



Utility Locating How it works

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Why is it important to locate?

- 2003 Bloor St. 7 fatalities
- Est. cost of damages are high (\$1B/YR)*
- Societal Costs
 - Service Disruption
 - Emergency Services
 - Loss of Product
 - Environmental Impact
 - Internet



In the past there were very basic tools for finding buried utility lines

Still seen in the field today



Today's typical locate set



**vLoc3-Pro
Receiver**



**Loc-10Tx 10-Watt
Transmitter**



**Loc-5STx 5-Watt
Transmitter**



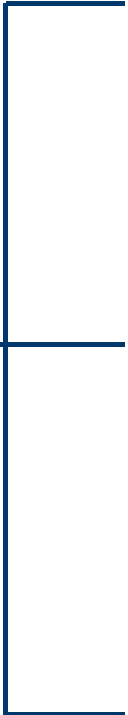
Connection lead set



Ground stake



Optional signal clamps



What has changed?

Then

- 1 Frequency
- 1 or 2 power levels
- No indication of signal output
- Depth had to be estimated
- Instrument sensitivity (gain) constantly changed

Now

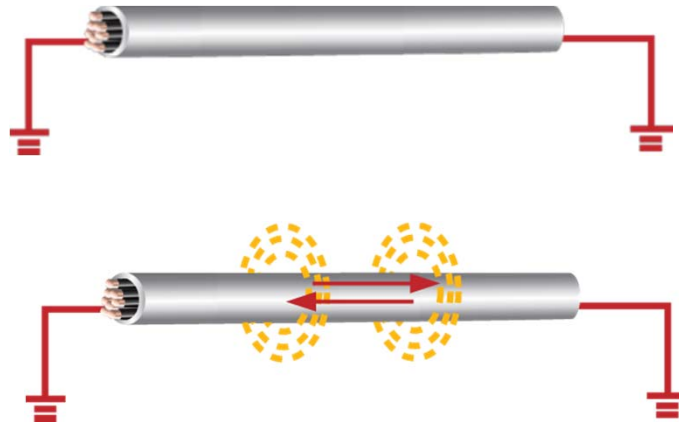
- 30+ Frequencies
- 4 power levels
- Current output and resistance readings
- Constant Depth Readings
- Automatic gain

