

BUYERS' GUIDE FOR ELECTROMAGNETIC PIPE & CABLE LOCATING INSTRUMENTS

BY MIKE PARILAC

This is the first *Underground Focus* Buyer's Guide for electromagnetic pipe and cable locating instruments. While there are about fifteen brands that can be purchased in North America, six of them have decided to participate. I thank each of them for supporting not only *Underground Focus*, but for supporting you, the reader. Without their advertising support, the Buyers' Guide would not be possible. This feature has only one simple goal: help educate the reader in an unbiased, unique and fruitful manner.

These six manufacturers were asked to submit approximately 400 words about themselves or their products. Some focused on a single product while others cast a wider net. Our staff told them they would receive a half-page of coverage. My commentary of their products will appear within their half-pages. They will be reading my commentary for the first time when they receive their copies of the magazine.

I only comment on instruments that have been in my possession for quite some time. No one sent me a new instrument for evaluation. I'm sure some of the manufacturers have newer software, more features and similar enhancements. But, I can assure the reader that my comments would be the same even if we had a new instrument that was made last week. Anyway, software has never found a buried utility and never will.

I gave the reader a bit of background for the Buyers' Guide in this issue's "View, Too" and "Deeds" columns, but you need more. You need to know that all of these instruments work on the same principle. For the most part, if one instrument can find a buried utility so can the others. When one instrument fails to do the job, the other instruments usually cannot do it either. Why? Because they are all impacted by identical electromagnetic principles.

It is those times that one instrument can do something and the others can't that intrigue me. Usually the instruments that can are almost always taking advantage one of two things: very high transmitting frequencies or superb inductive capabilities. Sometimes, it is both simultaneously. Very high frequencies and induction solve problems usually only when the buried utility is configured in a certain way. It is the characteristics of buried utility lines that need elaboration.

How many different characteristics of buried utility lines are there? You may assume there has to be hundreds. Well, for the creation of an electromagnetic circuit, which is what de-

termines if a utility can be found, there's only two. Yes, there are only these two:

- Number One: the end of a line is either grounded or not.
- Number Two: the end of a line is either connected to another line or not.

(Oh, if your line is not coated or jacketed you are grounded the entire run of the line and Number One does not apply.)

In junior high math class, we learned that a line is the shortest distance between two points. For our purposes, it's tough to create a short definition of a line so I have to walk you through it. Look at this gas service. It's in the middle of a



block. The line starts at the meter and runs to a gas main in the street, a street running east and west. The end of this service line terminates at the main. That's easy to understand. The service is one line. The location where the service taps into the main is the beginning of two new lines: the main going east and the main going west. These new lines will end when they reach the next service tap.



Now, metallic continuity is critical to the definition of a line. If we built a two hundred feet long water main using these twenty foot sections of pipe, how many lines would we have? Not one line, but ten lines. The rubber gaskets at each bell joint do not provide for metallic continuity between pipe segments so we have ten, twenty foot lines that make up our two hundred foot main.



There are many lines inside this electric transformer. Two of the lines are primary lines and the rest are secondary services. The primary lines will end when they reach the next transformer. Service lines will end when they

reach the customer's meter. When they reach the customer's meter these lines will be grounded, just like the lines are inside the transformer.

We now have enough to go on. Let's examine the photo of the gas meter. Is the visible end of the line grounded? No, it is not. Is it connected to other lines? No. Let's ask the same questions about the other end of the line, the one that we cannot see. Yes, it is grounded (making the assumption that the main wire is lengthy and metallicly continuous). It is also connected to other lines—two lines, in fact.

What about the water main we constructed. Pick an end from any twenty foot section and ask our two questions. Is the end grounded? Yes, the pipe is not insulated so the entire section is grounded, including the end. Does the end connect to other lines? No, the end is insulated from the next section of pipe because of the rubber gasket. It's the same for the opposite end of the pipe. It will be grounded, but not connected to other lines.

