GOLDAK

Underground Detection Equipment

OPERATING MANUAL

MODEL CI-5120
SEWER & CAMERA LOCATING RECEIVER

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A. General Description

The Goldak Model CI-5120 Sewer and Camera Locator is a portable gun-style instrument designed to help an operator to determine the underground location and depth of a 512-Hz transmitting device, sometimes called a "sonde". Often such a device will be integrated into the head of a sewer inspection camera. However, Goldak also manufactures battery-operated stand-alone transmitters (Model SR-512, Model SR-2512, and Model SR-512 Pulse) that may be attached in-line to a sewer cable, and that are compatible with the CI-5120 receiver. The 512-Hz signal that emerges from the transmitter is capable of penetrating cast-iron sewer lines as well as all non-metallic lines.

The design of the CI-5120 receiver strives for simplicity, relying on well-known, tried-and-true locating principles for operation. The controls are basic and essential. An experienced locator will immediately recognize the advantages of the CI-5120: appropriate control and audio/visual feedback for getting the locating job done quickly and accurately.

An operator with little or no experience with sewer locating can rapidly gain understanding, experience, and confidence by reading through this manual, studying the illustrations, and trying the instrument under controlled conditions. Goldak makes available a training video for sewer locating, as well. (See Section F of this manual for contact information).

B. Receiver Features

The CI-5120 consists of a control housing and a detection head mounted on the end of a sturdy extension shaft. The control housing features the control panel, speaker, and LED response display on the external face (see Figure 1). On the bottom, the housing is mounted on a pistol grip by which the operator holds the instrument while using it. Internally, the housing contains electronics that are connected to the detection head. Starting with the control panel, the instrument's mechanical features are detailed here:

1. "POWER" Switch: This rotary switch has three positions ("OFF", "ON", and "FILTER"). The "FILTER" mode allows the operator to hone in on specifically on the exact 512 Hz frequency. This will be discussed in greater detail under "Locating Procedures" below.

2. "SIGNAL ADJUST" Control: This is a continuously variable knob that allows the operator to adjust the amount of signal that is registered on the audio/visual response. It is sometimes called a "gain" control. Turning this knob completely clockwise will maximize the sensitivity of the receiver. Adjusting it while locating is helpful when trying to pinpoint "nulls" and "peaks" in the signal. This is the most important control for the operator to master.

Figure 1 - Instrument Features

3. "HEADPHONE" Jack: Stereo headphones (8Ω) with a 1/4 inch plug may be plugged into this jack. The audio signal will be routed away from the speaker and into the headphones.

4. Speaker: Will provide a strong, clear audio feedback while in the vicinity of a transmitter.

5. Light Bar Display: Visual feedback that indicates the strength of the detected signal from the transmitter.

6. Battery Indicator: Normally green, this indicator will turn red when the batteries need to be changed.

7. Pistol Grip: Molded to accomodate a secure hand grip. The receiver is ergonomically balanced around the pistol grip.

8. Detection Head: A sensitive, directional antenna securely mounted in a molded T-housing. The detection head senses the radiated signal from the transmitter. Swivel-mounted, the head can be set in any of three operating positions (figure 2) to aid in location and depth-triangulation (see more under "Locating Procedures" below).

FIGURE 2 - DETECTION HEAD POSITIONS

Horizontal "T" *Vertical* *45°*

C. Locating Procedures

1. Using the CI-5120 Receiver

To turn on the receiver, turn the rotary "POWER" switch one position clockwise to the "ON" position. For maximum sensitivity, turn the "SIGNAL ADJUST" knob all the way clockwise. For no response at all, turn this knob all the way counter-clockwise. The sensitivity of the receiver will change linearly with the position of this knob.

With the "SIGNAL ADJUST" control set to the desired level, sweep the area above ground near where the underground transmitter is likely located. If a small transmitter is being used (like the SR-512), the receiver will respond to it within a radius of 15-20 feet. If a large transmitter is used (such as the SR-2512), this detection radius will be as much as 25 to 30 feet.

