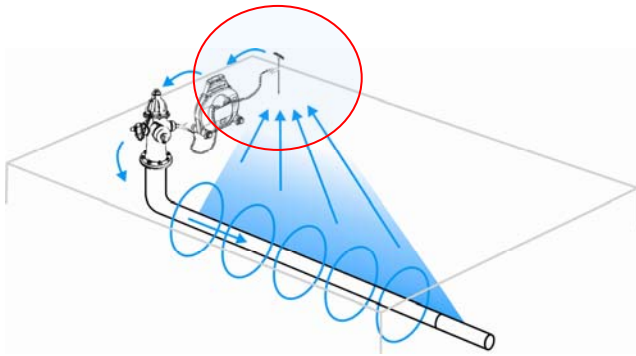


## Grounding – Completing the Circuit

What is the ONE thing you can do to improve the ease and accuracy of your locate? Improving the grounding of your transmitter is usually at the top of the list. As we have learned in our article on circuits, a complete circuit occurs when electric current flows from the transmitter, down the target conductor, and then back through the surrounding dirt to the transmitter. Electrical current cannot flow if it cannot return to its source. Making this last connection effective, dramatically helps to lower the resistance of the entire circuit, and allows more current to flow.



The “ground” as it is called is that last step. It is the connection from the dirt to the transmitter. Without a good ground it is difficult to have a strong circuit, and therefore difficult to create a strong field on the line or pipe. In this article we will take a closer look at this very important connection.



From the transmitter, down the line, back through the dirt it then needs to complete the circuit to the transmitter.

### Grounding Essentials

Most operators use the Ground stake that comes with their transmitter. In doing so it is important to sink the ground stake deeply into the soil. Planting the stake deeper increases the chance for reaching moist soil and exposes more of the metal stake to the dirt. Take precautions though to not hit a buried conductor with your ground stake. You can do a passive search with your receiver as one of many ways to help identify unknown utility line locations.

If necessary, longer, wider ground stakes can be used as well as shovels and other digging tools. A long screwdriver may be handy if you have nothing else.

Be careful to NOT to hit any underground utilities with your ground stake!



Like the antenna on a car, exposing more metal captures more signal.

### Grounding in different soils

Moist, heavy clay soil is highly conductive and provides an excellent return path. Plants need water and have root systems that can offer a deeper reach to moister soil.



Dry sandy soil provides more of a challenge. In dry, sandy soil the resistance to current flow causes a lower locatable signal. Water can be added to very dry soil to improve the grounding and lower resistance. Keep a mixture of Gatorade and Water in your vehicle for this purpose.

NOTE: In extreme conditions poor soil conditions may prevent any current from flowing which in turn prevents any locatable signal from being generated.



## Extending the Ground

A common theory in ground rod placement is that the ground rod should be placed at a 90 degree angle to the target utility and as far away as possible. In the congestion of the real world this is not usually practical. When attaching to a ground or placing a ground spike, care should be taken to not cross over other utilities. If another utility becomes a return path for the current then distorting signals may be the result, making locating more confusing and less accurate.

If you need to, you can look for other grounding opportunities. Metal road signs or telephone pole stabilizers can offer a good ground. (Be careful when using buried metal fence posts as this can then illuminate the whole fence if it too is metal and cause distortion if you are locating nearby.)

## Video Example



Click on image to play video.

## Things to Remember

- Things that affect the transmitter's ground
  - Type of Soil
  - Moisture Content of Soil
  - Size and depth of Ground Stake
- The more current that is flowing the greater potential for increased signal strength at the receiver.

- More signal strength makes locating easier and more accurate.
- Inductively coupling signals is not as efficient as the direct connection method so good grounds on both ends of the target utility are important for successful and accurate locating.
- **A good ground for the transmitter is essential to creating a good circuit.**