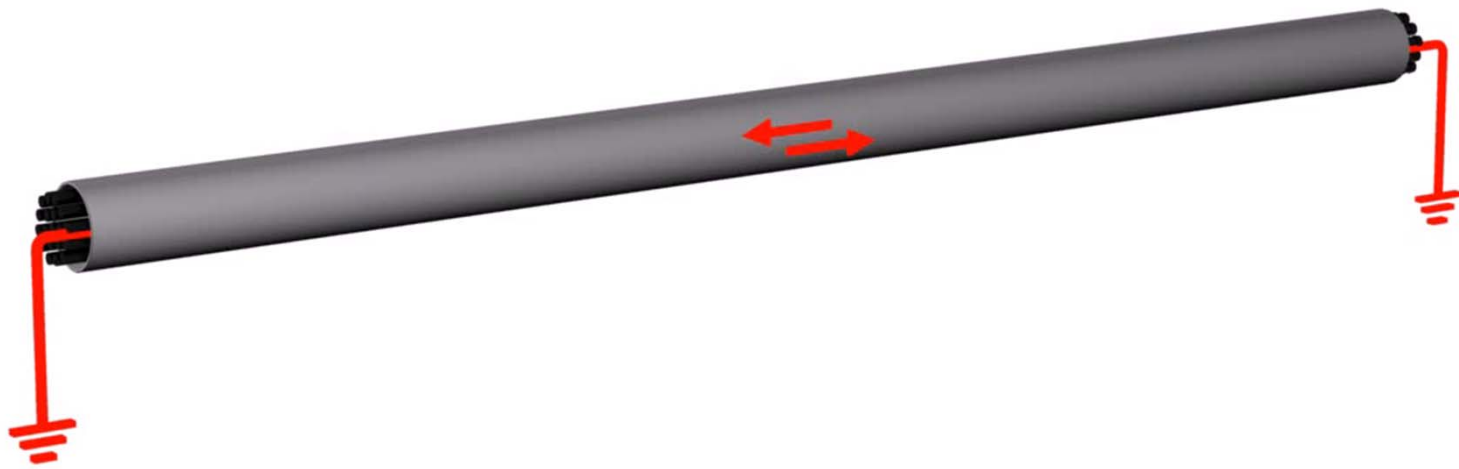


Both operate using the same science

The Locate Signal

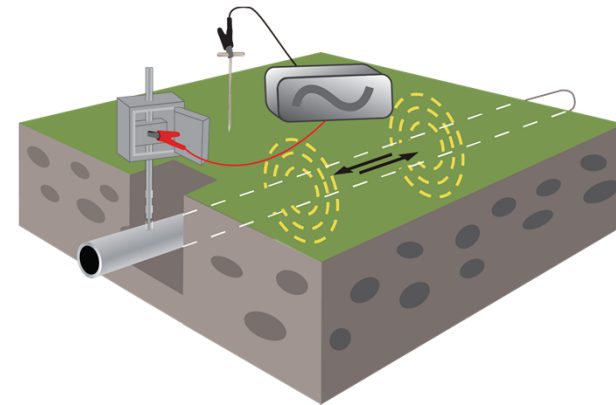
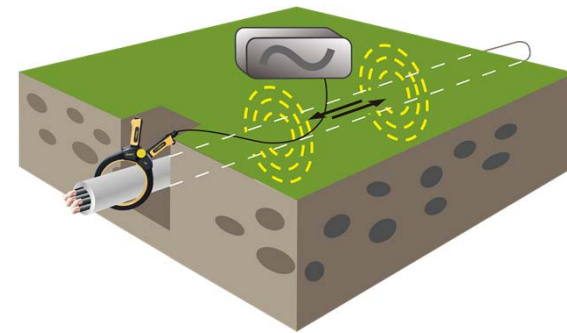
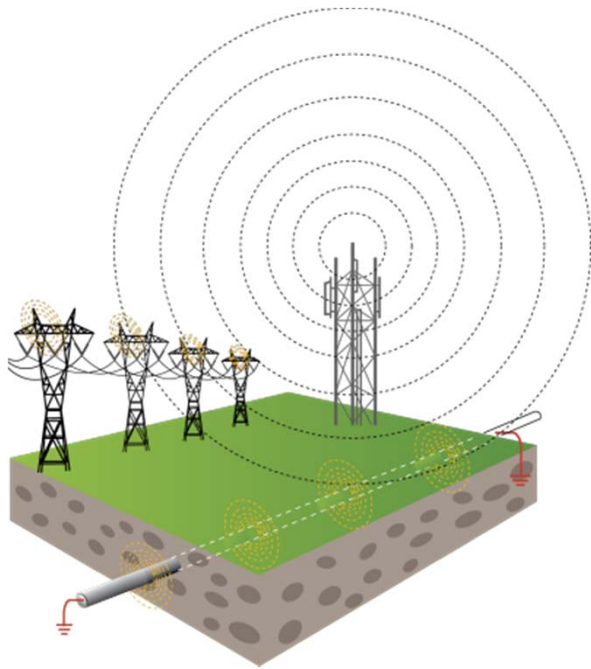
- Is produced by the flow of alternating current (**AC**) which creates an electromagnetic field
- This electromagnetic field *radiates from* the line and is known as the signal