2. Locating a Transmitter Device

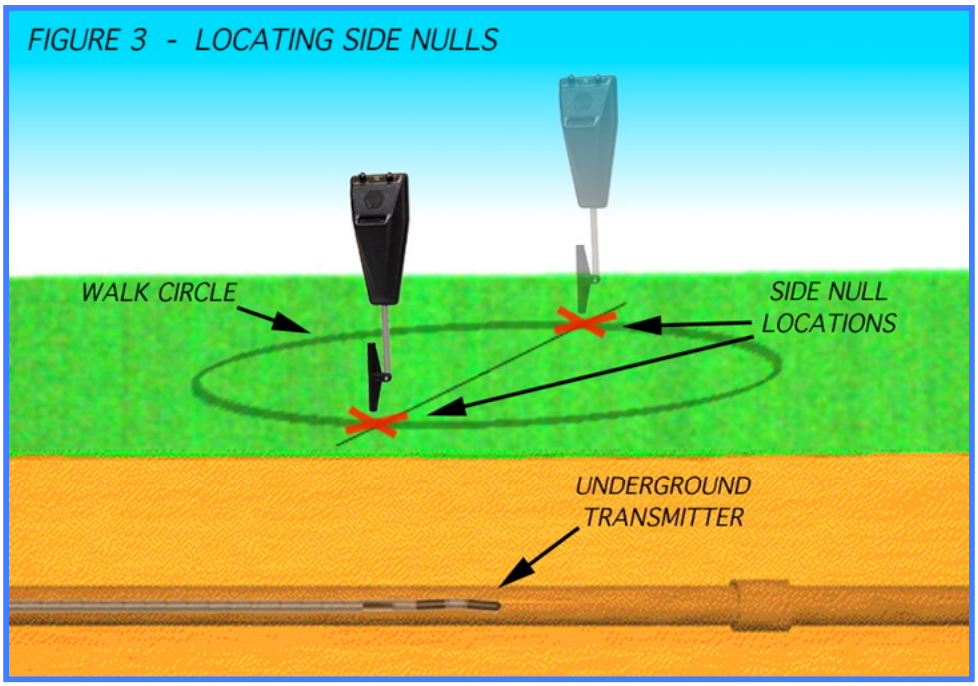
Having detected the transmitter, the operator of the CI-5120 may pinpoint its location by one of two methods: by "nulls" or by "peaks".

a) Locating by "Nulls"

i) Put the detection head of the receiver into the vertical position as shown in Figure 2. Position the CI-5120 vertically with the detection head near the ground (Figure 3).

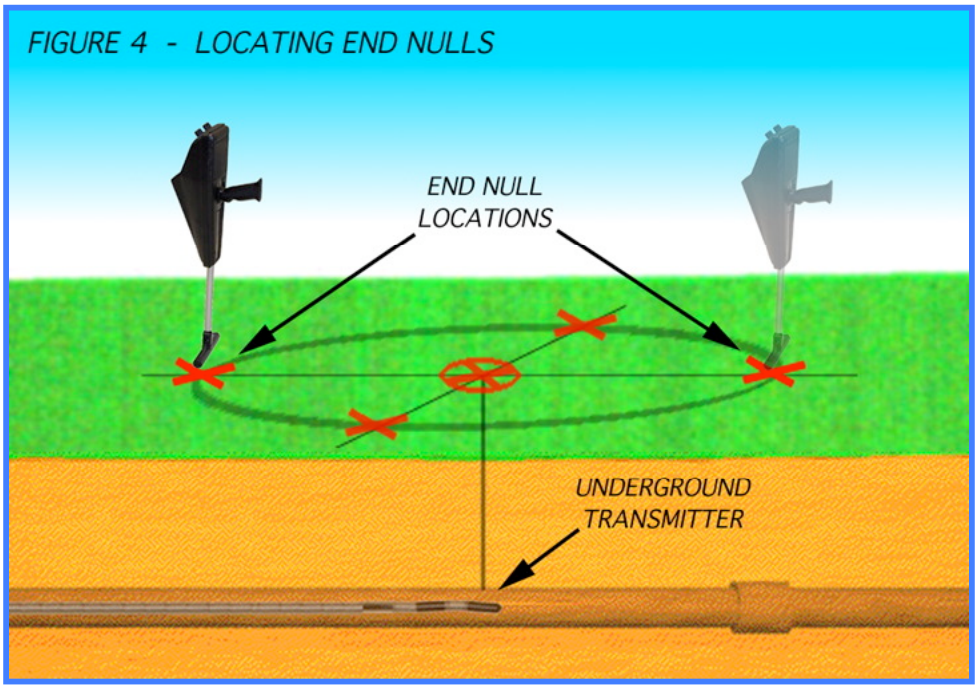
ii) Set the "SIGNAL ADJUST" control anywhere from medium to full sensitivity. *NOTE:* in practice this setting will vary depending on the strength and proximity of the transmitter.

