication and the sound change of the built-in speaker.
2. Lock indication: when the operator enters the signal area, there will be a corresponding lock indication on the SURE-LOCK locator display to ensure that the receiver can obtain a sufficient signal from the conductor.
3. Left and right display: The arrow on the display points to the position of the conductor. In synchronization with the arrow display, the speaker will make a sound.

The low tone indicates that the conductor is on the left side of the operator, and the high tone indicates that the conductor is on the right side of the operator. If the operator is directly above the conductor, there is no sound from the speaker.

The sound adjuster is used to adjust the volume.

1. Signal display: The signal strength indicator will appear on the display panel, and the range of numbers changes from 0 to 999. When the operator approaches the guide body, the value increases, on the contrary, the value decreases when away from the conductor. When the value reaches the maximum value, it indicates that the operator is very close to the conductor, and the receiver is in line with the conductor (see Figure 2-10).

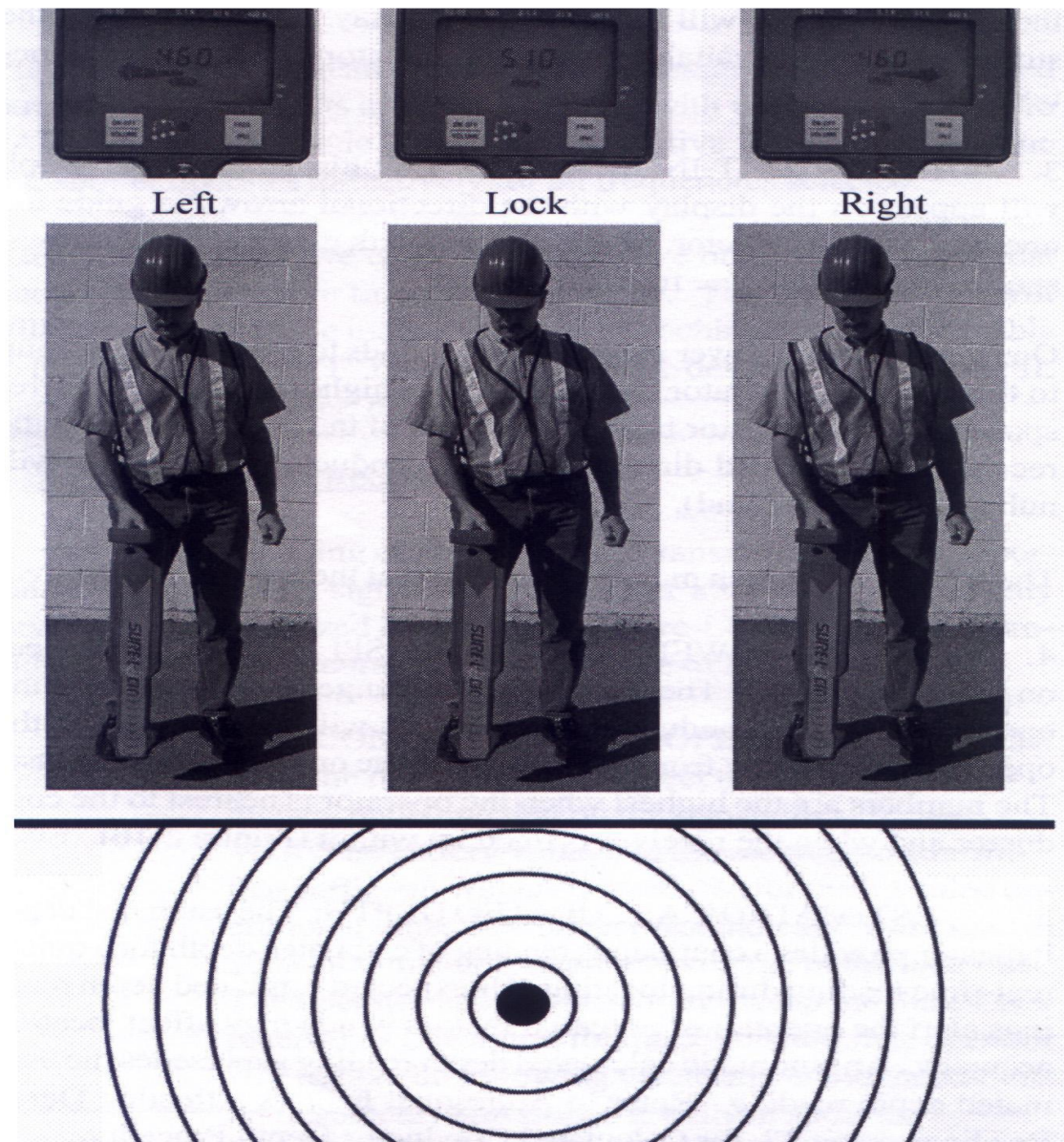


Fig. 2-10

1. Estimated / calculated depth value: SURE-LOCK can provide an instant display of the conductor depth estimate value. The unexpected depth estimate value reminds the operator that there may be other factors that affect the detection accuracy. The automatically calculated depth display replaces the estimated value. Refer to the description of calculated values in section J. When the operator ascertains the position of the conductor and the receiver is just above the conductor, there will be the following situations:
- a. The lock indication is active.
 - b. The left and right arrows on the display, the segmented bar graph disappears.
 - c. The left and right sound indicators disappear.
 - d. The relevant maximum signal strength indicator is displayed on the display.
 - e. Estimated depth value display.

