

# RADIODETECTION Application Note

## MAXIMIZING Locate signal when using Inductive Clamps.

Revision 1.0: August 7, 2003

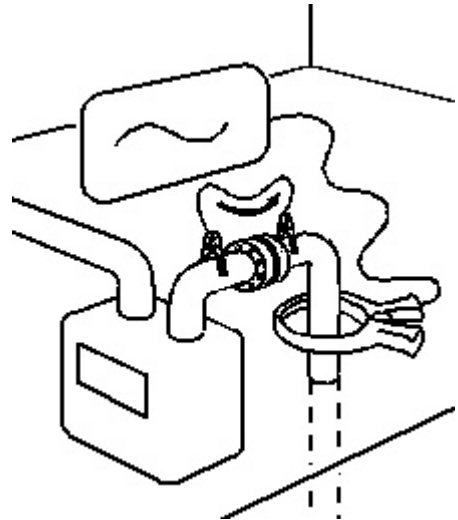
Most people involved in locating buried utilities have seen the inductive clamps used to apply signal to live cables and to gas lines when there is no suitable ground stake position available. Most people (but not as many) know that there must be paths to ground on **both** sides of the clamp position to get a better signal. That is why training pictures show jumper wires across gas line insulators when using clamps. And most locator staff know that the clamps usually don't give as strong a signal on the utility as the clips do.

What most people don't know is how to get **5 times** more locate current out of their clamps. Got your attention now, didn't I?

The basics of transformer theory say the more turns on a coil, the more voltage. We can use that to help us in locating by getting multiple wraps of whatever we are clamped around through the jaws. That may be possible on some things like wire, but if we are talking pipe that is impossible . . . or is it?

Ideally we want to use the conductive clips on a gas pipe locate but unfortunately frozen earth and concrete can sometimes prevent finding a good place for the ground stake. In these situations a clamp can be a real benefit.

Most training material shows clamps used like the drawing to the right, place the clamp around the pipe and jumper out the insulator. The insulator has to be temporarily shorted out as it is an electrical insulator and would prevent the flow of our locate current. Its main purpose is to prevent the cathodic protection current protecting the underground pipes from corroding from shorting out to earth via the pipes and grounds in the house.



A better way to use the clamp would be to clamp it around several turns of the jumper wire like in the picture to the left.

These 4 wraps changed our locate signal from 9 mA to 34 mA !!

This technique also works on tracer wire, just short out the end of the tracer wire to the 'house' side of the gas pipe. A particularly suitable jumper wire is described on the next page.

Gas, Telecomm and even electrical systems will all benefit from this method as long as we can get multiple wraps around the jaws of the clamp.

A typical jumper wire is shown to the right.

This jumper can be used for two purposes, clamping around insulators and shorting the ends of other services to draw signal up these 'dead end' connections.

When clamping onto a metal distribution system, jumper out the insulator by simply clipping the lead around the insulator or 'Lubo'. Place the inductive clamp around 4 or more wraps of the jumper as shown on the previous page, not around the gas pipe itself.



On a tracer wire system, use the clip or the butt connector to connect the jumper to the tracer wire and ground the other clip to earth via a ground stake, or other ground such as the house side of the gas insulator or meter. This will give the current a path to ground and give stronger locate signal. Place the inductive clamp around 4 or more wraps of the jumper as shown on the previous page, not around the tracer wire itself. Use caution in that other utilities are typically all grounded together to the house pipe and you may get current travelling out the wrong utility. If the other utility is shallow, the wrong utility could appear quite strong. Walk full circles around the connection point and use current measurement to confirm.

One other common problem with distribution systems is that little locate current may travel up other services. Use of a jumper like this to temporarily short out these other services will provide a good path to ground and a much stronger locate.

### GENERAL CLAMP USAGE

In order for a clamp to work correctly in this or any application, remember that there has to be a path to ground for the signal on BOTH sides of the clamp position. The clamp does not supply current like the clips do; it more accurately works as a current pump. It makes current flow on the cable it is clamped around, to a path ground, back through the earth to a ground on the cable behind the position of the clamp. See the following diagram for a visual explanation.

For best results, there should be a hard ground on both sides of the clamp, however a longer length of direct buried cable will also provide a suitable path due to the leakage of the high frequency (8 kHz) signal to ground through the insulation. For this reason, clamps will not work very well on a hot conductor without a concentric neutral. When placing a clamp on a concentric cable, make sure it is clamped around the cable **and** concentric neutral, not just the hot center conductor. In the case of a 3 phase system, the currents may not flow through the earth but rather through the neutrals of the other two phases.

This paper is still under development. If you have suggestions or notice errors please do not hesitate to get in touch with the author at the numbers below.