iii) Proceed to locate as shown in Figure 3. With the detection head vertical, walk in a square or circle in the signal area around the transmitter. As shown, you should be able to locate two nulls, where the response suddenly vanishes. These are called "side nulls". Mark on the



ground the locations of the side nulls, and draw a line through these marks.

iv) Now swivel the detection head to the horizontal position ("T" position). Stand three to five feet off of the line just drawn and sweep the detection head in line (parallel) with the drawn line. You will locate a null somewhere along this path. This point is called an "end null". Mark the location



of this end null, and find and mark the corresponding end null on the opposite side of the drawn line.

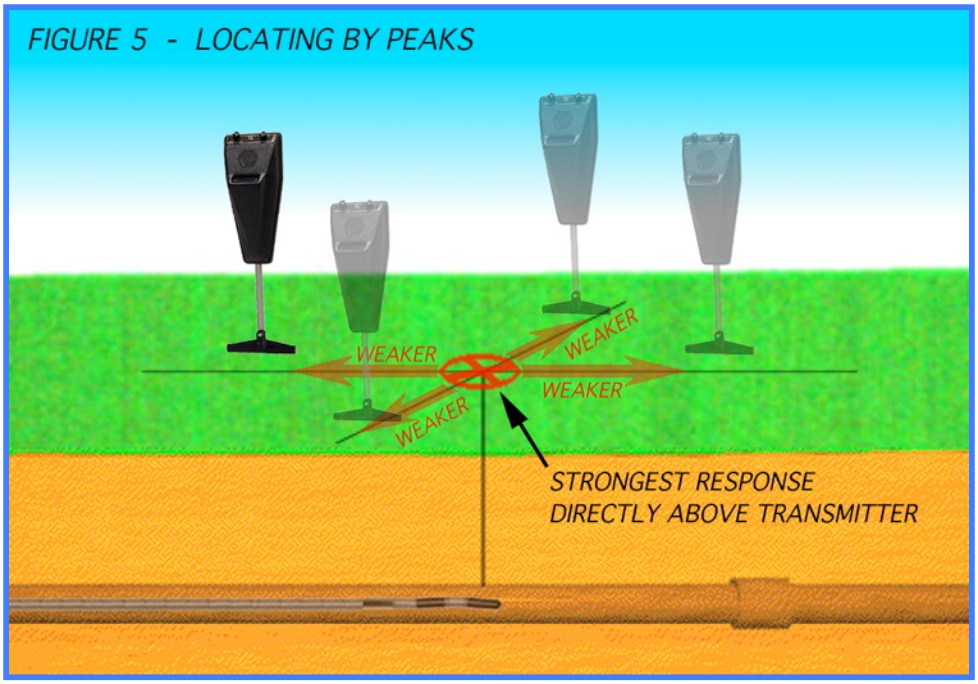
v) Draw another line connecting the end null locations. Where the two drawn lines intersect is the surface location directly above the underground transmitter. Therefore, this intersection is directly above the sewer line as well.

b) Locating by "Peaks"

i) Put the detection head in the horizontal ("T") position. Hold the CI-5120 receiver vertically, with the detection head near to and parallel with the ground.