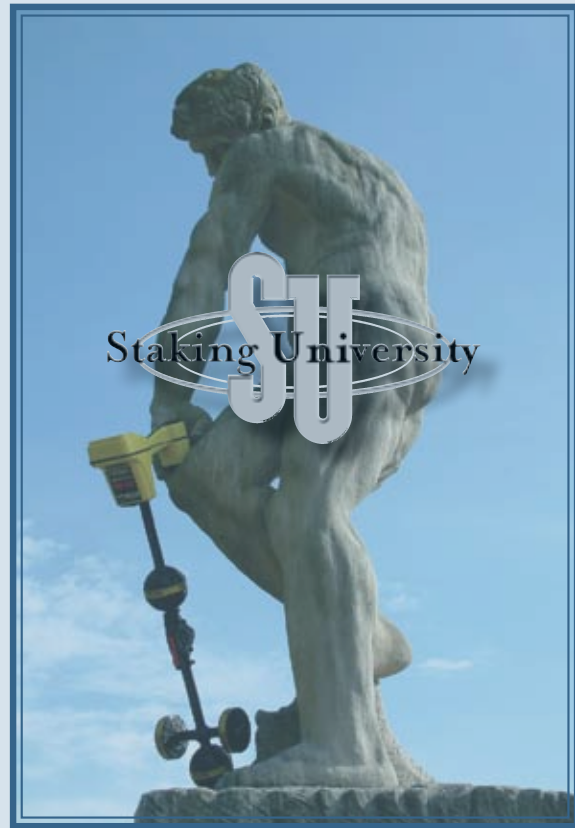
Finally, let's look at one of the two pictured primaries in the transformer photo. Is the visible end grounded? Yes. Is this end connected to other lines? Yes, quite a few. Do we have the same scenario for the other end of the primary? Yes, we do.

My intent with this brief exercise was to provide a background for why things happen when an operator attempts to find buried utilities. Success with these instruments is dictated by things over which the operator has little control. That is why no one instrument is perfect for all situations. Let me give you my short list of list of things that you need to know regarding electromagnetic pipe and cable locating instruments:



1. The transmitter is more important than the receiver.
2. There are four basic groups of transmitter frequencies: low-low (1 kHz and under), high-low (7-10 kHz), low-high (25 kHz-130 kHz), and high-high (200 kHz and higher). You'll notice some gaps. I don't think anyone uses standard frequencies within these gaps.
3. Some of the fifteen brands of instruments do not induce very well. When I say induce, I am not talking about the inductive coupler. I am talking about utilizing the inductive coil inside the transmitter.
4. Digital depth readings are critical to buried line location accuracy. Forget about the actual depth of the line.

Turn the page to look at our featured equipment.



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What they say:

For more than 30 years, 3M Dynatel locating and marking products have provided solutions for locating, fault finding, accurate marking and relocation of buried facilities for

companies concerned with restoring outages, minimizing operating costs and efficiently managing assets.

Included are simple systems using passive and RFID technology for positive identification of buried facilities and functionality with industry standard GPS/GIS mapping systems.

Finding underground pipes just got easier. The new 3M Dynatel Advanced Pipe/Cable Locator 2220M harnesses the time-tested technology of other

Dynatel locators but is specially designed to locate underground pipes simply and accurately. The easy-to-use locator is rugged enough to stand up to harsh field conditions, yet is highly sensitive to deliver accurate results. The locator's two active trace frequencies, 8 kHz and 82 kHz, can be used for most underground locating applications as its enhanced inductive capability provides the maximum allowed induction power. In addition, the receiver can detect passive power (50/60Hz) and radio (15k-30kHz) for damage avoidance as well as remote transmitters such as sondes and pipeline inspection cameras. The operator can choose the frequency best suited for the situation, allowing maximum performance.

For more information, call 1-800-426-8688 or visit www.3M.com/dynatel.

What I say:

The Dynatel product I use is a 2273 with m-ID function. The four transmitting frequencies are: 577 Hz, 8 kHz, 33 kHz, and 200 kHz.

The Dynatel provides all four frequency ranges, although sometimes you could really use one in the 80 kHz range. I find it to be a capable inductive instrument, although you cannot induce on 8 kHz. Of the instruments that have 200 kHz, the Dynatel is by far the best. Not sure why that is, but it is. Good passive detection, too.

What puts this instrument over the top is the programmable marker ball function. You can find marker balls with other instruments but this one allows you to program the ball in the field. Wow! I know this has nothing to do with finding lines in the conventional sense, but it's huge. If only more utilities would use marker balls.

What we'd talk about over a beer:

The null response.

