"A Locator's Odyssey" — Identifying and Dealing with Interference

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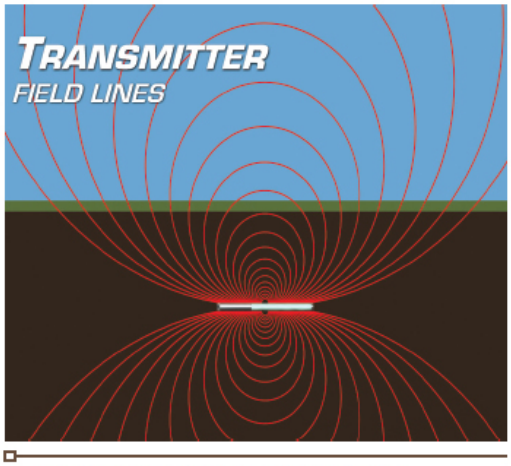
By Mark Gallucci — Jan 02, 2014

Have you ever been driving down the road next to a semi-truck and heard snippets of the truck driver's voice from his Citizens Band (CB) radio come through your vehicle's speakers? Perhaps you remember listening to AM radio while multiple station's transmissions are being heard on your speakers. Or have you ever driven across a metal bridge and had your radio signal get distorted so you hear heavy static.

The situations mentioned above are all examples of signal interference. HDD transmitters (aka: sondes, beacons or probes) emit a Radio Frequency (RF) and HDD locators (aka: receivers, trackers) pick up that Radio Frequency.



Di-pole electro-magnetic field emitted from an HD transmitter.

The CB-radio and the AM transmission tower are examples of an Active Interference source. Active Interference can be defined as anything that emits its own electro-magnetic field. Anything and everything electrical emits an electro-magnetic field. When an active interference's electro-magnetic signal is A) at or near the frequency of the HDD locating equipment being used, or B) just so overwhelmingly strong there is the potential that the hand-held locator will receive that active interference signal.

The purpose of all locators is to pick up signal regardless of its origin. It does not discriminate against the source of the signal. Many HDD locating systems do a remarkable job of filtering out errant signals but there are times when unwanted signals can't be shielded because of regulation. In the United States, HDD locators comply with Part 15 of the FCC Rules, which states; "Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation." Other examples of active interference included: over-head and below ground electric power lines, traffic signal loops, micro-wave towers, cathodic protection, fiber trace tones lines, hand held radios or phones, electrical systems of operating machinery and invisible buried dog fences.

Passive Interference

The steel bridge is an example of a Passive Interference. Passive interference is not a source of electromagnetic signal but a blocker of signal. The metal in the bridge acts to distort, misshapen and weaken the signal reaching your vehicle's radio receiver just as rebar reinforced concrete acts to distort and weaken the transmitter's signal on its way to your HDD locator. Conversely, metal can also act as a signal carrier, artificially increasing the amount of signal received if the locator unit is positioned too near the body of metal. Today, manufacturers of HDD locating systems use both the strength of the signal from the transmitter and the shape of the signal to precisely identify the

transmitter location. If the shape of the signal has been distorted because of passive interference, chances are good that pinpointing the transmitter's location will be more difficult. The exact depth of the transmitter can be much more difficult to ascertain. Remember, the amount of signal strength received by the HDD locator is the basis for the depth reading being displayed. The transmitter's signal strength and your depth readings become one and the same during the system calibration sequence necessary for all locating systems. Signal Strength is depth ~ depth is signal strength. The stronger the signal received by the locating unit, the shallower the depth reading will be, the weaker the signal received by the locating unit, the deeper the depth reading will be. "How did my depth just increase 12 in. while drilling one 10-ft rod at 0.0 percent pitch under level terrain?" You didn't. More than likely you drilled beneath a passive interference source that weakened the transmitter signal creating the illusion of being deeper than you actually are. Other common sources of passive interference include: steel pipe, guard rail, rail road track, vehicles and machinery, chain link fencing, metal plate, metal buildings, bridge abutments and salty or brackish water.

We can lessen if not remove the negative effects of both active and passive interference by getting the hand-held locator away from the source of the interference. How does your vehicle's stereo sound once you're off the steel bridge or out from underneath an overhead power line? Before you can get separation from the interference, you must first identify the source of the interference. Unfortunately, no one has the ability to see active interference, but the locator in your hand can. To identify potential areas of active interference that might affect your locator's ability to perform, walk the drill path and check the background noise levels by observing the signal strength being picked up before powering up the transmitter. How much background noise or electrical interference is too much? Tolerance for background noise is a function of the transmitter being used with regard to its frequency, signal output and the depth of the installation or pilot bore. The deeper the installation, the more prone we are to active interference issues simply because the transmitter's signal lessens as the transmitter gets deeper.

Only after identifying the interference can we begin to overcome the problems encountered. All HDD locator manufacturers offer transmitters in multiple frequency and multiple signal strengths. Dual frequencies transmitters are available that allow users to shift the frequency being emitted or the signal being received by the locator. Certain frequencies perform better in certain environments. A 1.3-kilohertz (kHz) frequency transmitter lessens the adverse effects of rebar and other metallic interferences, both 12-kHz and 19-kHz transmitters overcome much of the frustration when drilling beneath a traffic signal loop and other active interference areas.

After you have selected the most appropriate transmitter with regard to frequency and signal output, separation is the key. The easiest, simplest way to get separation of the receiver from underground interference sources is to merely hold the locator higher off the ground. Holding the receiver higher off the ground above a passive interference source allows the transmitters field lines an opportunity to re-constitute to their normal shape. Again, we locate based on the shape of the signal, as well as the strength of the signal.

Alternative methods to get separation from problem sources would be to "Remote Steer" or to "Target Steer." Remote Steering is placing the locator directly on and parallel to the drill path many rods out in front of the transmitter housing. How far out will be determined by the particulars of the drill site and the transmitter selected. Higher frequency transmitters provide greater distance. Placing your receiver 40, 50, or 60 ft out in front is common. The locator indicates the exact direction the transmitter is pointing, therefore, maintaining the correct line. Depth is controlled by monitoring the transmitter's pitch data. "Target Steering" is "Remote Steering" done one better by allowing the desired drill depth to be programmed into the hand held receiver. The drill rig operator's remote display changes from its normal view to a view that visually indicates where the transmitter is relative to where you want it to be both in line and depth. Keep the floating ball on the vertical cross hair and you're drilling directly at the receiver, keep the floating ball on the horizontal cross hair and your drilling directly to the target depth value previously input. Both "Remote Steering" and "Target Steering" methods are employed when crossing an interference area or an obstacle on your drill path.

Should you need to parallel an interference area or obstacle "Off-Track Locating" is the preferred method of getting separation while still controlling the drill string. Many directional drillers and locators are unaware that a trackable line exists that bisects the transmitter at exactly 90 degrees if the transmitter is at 0 percent pitch. By identifying several points on the locate line that we know cuts the transmitter at exactly 90 degrees, you can determine both the direction and depth of the transmitter some distance to the side of the problem area.
Given the advancement in HDD locator technology and the user-friendly displays, we can teach a novice to properly locate a transmitter in a manner of minutes if on an interference-free drill site. It's knowing how to identify and deal with interferences that distinguishes our industry's best locators.

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