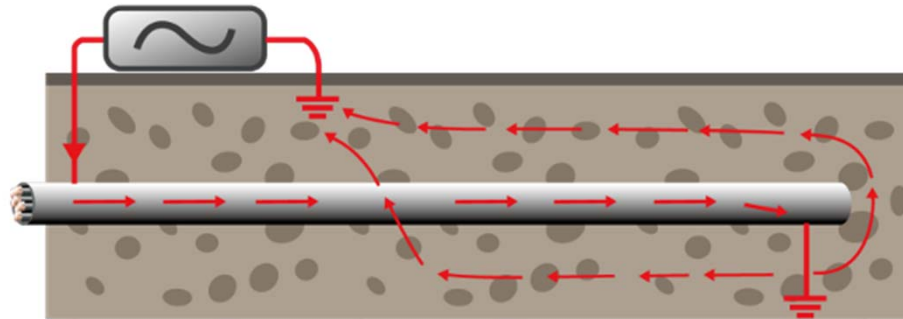


Signal Sources

Signals used for locating can originate from a transmitter (active locating), or a variety of other sources (passive locating).

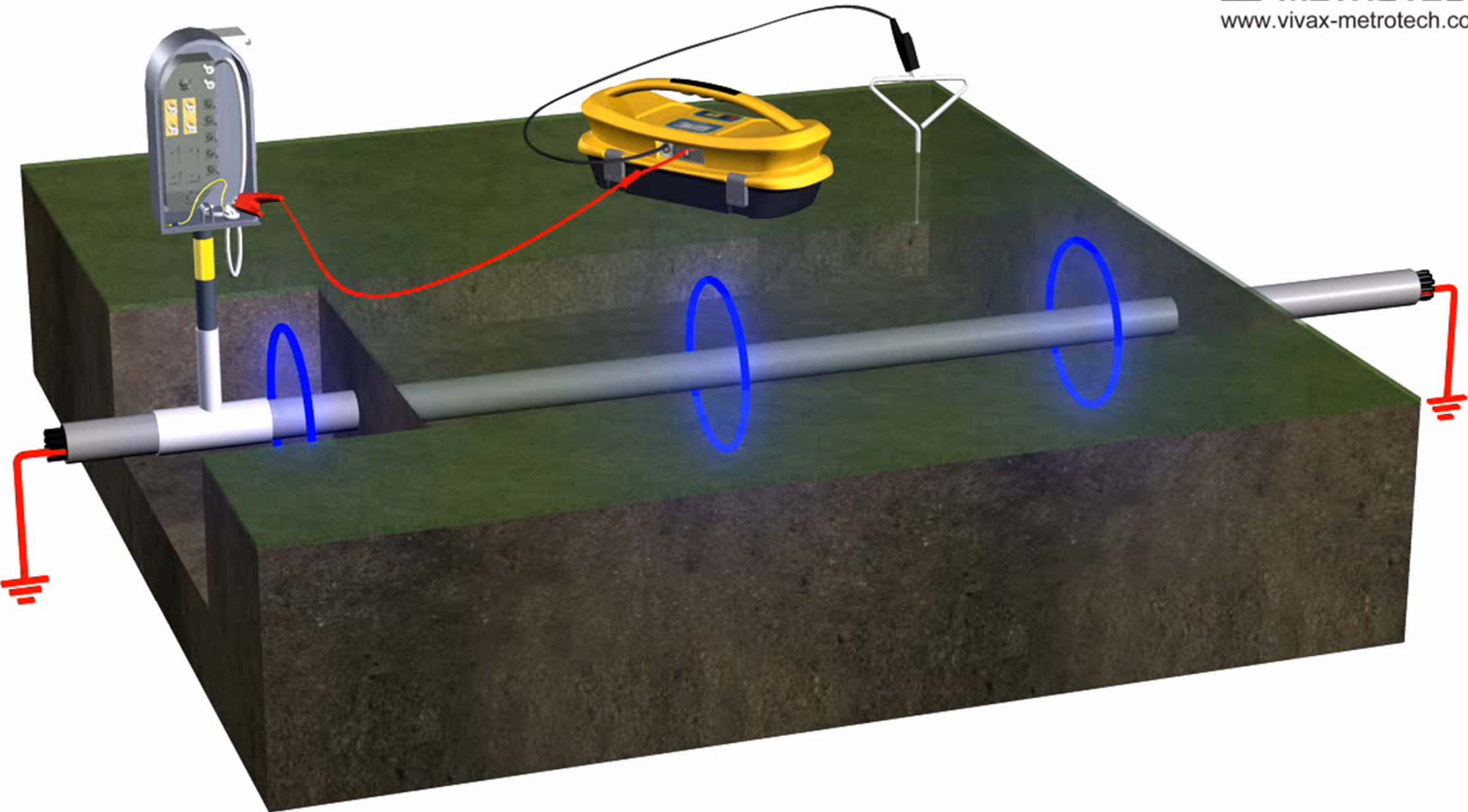


The Locate Signal

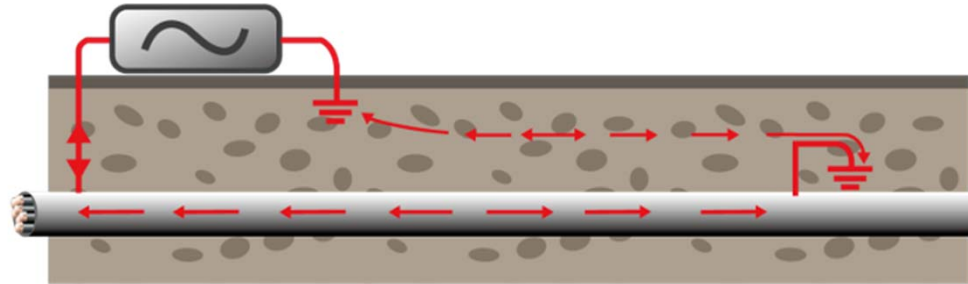


- Signals are created by the current flowing from the transmitter which travel along the conductor (line/cable/pipe) and back to the transmitter.
- The current typically uses the ground to complete the current. The ground stake is used to complete the circuit through the ground.





The Locate Signal



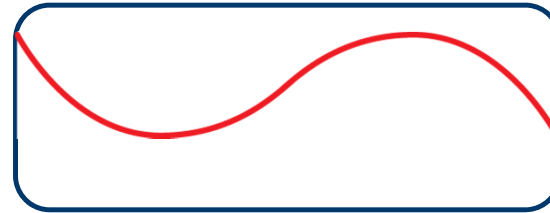