What they say: For more than 75 years, Heath Consultants Incorporated has been the leading service provider and manufacturer to offer a wide range of products and services to the various utility, municipality and contractor markets. Their Sure-Lock® multi-frequency pipe and cable locator is designed to increase locating accuracy and productivity. With frequencies ranging from 8.1K to 480kHz, a field technician can easily locate audio, radio and ultra-high frequencies. A unique feature of the All Pro is "continuous depth" readings. No need to press a button for your depth, a depth reading is continually displayed on the receiver as you near the target conductor. Only the All Pro can provide you multi-frequency technology in a simple two-button operation, allowing your field technicians to become expert locators more quickly.

Heath is also the manufacturer and exclusive distributor for a wide range of gas detection products including the Remote Methane Leak Detector (RMLD™), DP-IR, Optical Methane Detector, and Gasurveyors.

Heath services include underground utility locating, walking and mobile leak surveys, gas leak pinpointing and odor complaint re-

sponse, as well as water leak detection and pinpointing. Heath also offers a wide variety of support services, including but not limited to: meter reading, corrosion readings, valve locate and exercise and GIS/GPS data collection.

For more information on Heath products or services, please contact their Customer Service Department at 1-800-HEATH-US or visit their website at www.heathus.com.

What I say: The Heath Consultants product I use is the Sure-Lock. The three transmitting frequencies are: 8 kHz, 81 kHz, and 480 kHz.

The Sure-Lock transmitter has three of the four frequency ranges. It induces well in all three frequency ranges, the most possible. Needs a low-low frequency for conductive, though. I like constant depth on a receiver, but not many manufacturers provide it. Heath does. The passive detection mode is particularly sub-par.

The automatic transmitter voltage adjustment for 8 kHz conductive operation makes this instrument particularly effective for energizing lines beyond ground points. The 480 kHz on induction is perfect for old, broken and open-ended tracer wire systems.



What we'd talk about over a beer:

Low, low frequency.



What they say:

The McLaughlin Verifier G2 uses “Smart” transmitter technology along with improved noise reduction to achieve extreme accuracy in line location and depth calculation. Additional features include peak and null locating modes, four active frequencies, depth readout and Current Measurement Index (CMI), unique inductive method, passive radio search, increased depth capacity to 30 feet and a completely weatherproof receiver. For more information on McLaughlin products and services, visit the company’s website at www.mightymole.com or e-mail McLaughlin at mmole@mightymole.com.

What I say:

The McLaughlin product I use is the Verifier G2. The four transmitting frequencies are 512 Hz, 9.5 kHz, 38 kHz, and 80 kHz.

This G2 has three of the four frequency ranges. There is no high-high range, which does

limit any instrument’s versatility. That said, I think this is the best inductive machine on the market. On 9.5 kHz inductive, you can isolate lines better than some instruments can with an inductive coupler.

The G2 receiver has a null response that is weak. The receiver has good passive functionality and accuracy in digital depth reading. Both are nothing short of phenomenal. Guess that’s what you get when you use three peak antennas.

What we’d talk about over a beer:

Software modifications for gain control.

What they say: For more than 40 years, utilities, contractors and locating services have relied on Pipehorn Pipe and Cable Locators to find what other locators cannot. Pipehorn was born out of a gas company’s need for a better way to locate its cast iron pipe. Today, it is often the only locator capable of pinpointing the most difficult conductors like inserted services, worn or broken tracer wires, detectable tape, cast/ductile pipe, parking lot and street lights. Nothing works better when direct connection is impossible; and nothing is capable of “sweeping” areas for un-marked utilities like a Pipehorn.

Introduced in 2005, the new Pipehorn 800 Series Locators are the result of years of suggestions and feedback from users. The widely popular and versatile Pipehorn 800-HL features the same unique high frequency performance and now adds low frequency (simultaneous conductive transmission) to tackle the challenges of today’s congested underground. At \$1,245, Pipehorn 800-HL meets or exceeds capabilities of locators costing thousands more and arguably represents the best value in the locator market.

Pipehorn also makes the Maghorn Ferro-magnetic Locator with patented Planar-Flux sensors. Locating paved-over or deeply buried valves, lids and pins has never been easier—especially if they are in close proximity to metal obstructions like cars or fences.

With free operator training wherever Pipehorn locators are used, they have the best warranty in the industry, same day shipping and 48-hour turnaround on service. Their customers reap the benefits of a direct factory relationship.

“In 1968, we got our start by solving a problem at a price that made sense. We continue that philosophy to this day, helping users increase productivity, prevent damage and work safely. Of that 40 year reputation, the Pipehorn team is rightly proud,” says Don Plosser, President.

