Pipe and Cable Locator
Pearson Holiday Detector
Model EPT- 1000

Electronic Pipeline Technology

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Theory of operation:

Dr. Pearson from the United States of America for the first time discovered that electromagnetic waves can be stored in a pipeline and create a circular electromagnetic field around the pipe. The receiver with a search coil is able to detect this magnetic field. This is the principle theory as to why most pipe and cable locators work.
The Model EPT- 1000 operates on what is known as the “Conductive” Principle.
The Transmitter provides a distinctive electrical signal current and by doing proper application and installation, the current causes a flow to a loop which is the pipe and cable being investigated.

An electrical current flowing in a pipe or Cable creates a circular Magnetic field. If an antenna coil is placed within that field, an electric current is induced in the antenna. This current can be amplified and heard on headphones, loudspeakers, or by visible meter.

The relative loudness of the signal, with the position of the antenna coil, enables the operator to determine with precision the location of the pipe or cable and its depth below the ground surface.

By understanding these principles, and the use of this equipment, it enables the operator to find out many factors such as; location of extension, open, or grounded.

The Receiver has a high gain amplifier that employs Transistors and active filters for 750 HZ. The filter rejects interference of any AC and DC current except the pipe magnetic field. The search coil has low Impedance and has a gauge for 45 degree angle. .

The pipeline locator is equipped with loud speakers and it is possible to connect it to earphones. There is a switch to test the Battery condition before operating.

The audio frequency current causes a current flow in a Pipeline, creating an Electrical field around the pipeline. The Intensity of the electrical field depends upon the amount of current flowing in the pipeline.

This electrical field can be measured by placing a search coil in the same plane as the pipeline. As the coil moves back and forth making a right angle with the pipeline, the electrical field will be cancelled directly over the pipeline. A null will be noted as long as a relatively large amount of audio current is flowing in the pipeline.

Using the null method, it is possible to follow the pipeline while a large amount of audio current is flowing in it. When a large amount of audio signal can be applied to a pipeline, and a suitable receiver is used, the practical depth of the pipeline locating can be extended to much greater depths. Pipeline at depths exceeding 35 feet have been accurately located by employing this equipment and method, and depths greatly exceeding this may be possible, depending on the condition of protecting coating.

To locate deeply buried or submerged pipelines, the audio oscillators electrically connect to the pipeline at a convent location at either ends of the line, but properly at a terminus so the audio current will flow in one direction only. If the pipeline is well coated, the audio oscillator may be made though the water in the immediate vicinity of the pipeline terminus. If the pipeline is poorly coated or has no protective coating, the audio oscillate ground should be made through a well insulated cable to a point several hundred feet away from the oscillator and a right angle to the pipeline.

After Audio frequency current is properly applied to the pipeline, the locating survey is conducted from a boat. The operator should place the search coil in a horizontal position with reference to the pipeline and as the boat makes am oblique traverse over the pipeline, a sharp null effect will be noted. By audible observation, the operator will notice a gradual rise in tones as the location of the pipeline is approached and the null effect should occur when the search coil is directly over the pipeline.

This method and equipment can be used in locating pipelines in almost any situation. With well coated pipelines, the operator can advance away from the audio oscillator for several miles. Another positive aspect of this method is the tracing of an individual pipeline through a mass of pipelines, provided the one under study is isolated.

Receiver Model: “EPT- 1000”

Specifications:

1) 8 step sensitivity selector start with A up to H
2) High and low switch gain for long distance tracing
3) Power ON and OFF selector and Battery condition tester
4) Search coil with an extra cable to connect to the Receiver
5) Audio Volume for loudspeakers or headphones
6) Nickel Cadmium rechargeable 7.2 volt Battery
7) Analog meter “100uv full scale” is a rugged sealed meter, properly damped to visually display and follow the receiver signal.
8) Audio or Headphone alarm when receiving signal
9) Low consumption rate current max 25 mil amp.
10) Filtered input for only for 745 HZ and 4 HZ Audio Frequency with automatic gain Control “AGC”.
11) Ability to find exact pipe location point by using null method theory and find the approximately depth by the using 45 degree Rule.

"EPT- 1000 RECEIVER"

Transmitter Model: “EPT- 1000”

The transmitter is designed to operate from a 12 DC volt External power sources. It contains a circuit that generates a distinctive AC 745 HZ signal. The signal is accompanied by an interruption signal 4 HZ to make the signal more distinctive. An operator has to connect the signal to the conductor and ground.

Specifications:

1) Crystal Control Oscillator
2) Dual Transmitter Frequency 745 HZ and 4 HZ
3) Temperature Frequency Stabilized
4) Selectable output voltage from 2- 75 volt to match the unit impedance with conductor with a visual meter indicator.
5) Enable and Disable Interruption Switch
6) Battery Test LED indicator
7) Heavy duty Pelican case Model “1350” and weight approximately 6.9 Lb.