- We think of the signal traveling from the transmitter and back to the ground stake. In fact the signal is continually changing direction, flowing back and forth.
- The rate at which it changes is called frequency, so for instance, 50Hz means the signal changes direction 50 times per second, 8000Hz (or 8 kHz) means 8000 times per second. (The “k” denotes 1000).
- The frequency is chosen depending on the application.



Active Signal - Frequency Range

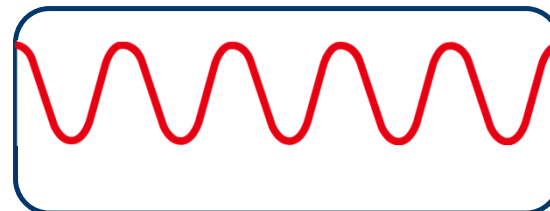
- **Low frequency - 100Hz – 1 kHz**

- Best for cables
- Direct connection
- Long distance
- Low distortion



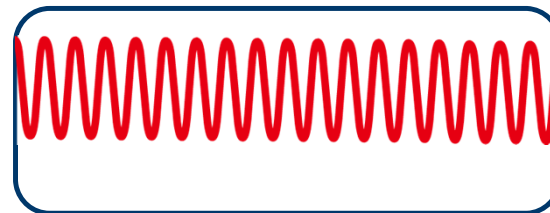
- **Medium frequency - 8 kHz – 33 kHz**

- Good for pipes & Cables
- Direct connection, clamp & induction
- Reasonable distance

