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*SETTING THE STANDARD FOR SERVICE*

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## TECHNIQUES FOR BETTER LOCATING

Line locating is not rocket science. A little common horse sense should tell you that some of the information being taught by so-called experts is not true. They teach what they think to be true because that's what they were taught. "Always place your ground rod 90 degrees from the route of the line being located", or "direct hook up is the preferred method of placing signal on a line" are a couple of examples that are not true.

1. ALWAYS PLACE THE GROUND ROD AT 90 DEGREES FROM THE ROUTE OF THE LINE BEING TRACED.

How do you know where 90 degrees is? You don't know where the line is, that's why you're out there. If you knew where 90 degrees was, you may not have to trace the line because you already know where it is.

On a direct hook up, the transmitter signal injected into the line must come back to the ground Rod to close the circuit loop. You cannot have current flow unless you have a closed loop and current is what produces the magnetic wave your receiver is looking for. It is far more important to have a good ground than a ground at some remote distance. Pouring water on the ground rod will also help a locate in dry soil. A good ground next to where the hook up is being made will do several other things that could improve a locate. ( a ) You have less chance of inducing signal into some other utility by crossing it with your ground rod. ( b ) It will help reduce the error in the locate near the transmitter from a distorted radio wave created by your direct output wires. If it is true that two radio waves can repel each other as I will prove later in this article, where the direct output leads and the ground rod is positioned can mess up a locate when you are locating near your transmitter. The signal on the ground rod wire can repel the signal on the line being traced creating an error in the locate.

You can demonstrate this by finding the line under test. Move your ground rod out four or five feet in the direction the line is running and install it two or three feet off to one side of the line you have located. Turn your transmitter on and see if the line is in the same place. Since I have never seen a line move just because I moved a ground rod, I will have to assume the ground wire signal is pushing the locate off to one side.

## 2. DIRECT HOOK UP IS THE PREFERRED METHOD TO MAKE A LOCATE.

The preferred method is the method that works on the locate in question and the direct method will not always do this. Those who make these statements should take the time to learn more about instrument and other methods of using it.

One method that is often overlooked is the Inductive Coupler. When a telephone or cable TV pedestal is opened, try placing the Inductive Coupler around the cable to be located. The "Signal-Divide-Down" phenomenon will allow the locate to be made without grounds being removed. If available, the service drop or meter riser at the house will allow a trace back to the pedestal or transformer with ease and much faster than trying to set up a good ground or removing ground bonds.

Contract locators cannot open some enclosures and as a result, they are limited to where and how they place signal on a line to be traced. Their life would be made a lot easier if they would learn to use their locators in all the ways that are available. When we focus on one or two methods of using a locator, we limit our ability to make some locates. Even though the instruction manual tells you three basic methods of inducing signal, there are numerous variations of each method. The instrument you are using is nothing but a tool, you are the locator. How you use the tool is what will make the difference. In other words, it is time to start making the instrument do things the way you want them done instead of accepting what it has been doing for you.

The following information will explain how the radio wave can distort and throw your locate off to one side of the actual position.

When utilities were in the ground by themselves, locating was easy. Even a good set of welding rods would work for some people. With the advent of joint trenching where a multitude of pipes and cables are in the same trench, a whole new set of problems came forth in trying to produce a good locate and we manufacturer's are part of the problem.

Just because we design and produce line locators and have been making locates for a number of years does not necessarily qualify us to teach utility locating. I hear salesman telling customers they can teach you everything you need to know in 30 minutes. I wish it were that easy. My job would be a lot easier if that were true.

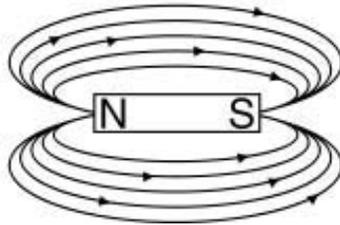
First of all, there has never been a pipe or cable locator that ever located a pipe or a cable. The locator you use can only locate a radio magnetic wave that radiates above ground. The instrument has no idea of what is below ground or where the signal is coming from. It only reproduces the information it detects above ground.

Like a wrench we purchase to take a nut off a bolt, the electronic instrument we use to make a locate is nothing but a tool. The nut will not come off the bolt until we make the wrench do something. In other words, we are the locator and the instrument is nothing more than a tool.

To use the tool to your best advantage means you need to take command of the instrument and make it do what you want it to do instead of it taking command of the locate. To do this will require a little more information than the average company is providing to the operator. A basic understanding of what the instrument can and most of all cannot do is an absolute must.

In Figure 1, we show a magnet. You cannot see them, but magnetic lines are radiating around the magnet from the North Pole to the South Pole. By placing a piece of paper on top of the magnet and sprinkling iron filings on the paper, we can see what the magnetic lines look like. When two north poles approach each other, we can see what happens to the magnetic lines as the two poles appose each other. The iron filings will show how distorted the magnetic lines become. The magnetic lines around a magnet would be like a magnetic wave around a conductor if we place a D.C. voltage on that conductor.