EPT- 1000" Transmitter

Transmitter (30 W)

1- Power selector: to match the output with pipeline impedance and has five steps.
2- Interruption switch: to distinguish transmitter from other sources. It has three steps. The first and second for matching the impedance with the pipeline and the third one is the interruption mode which disconnects the meter from the output power.
3- Output terminals for connecting it to the pipeline with two alligator connectors
4- Input Battery terminals: for connecting extra Battery or to charge the internal Battery
5- Battery condition LED tester
6- Switching charger for work from 90 up to 260 volt

How to start operation and trace the pipeline:

Charge the Batteries of the Receiver and Transmitter. The receiver Battery is good if it is over the 80 Receiver scale meter.

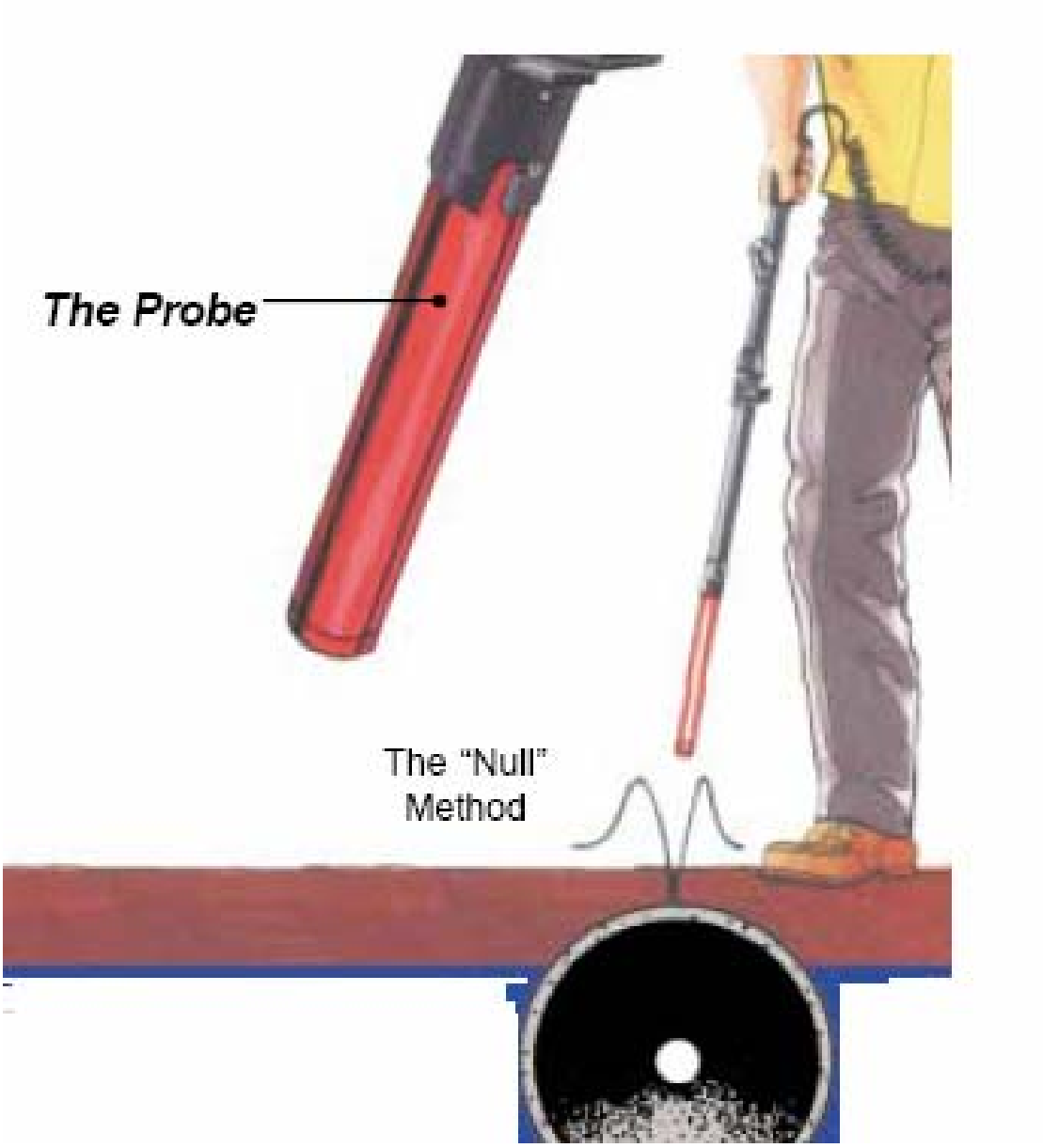
Connect the output of the transmitter to the pipeline and a remote ground wire perpendicular to the pipeline. Turn it on and Put the power selector on step A. Then select Interruption switch OFF.

By changing the selector you have to find the Max voltage on the Meter. If the Meter is a full scale (scale =1 for output voltage) then select the middle state of interruption switch (scale = ½ output voltage) and then find the max voltage on the Meter.

When you find the Max power step, you can change the Interruption switch ON and automatically the Meter will turn OFF. Normally when there is a big pipe and bad coating it, will start from low voltage and high Current up to a small pipe with good coating and will be in the end of the power selection with higher voltage.