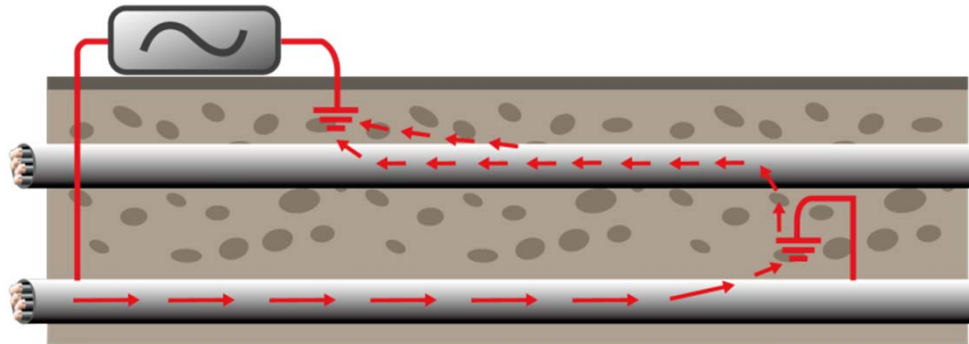


- **High frequency - 65 kHz – 200 kHz**

- Induction
- Short distance
- Prone to distortion



The Locate Signal



- Signals may use other pipes and cables to return to the transmitter because they represent a lower resistance than the ground.



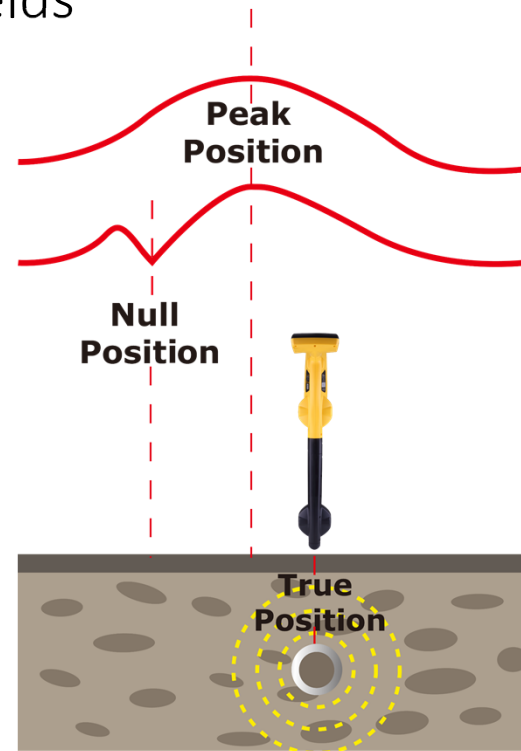


Identifying Distorted Fields

Use **Peak & Null** modes to identify distorted fields

- On a clean undistorted field the Peak and Null locate response will line up
- If distortion is present, the peak and null locate response will no longer line up

Typically, the greater the distortion, the further apart these locate responses will be.