Each of the above information provides the operator with valuable information for tracing the conductor. If none of the above conditions occur, it indicates that the position of the conductor has not been determined.

Steps for calculating conductor depth value

Once the operator confirms that the conductor has been positioned according to the above sound and visual display, then the calculated depth value can be displayed.

The operator should perform the calculation of the depth value display according to the following procedure:

1. Keep the receiver vertical, place the end of the receiver directly on the ground above the conductor, and keep the receiver and the conductor vertical.

1. Keep the receiver vertical, and the bubble should be in the middle of the bubble level.

shift.

2. Hold this position for about five seconds, you can automatically obtain the calculated depth of the conductor

Degree value display.

3. Observe the calculated depth value that appears on the display. This value will remain for a few seconds, displaying the distance from the end of the receiver to the center of the conductor in centimeters.

Then, SURE-LOCK will automatically return to the detection mode and display the estimated depth value.

4. For the same conductor depth display, multiple detections, multiple display calculation depth value. Of course, keep the receiver vertical.

If the depth value is not displayed on the display, or there is no reasonable digital display, this generally means the following:

- a. "Abnormal number" display (left and right and signal strength indication is unstable).
- b. Air coupling phenomenon occurs in the transmitter.
- c. Interference with other conductors.
- d. The conductor depth exceeds the limit of 288 inches (732 cm).

These phenomena remind operators that they should re-determine the working position of the transmitter, or choose other transmitter working modes.

Other factors affecting the depth reading:

1. Interference with other conductors in the detection area.
2. The type and conductivity of the soil.
3. The receiver is not in the center of the target conductor.
4. The relative relationship between conductor depth and size.

5. The depth of the conductor changes, or the conductor is inclined at the reading position. .

6. Grounding method.

Two methods are usually used to assess the influencing factors. One method is to rotate the receiver around the axis

At 180 degrees, this method can cause a depth value error of 10%. When the error reaches 15-20%, the average value can be taken, which can be used as the reading result of the inclined conductor. Errors greater than 20% indicate inaccurate readings. Another method is generally called "lifting experiment". This method involves a standard calculated depth value, and then the receiver is raised to a certain height, and the new calculated depth value is observed on the display. The part where the reading is higher should be the lifting height of the receiver.

The reading of the receiver's calculation of the depth value needs to integrate the above influencing factors, otherwise, the calculation depth error may exceed 20% of the true value.

Safety first!

Before the transmitter is directly connected to the power supply, please turn off all power supplies to ensure safety.

Care should be taken when using the SURE-LOCK locator to directly connect the 240V, 56 ~ 60HZ power supply mode. Not all modes have this function (HOT BOX).

Before the transmitter is connected to the conductor, the power supply should be turned off. The SURE-LOCK transmitter can output a voltage of 100V, which is enough to cause electric shock if you are not careful.

In order to ensure a good sign, it is recommended to insert a flag with a safety sign on the bracket of the transmitter on a street or a place with heavy traffic, and place a traffic cone beside the transmitter. At the same time, the operator should wear a safety vest and a sturdy hat when performing the operation.

If the SURE-LOCK is well maintained, it can be run trouble-free for many years.

III SURE-LOCK Optional Accessory

Optional accessories for A. SURE-LOCK pipeline detector

Coupler clamp: Type 91 Product code 58212524;

58 type product code 56212309;

Type 10 Product code 56112652

Probe rod:

Product code: 1900480

The probe rod has a tempered steel rod of 0.5 inches (40 inches long) and an insulated piston handle to protect the operator from electric shock. Various models are available.

It is impossible to include all the information in this manual. A good device needs good operation. The device only cooperates with the operator. Both are good, so the operator should understand the correctness of the device. The method of use, repeated practice many times, after mastering certain experience, will surely become the expert of using SURE-LOCK locator. For more information, you can contact Hans directly via phone or the Internet.

IV Warranty

All equipment and products produced by Heath are guaranteed to be free from defects in materials and workmanship for one year (from the time of shipment).

The probe rod (except the handle) is guaranteed to be free from defects in materials and workmanship for 90 days.

The limited maintenance time of the authorized maintenance organization of the factory in Houston is 90 days of material preparation and 30 days of labor.

This warranty is limited to material problems and process problems during use; it does not include damage during transportation, of course, it should be treated separately if it is caused by packaging problems; this warranty does not include problems caused by: accidents, improper use, Negligence, wrong operation, unauthorized modification and changes, and failures caused by repairs not authorized by Heath. The warranty does not include batteries and damage caused by battery leaks, as well as other probe rods Consumables.

Heath is responsible for repairing or replacing faulty parts, returning faulty products to authorized repair institutions, and reliable guarantees. The cost of maintenance does not need to be borne by the customer.

Heath is not responsible for failures and damage caused by indirect causes. In addition to the above guarantees, Heath does not make any other guarantees.

When you need to repair Heath products, Heath has the following recommendations:

Pack carefully, use the original shipping carton, and return all parts.

Pay attention to shipping and billing addresses.

Indicate the device and product name, device model, and related serial number. Fault phenomena and contacts.