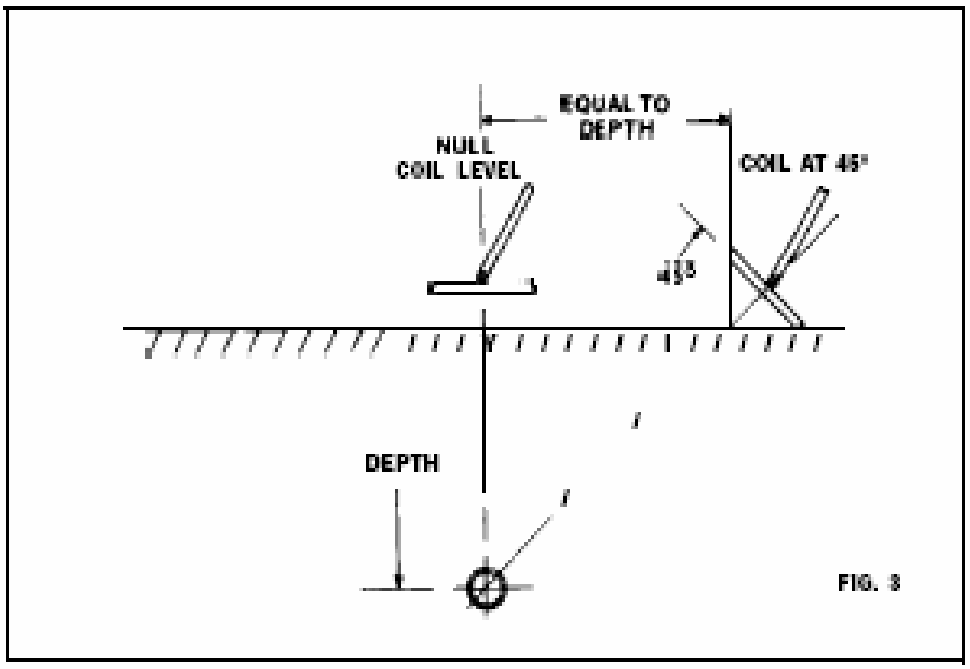
Connect the search coil to the Receiver. Put the Gain switch on low and Range switch on step A. Stay on the assumed pipeline, go back and forth to hear the interruption beep alarm, otherwise step by step increase the range switch to hear the beep. When the hearing the beep, the operator will approximately find the pipeline. Please put your volume very low on the red line.

To find the pipeline location accurately, put the search coil in a vertical position to the ground and go back and forth suddenly. Only in one location the beep will stop and you have a null and if you continue the beep will start again. This null point is the exact location of the pipeline.


The Probe
The "Null"
Method

How to find the depth of the pipeline:

When you find the exact location of the Pipeline, put your search coil in 45 degree angle by using the gauge on the top and perpendicular to pipe gently move back until the beep stop. The distance from the pipeline to this point is the depth of the pipe.



Pearson Holiday Detector:

EPT- 1000 detector is designed to locate discontinuities, flaws or breaks in the coating of buried pipelines. This method makes it possible to locate the exact location of coating breaks in buried lines without access to the surface of the coated pipe. Locating electrical discontinuities aids in evaluating the application of a coating and also these discontinuities can be repaired to eliminate corrosion and to reduce the amount of current required for cathodic protection.

The method used to locate discontinuities is that of applying audio frequency A.C. energy between the coated pipe and ground. A traverse along the pipeline is made in with the difference in potential is indicated across approximately twenty to thirty feet of soil above the line. This potential difference is noted in the Receiver. When an area is reached where the difference in potential is considerably greater than the average potential over the pipe, a discontinuity is assumed to lie under this area.
A loudspeaker is built into the Receiver, eliminating the need for earphones except in noisy areas. Plugging the earphones into the jack marked PHONES disables the loud speaker.

Both operators have a pair of pogo sticks; both pogo sticks of an operator are parallel running the cables inside their pant legs. The key operator connects with wires from both of his Pogo sticks to the one input Receiver terminal. The secondary operator connects the

wires from both of his pogo sticks to the other input Receiver terminal.

The Receive is turned "ON", and the apparatus is ready for use.

The traverse along the pipeline is made by walking over the pipe at a slow speed. Beginning adjacent to the transmitter set the Receiver Selector so that the signal from the Transmitter can be heard at a very low level. As progress away from the Transmitter is made, the signal may drop and the level can be raised again by increasing the Selector level. A discontinuity is indicated by an increase in average signal level, followed by a relatively sharp decrease, and then another increase and then back to normal level as progress is made over the discontinuity.

The exact point of discontinuity lies under the point of decreased signal or null. This, then, is the point halfway between the two operators. If a series of discontinuities exist in close proximity to each other, the null effect may not be heard, or very difficult to observe. In this case, one man walks along the line and the other walks at right angles to the line and a discontinuity is noted by an increase in signal of voltage Gradient directly over the fault.