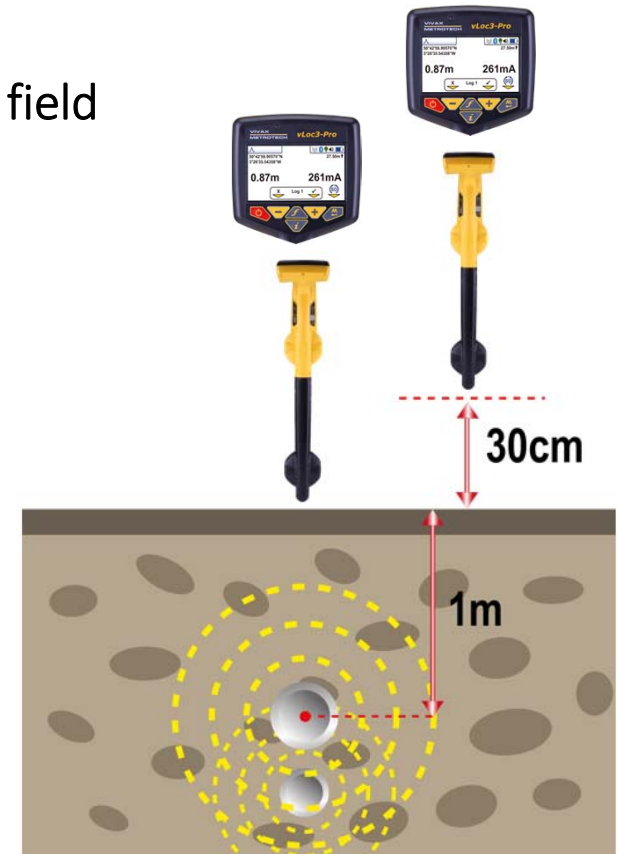


Identifying Distorted Fields

Using Depth Measurement to identify a vertical distorted field

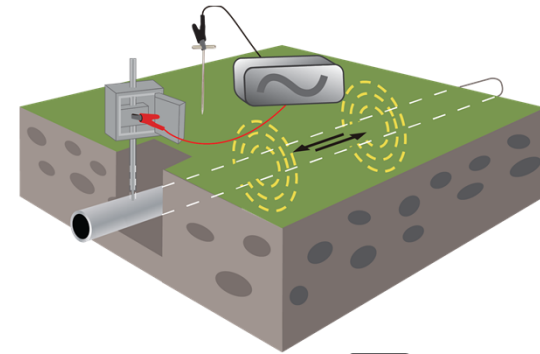
- Locate the line & measure depth with the locator resting on the ground
- Lift the receiver off the ground by a known distance (say 1ft (30cm))
- Take another depth reading

The depth reading should have increase by the distance you raised the receiver. **If it is significantly different, the field is distorted.**

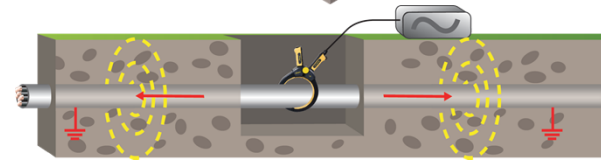


Active Signals - Applying

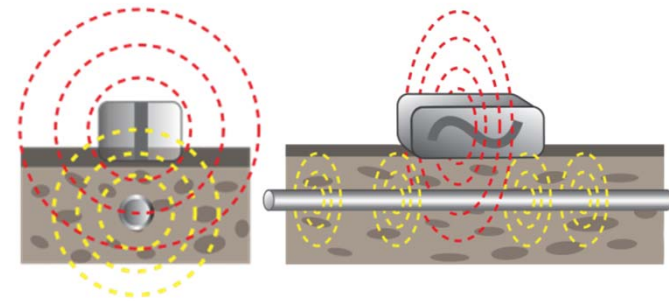
Direct connection – red lead to the target line, black lead to ground



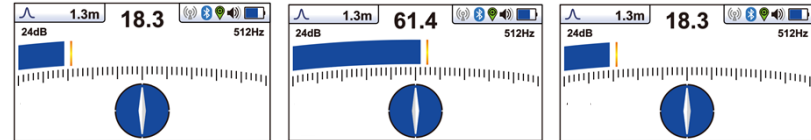
Clamp – induces a signal into a pipe or cable, without making a direct connection



Induction – induces the signal onto a pipe or cable, by placing the transmitter on the surface over the target line