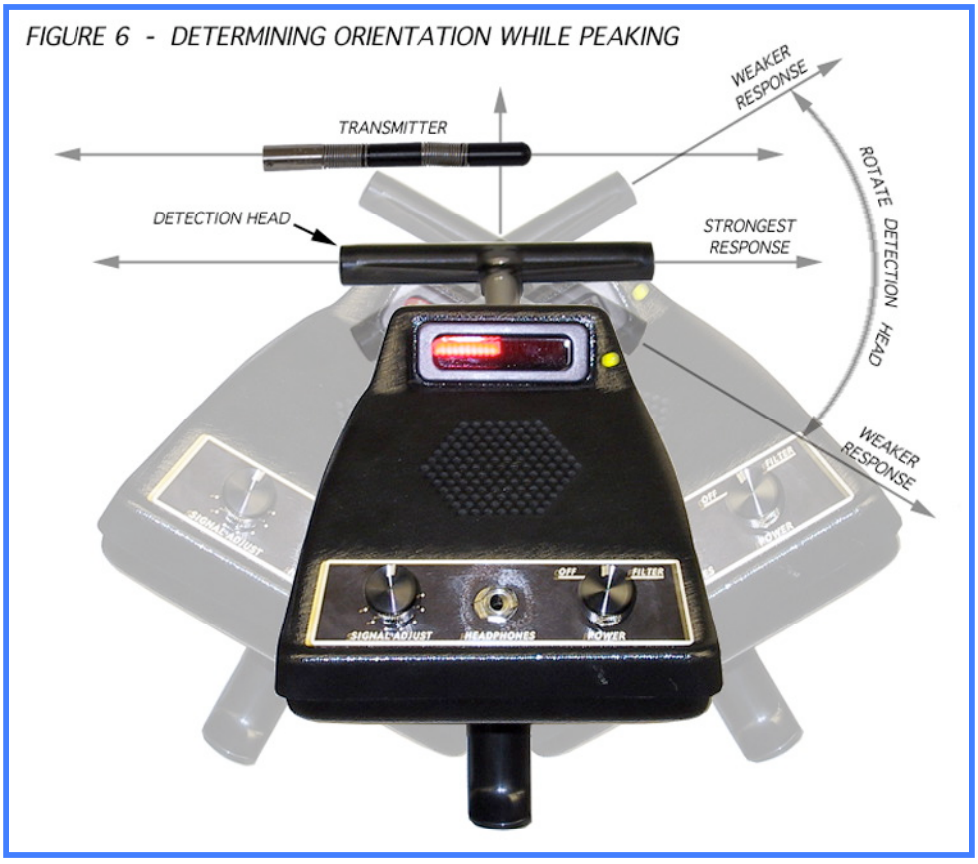
ii) Set the "SIGNAL ADJUST" control so that the graph display reads half-scale, maximum.

iii) Proceed to locate as shown in Figure 5. While holding the detection head horizontal, walk in a direction that causes the signal response to increase. If the response reaches full-scale, adjust "SIGNAL ADJUST" counter-clockwise to reduce the response toward half-scale again.



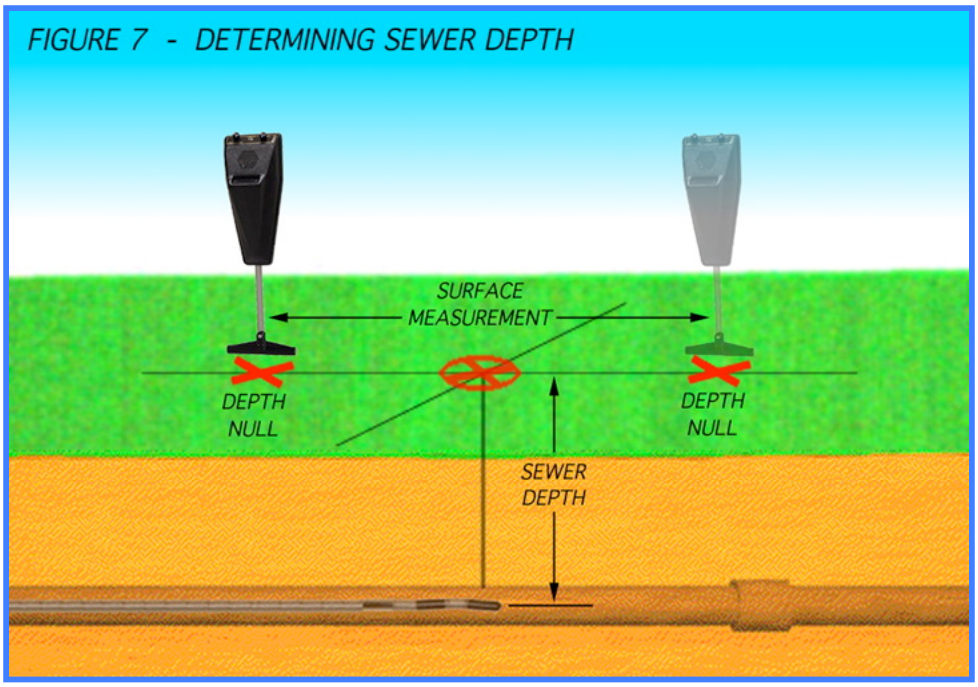
iv) Continue to search in this manner until the signal response "peaks". The peak is that location at which the response is the greatest relative to that of the immediately surrounding area. Mark this location. The underground transmitter (and the pipe) should be directly below this mark.

v) To determine the orientation of the transmitter, rotate the detection head over the peak mark, as shown in Figure 6. When a maximum response is registered, the detection head will be in line with the transmitter.