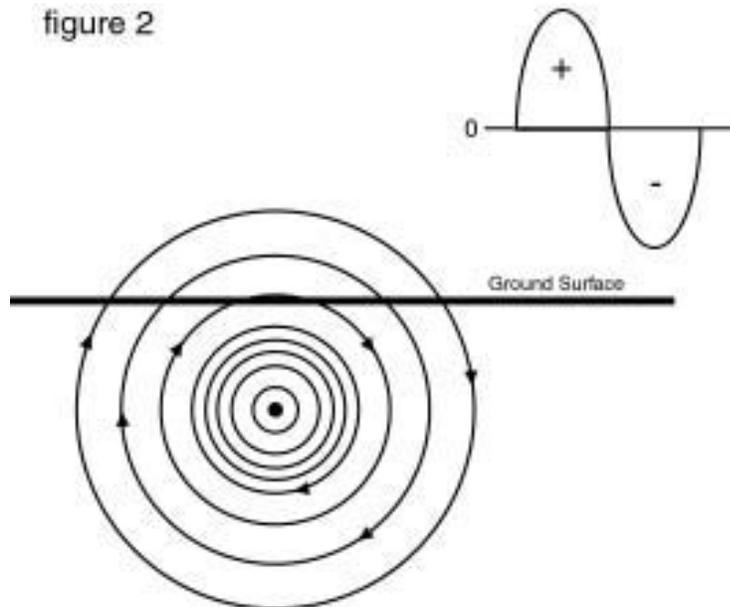
figure 1



In other words, the lines only travel in one direction.

In figure 2, we show what the radio magnetic wave looks like when an A.C. signal is placed on a conductor. Because an A.C. sine wave has a polarity above and below a zero reference line, the radio wave not only increases from the zero reference line, it decreases back to the zero reference line and then repeats the increase and decrease in the opposite direction. This is what makes a line locator work.

figure 2

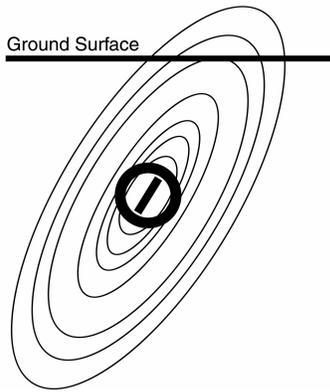


When we place a conductor in a moving magnetic field, we induce a voltage into that conductor just like a transformer induces voltage from a primary to secondary winding. By placing your receiving antenna in the moving magnet field, voltage is induced into the antenna wire. in the conductor ( receiving antenna wire ) We then amplify it and display it to the operator by means of sound and some type of video display. All line locators operate the same way.

If we were to place a metal fish tape in a plastic pipe as in figure 3, we could place a signal on the fish tape and locate that plastic pipe. Notice the magnetic wave took the shape of the

conductor and the magnetic wave above ground is off to one side. Every line locator on the market would locate the crest of the wave off to one side and the locate would be wrong.

figure 3



In figure 4, two cables are side by side and they are connected together at the house to the same ground rod. When signal is placed on one, signal is on both of them. Since the rotation of the magnetic wave is the same on both cables, the magnetic lines fight each other just like two north poles of a magnet. As they repel each other, the net resulting wave becomes distorted. If the two cables were at different depths as shown in figure 5, the radio wave above ground would be like the fish tape and the locate would be wrong.

figure 4

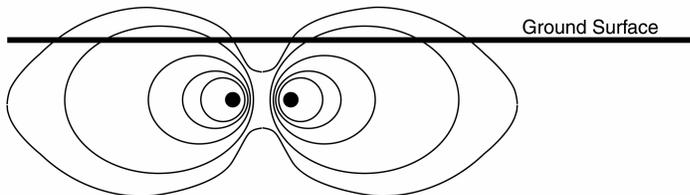


figure 5

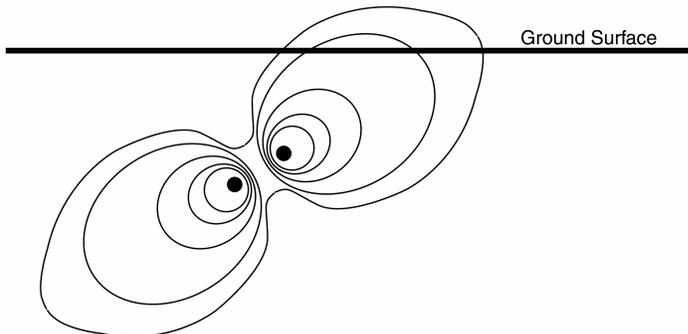
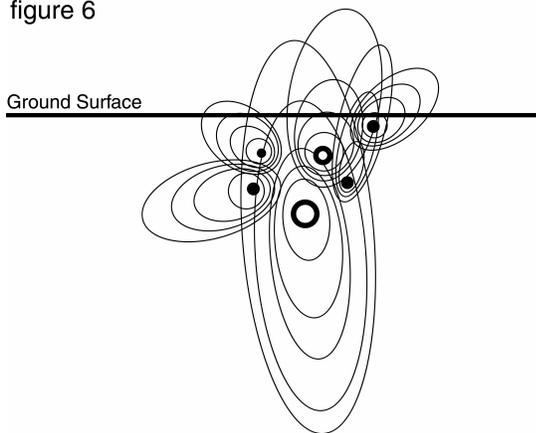


Figure 6 shows what a real joint trench locate might look like to the operator and to make sense out of this type of locate will require a little more than “here are the keys to the 18 wheel truck, now go drive it”.

figure 6



Most instruments will be talking to the operator and will tell the operator when an error in a locate is being made. Few operators are listening to what their instrument is telling them. When used correctly, almost every instrument on the market knows when it is making an error if the operator knows how to check for the error. In most cases, the instrument will even tell the operator how much of an error in the locate is being made.

Bells and whistles do not locate. You the operator, you are the locator. Your instrument is nothing but a monkey wrench and the nut will not come off a bolt when you set a wrench on the nut. You the operator must make something happen. If you do not apply the proper technique, you either break the bolt or you take skin off your knuckles. It is a pure matter of how you use the tool as to what kind of job the tool can do for you.

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