CREATING A GOOD SIGNAL PATH

The most important factor in locating is if you don't have a circuit to trace…
you won't find the cable. Understanding how the transmitter signal travels, the requirements of the signal, and the reaction of the signal (ground conditions, cable faults, bonding issues, and adjacent cables) is the key to becoming a superior locator.

Basic Concept of Locating

- A signal is introduced onto a metal conductor with a transmitter.
- The signal travels through the metal conductor to a ground.
- The return path of the signal is through the ground, back to the transmitter.
- Trace the signal path with the receiver.

Probably the most important part of underground locating is understanding signal path.
As an analogy, I imagine a light in my home.
The light socket requires two wires, the white and the black.
There has to be a switch.
AND THERE HAS TO BE A BULB….

Similar to the light circuit, locating signals require the same principles in order to complete the signal path.

So, in order,
we will discuss getting the signal onto the cable, the signal path through the target cable, back through the ground, and finally, how to detect that signal and be confident that it is traveling on the target cable.

How Good is your Ground?

Good Ground = Good Signal Path
All locators use the phrase "how good is the ground?".
The question refers to the quality of the circuit that you are going to trace… the circuit from the red lead of the transmitter, through the target cable, through the far-end ground and back through the dirt to the black lead of the transmitter.

The quality of the signal path is measured in ohms.

Press the second key of the transmitter to activate the ohm meter.
A flag will appear over the OHMS icon, when in ohms mode.
The resistance of the signal path will display on the transmitter.
How good is the circuit that you have made on the target cable, through the far-end and back through the dirt?
Have you got a circuit?
Did someone leave the bonds off the far-end?
Are you missing the light bulb?
Is your ground so dry that nothing will go through it?
Listen to your transmitter… it will tell you.

So we have a signal source (the transmitter). We know which cable we have to locate (target cable), and we know that the cable is grounded on the far-end.

The far-end ground provides a contact to dirt, which is the return path of the signal to the transmitter's black lead.

Return Path = DIRT
Improving the Ground
It's NOT the length of the ground rod that matters…
Not much return area…
A long ground rod provides a larger area of detection…

The quality of the dirt is out of our control. Dry conditions, rocky terrain, iron ore deposits… all out of our control. The only thing that we can 'semi-control' is the return point… the ground rod… or the catcher's mitt.

The ground rod is going to complete the circuit… 'catch' the return signal, so to speak.

An easy, good ground…

If you don't have any water… or you ran out on the last job… or you locate in moist soil conditions already….
There is one other option to improve the ground return.
A SHOVEL.
The area of return is larger than the small ground rod, obviously… and actually bigger than the long ground rod
BECAUSE: the long ground rod's surface area is smaller than a simple shovel pushed into the ground 6-8 inches.
Do the math…. 36X.5 (length of rod X width of rod) = 18 sq inches.
A standard spade the is 10 inches wide, pushed into the dirt 6 inches produces a surface area of 60 sq inches.

Why do I care
"how good my ground" is?

Rule of Thumb:

LOW FREQUENCIES TRAVEL FARTHER, AND ARE LESS LIKELY TO BLEED TO ADJACENT CABLES.

Here are the guide lines that I use when selecting a transmitter frequency.
The frequencies will operate in different ranges, but I have been successful using the guidelines.

The transmitter 'ground tones' (the solid, the beeping, etc) don't match this table and are very general….
The tones of the transmitter are set as follows:
0-3K = solid
3k- 10K = beeping tone
>10K, no tone
This table is a more specific and reflective of field experience.

Use the lowest frequency possible.

Your Best Bets
LOW Frequencies are..
- Skinny and Long
- Travel farther
- Less BLEED-OVER
- Have to have a good ground

HIGH Frequencies
- *BLEED-OVER*

Low frequencies are less likely to bleed to adjacent cables.

BLEED-OVER is a locator's worst enemy. Using low frequencies lowers the chance of bleed over. In this illustration, the target cable has 577Hz applied to it. The magnetic field appears on the adjacent cable, but only a LITTLE BIT. You probably wouldn't even be able to detect the adjacent cable with the receiver, because the bleed-over signal is so small….

High Frequencies are Fat and Short
Travel shorter distance
More likely to BLEED-OVER
Not so picky about a good ground
(Any one will do)
The magnetic field is 'fatter' for
high frequencies, therefore they bleed more easily.