3. Measuring Line Depth

To measure the depth of a line at a given point is to measure the depth of the transmitter within the line. This is done by locating “depth nulls” and measuring their separation. When done properly, this technique is fail-proof and accurate, and can be used, for example, to determine the fall of a sewer pipe.



a) With the detection head in the horizontal ("T") position, hold the receiver so that the detection head is in line with and directly over the line drawn between the end nulls, right above the transmitter.

b) Move the detection head along this line and search for a null to either side of the transmitter location. Mark the location of the null.

c) Similarly, locate the depth null on the other side of the transmitter location, and mark this location.

d) Measure the distance between the depth nulls. This distance is the "surface measurement".

e) Use the depth calculator disc to relate the surface measurement to the actual depth of the transmitter in the line. If you do not have a depth calculator, the depth can be calculated as follows: depth = 70% * surface measurement.

4. Using the "FILTER" feature

When the right control knob is rotated to the “FILTER” setting, the CI-5120 employs a special filter that electronically enhances the 512 Hz signal specifically. The result is a strong, easily recognizable response that provides sharp peaks and nulls that are easy to identify.

Note: The user will discover that jobs will be done easier using the CI-5120 Receiver in “FILTER” mode. While “FILTER” is an electronically enhanced signal, “ON” is a true signal, which portrays the transmitter exactly as it sounds. This may become advantage as in areas of difficult congestion, an experienced user could potentially recognize his transmitter signal against that of closely related interference signals.

D. Understanding Sewer Transmitter Devices

Traditionally, the most reliable way to locate underground sewer services has been to insert a locatable transmitting device into the sewer line, and to use an appropriate receiving device to find the surface position and depth of the transmitter. Because the transmitter is inside the sewer line, these measurements apply to the line itself at that point.

Most, if not all, sewer transmitters use a small directional antenna that emits a signal field in a predictable pattern. The signal frequency can be very low (i.e., 512 Hz) and range up to RF (several hundred KHz). The field pattern allows a receiver to precisely locate tell-tale points around the transmitter (nulls). These nulls can be used to determine exact location and depth of the underground transmitter (see “Locating by Nulls” above).

Different sewer transmitters have different applications, depending on the job being done. A low-frequency transmitter (512 Hz) is good for general sewer locating, because its signal can penetrate cast-iron as well as non-metallic lines. However, low-frequency transmitters tend to be more limited in range and are subject to being interfered with by powerline fields. Radio-frequency (RF) transmitters are very good for non-metallic sewers and conduits, because they tend to provide greater range in smaller packages

compared to low-frequency transmitters. Also, some jobs that cannot be done with a low-frequency transmitter can only be done with an RF transmitter (e.g., finding a break in a cast-iron line).

E. Miscellaneous Notes and Suggestions

- It is advisable for the operator of the CI-5120 to become familiar with using the instrument prior to doing an actual underground location job for the first time. We recommend that the operator practice locating a visible transmitter in order to gain this familiarity. In doing this, it will become clear how to locate the nulls (and how the position of these nulls relates to the actual position and orientation of the transmitter).

F. Technical Assistance and Servicing

If you are having problems using the CI-5120 Receiver, please consult this manual first. If this manual does not provide the information you are looking for, contact Goldak Inc. in any of the following ways:

Phone: (818) 240-2666
FAX: (818) 244-6818
E-Mail: sales@goldak.com

Goldak can provide you with videos for additional training.

If you believe that the instrument is not functioning properly or has become damaged, you may send it to our repair department. If you do so, we suggest the following:

- Securely pack the instrument for shipping, including all accessory items normally used with the instrument.

- Include with the instrument a note describing what kinds of problems have been encountered while using the instrument. This information will help our technicians more quickly diagnose the problems.

- Send the packed instrument to this address:

  547 Arden Ave.
  Glendale, CA 91203
  ATTN: Repairs

  Be sure to include a customer number, name, and return address on the carton or inside the package. Goldak will respond with a repair estimate shortly after receiving the instrument.