Visit www.pipehorn.com or call 800.952.3710 to get more details or schedule a demo.

What I say:

The Pipehorn product I use is an 800-HL. The two transmitting frequencies are 9 kHz and 480 kHz.

The Pipehorn has two of the four frequency ranges. It induces only on 480 kHz. There is no passive detection. This is clearly not an instrument for all scenarios. If you don’t have an instrument that induces with a frequency of over 450 kHz, there will be lines that you cannot find; yet the Pipehorn will. Pipehorn will find lines such as iron pipe in dry, resistive soil, broken and open-ended tracer wire systems and low-voltage lighting.

Additionally, this is the best instrument for two-man sweeps, a process used to detect unmarked and unknown facilities. If you are an



excavator, a Pipehorn is your cheapest insurance policy.

What we’d talk about over a beer:

Another beer, here!

continued on the next page



What they say:

The new RIDGID® SeekTech® SR-60 utility locator provides end users with more information to make the most informed decisions about underground infrastructure for easier and more accurate locates. The SR-60 is the only utility locator with the capability to receive the full range of locatable frequencies, allowing it to be used with any pre-set frequency transmitter.

What they say: Schonstedt Instrument Company continues to refine and extend its magnetic and utility locator offerings.

The GA-92XT magnetic locator combines Schonstedt's legendary sensitivity and durability with a revolutionary form factor—at less than 16 inches, the XT stores and carries easily, but extends to a full 26 inches in use. Pistol-gripped for good ergonomics and true one-handed operation, the GA-92XT is the magnetic locator of choice for utility professionals. It is perfect for locating buried manholes, handholds, and other ferrous objects.

Similarly, the XTpc utility locators extend in use and are holsterable and are easy to use one-handed, leaving one hand free to spray marking paint or to carry tools. The XTpc transmitters are also compact, and easily fit into a shirt pocket or tool belt. XTpc locators come in 33 kHz and 82 kHz models, and last year a 512 Hz model was introduced for use with a sonde. New this year are improved displays, with directional arrows and depth readings in

Expanding on the SR-20 utility locator, the SR-60 has additional frequencies and more versatility. With the SR-60, users can locate at the broad frequency range of 10 Hz to 490 kHz, and can tune the frequency 1 Hz at a time, allowing the SR-60 to be used with any pre-set frequency transmitter. The unique passive search mode can be used to search all broadband passive frequencies at once, allowing for easy identification of unknown metallic lines in the target area. These features provide the necessary data for the professional locator to develop a comprehensive and accurate understanding of the underground infrastructure.

The SR-60's innovative, easy-to-read display visually maps the signal, so end users can constantly view the changes in the line direction, depth and signal strength in real time. With the added feature that allows users to program up to 30 field-configurable, user-designated frequencies, end users have maximum versatility.

The RIDGID SR-60 locator uses multi-directional antennas and state-of-the-art processing to provide users with the information they need to effectively and easily locate underground utilities.

“RIDGID locators are engineered to raise the standard in locating equipment. With the technological advancements and the higher frequencies that the SR-60 has to offer, professional locators are empowered with more information to make more informed decisions about their locates. The SR-60 offers the most flexibility as it provides the broad-

est range of frequencies,” said Ed McKiernan, vice president, marketing, RIDGID.

all modes, including passive. Also added this year is a 60 Hz mode that can be used passively (without induced current from a transmitter) to detect the DC current induced in lines by sacrificial anode systems. Users like the small size and excellent battery life, which make the XTpc locators good choices for daily or occasional use.

The TraceMaster II is Schonstedt's flagship utility locator and continues to be one of the most sophisticated and easy-to-use locators on the market. Besides good ergonomics, one-handed use and the most intuitive display and control system on the market—two knobs and two buttons (all four are 'thumbable') with an LCD interface give access to all features—users like the TraceMaster's extreme sensitivity and the patented remote frequency switching. A radio link at the receiver end enables users to switch transmitter frequencies while working, extending the length of location runs and extending battery life. Schonstedt is also set to

continued on next page

est range of frequencies,” said Ed McKiernan, vice president, marketing, RIDGID.

In addition to the SR-60, RIDGID also offers a complete line of locating equipment that includes the SR-20 locator, and the ST-33Q, ST-305 and ST-510 transmitters. All locating equipment is backed by the RIDGID lifetime warranty against material defects and workmanship. For more information, visit www.ridgid.com/seektech.

What I say:

The RIDGID Product I use is the SeekTech SR-20 with the ST-33Q transmitter. The four transmitter frequencies are 128 Hz, 1 kHz, 8 kHz, and 33 kHz.

The SR-20 has three of the four frequency ranges. There is no high-high range and 33 kHz is on the low end of low-high, limiting induction capability. On the other hand, its 128 Hz is the lowest frequency of any standard frequency on a portable transmitter. Let's talk long tracing distances on pipelines and cross-country fibers!

Because of the number of receiving antennas, you get information about the shape of your field and information about other nearby energized conductors without ever moving the receiver. No one else can do that. The receiver provides constant digital depth and provides digital triangulation. With seven passive frequencies, the SR-20 is the best passive receiver on the market.

What we'd talk about over a beer:

Higher frequencies.



See this pipe and cable locating instrument? It was made in the 1950s. It works exactly the same way as a costly new model made today. You have a transmitter and a receiver (seen on bottom). The transmitter is really a mini-power plant. When the power plant's voltage is applied to both earth and a metal utility line, current flowing on the metal utility line produces an electromagnetic field. When the receiver's antennas are positioned in this field, the field's energy is transferred—or induced—onto the antenna. This induction is responsible for the designation of buried pipes or cables. You are not finding the pipe or cable, you are finding a field.



Here is a photo of two marked electric lines. These lines were designated in passive mode. One way passive signals appear on buried lines is that flowing electricity creates an electromagnetic field. This field is then detected by the instrument's receiver. The problem with this method of detection is that the electromagnetic field can be transferred onto other metallic conductors, either through metal-to-metal connections or through induction. That is what happened in this photo, because there are no electric lines located anywhere nearby. I know this because these marks are two blocks from my office.



There are only two ways to produce current on a metallic pipe or cable using a pipe and cable locating instrument. The first way is make a metal-to-metal connection between earth and the utility. The other way is not to make a metal-to-metal connection between earth and the utility. There are different names for these two methods, but let's start with what they were named on this old instrument: regular and direct. Today, "regular" is usually termed "inductive" or "indirect." There is another name, but it is a rather poor choice of terms, "passive." Generally, passive refers to current on a metal utility that is produced by something other than an instrument's transmitter.

DEEDS

What's the Frequency, Kenneth?



Here is another pipe and cable locating instrument. This unit houses both a transmitter and a receiver. The transmitter works only in the inductive mode. This instrument shows the interface between different dielectrics, or non-conducting substances. By measuring the time it takes for the transmitter's energy to reflect back to the surface from different dielectrics, a graphical depiction of this reflected energy can designate the location of buried utilities, including non-metallic lines.



At regular intervals, "Deeds" will focus on definitions of industry terms. We'll try to make things simple so that everyone involved in damage prevention, excavation, or other utility detection endeavors can benefit. "Deeds" will have a web home, too. Look for ViDeeds at www.underspace.com. ViDeeds will offer video supplements to features that appear in *Underground Focus*.

Schonstedt Buyers' Guide continued

introduce a new 'dual jack' transmitter, which will allow users to locate 'out' (walking away from the transmitter) on one pipe or cable, switch frequencies as needed, and then transfer to a different line for locating on the return journey. This new feature increases locating efficiency.

Every Schonstedt locator is made in the United States, in Kearneysville, W.V., and all are backed by the longest repair-or-replace warranties in the business. In business since 1953, Schonstedt Instrument Company is a classic American infrastructure firm that con-

tinues to lead the way with effective, innovative technology. For more information, visit www.schonstedt.com or call 800-999-8280.

What I say: The Schonstedt product I use is the TraceMaster II. The four transmitter frequencies are 575 Hz, 8 kHz, 82 kHz, and 455 kHz.

The Tracemaster II has all four of the frequency ranges and the individual frequencies are perfectly selected. Apart from its lack of range for passive detection, it can handle any and all buried utility locating scenarios. While

not spectacular in any way, I can do a day's worth of tough locating with no need for a second brand of instrument (that's saying a lot).

The receiver displays peak and electronic null at the same time. There are several instruments that do this, but I believe this instrument gives you the best response for electronic null. No doubt the two, 45 degree, angled antennas and manual gain have something to do with that.

What we'd talk about over a beer:

Continuous digital depth readings. **UF**