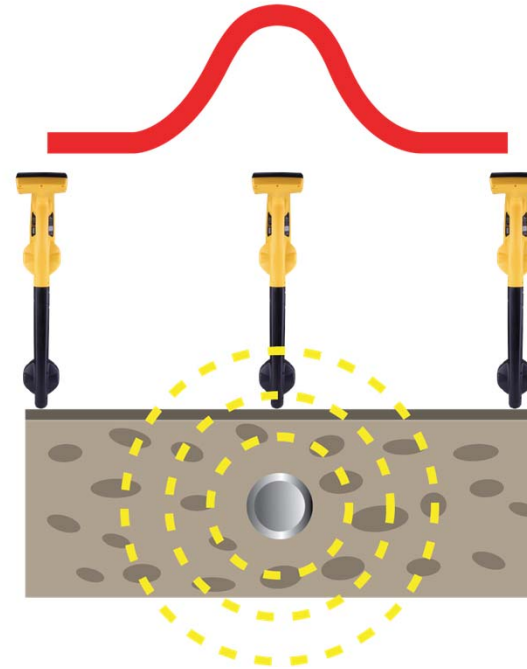


Modes - Peak

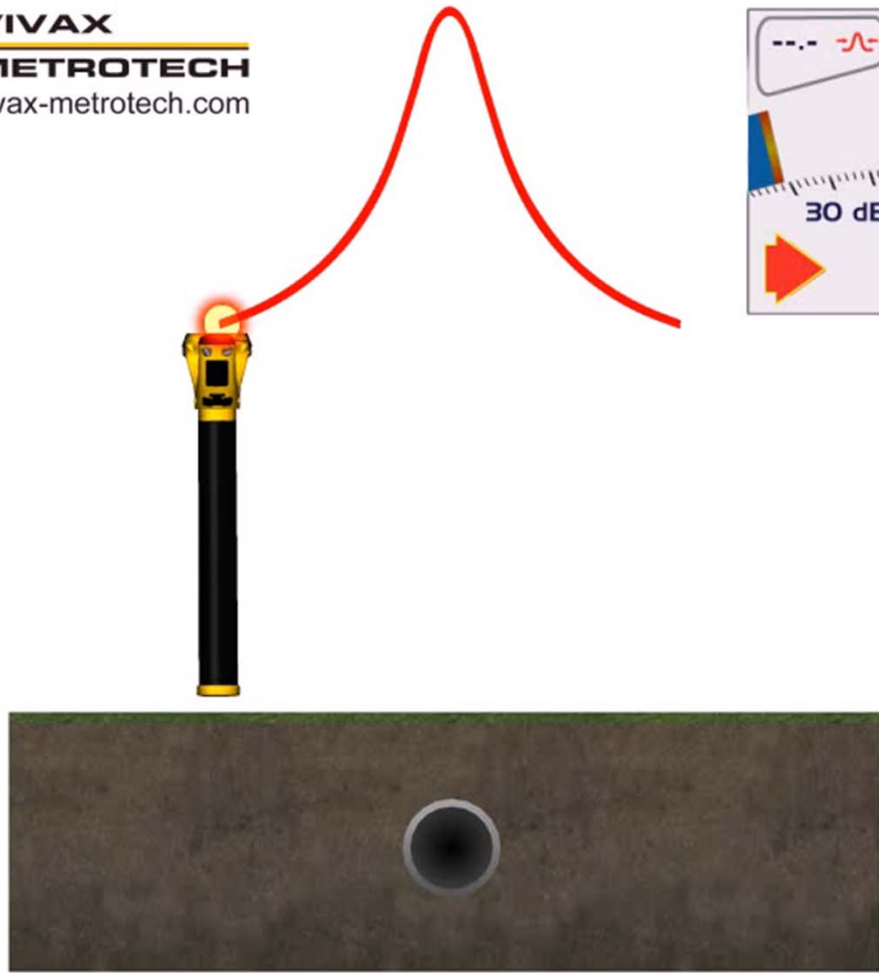


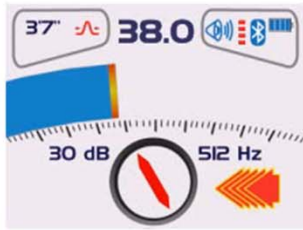
Peak mode

- Provides a maximum response over the line
- Uses two peak antennas
- The most accurate locate mode

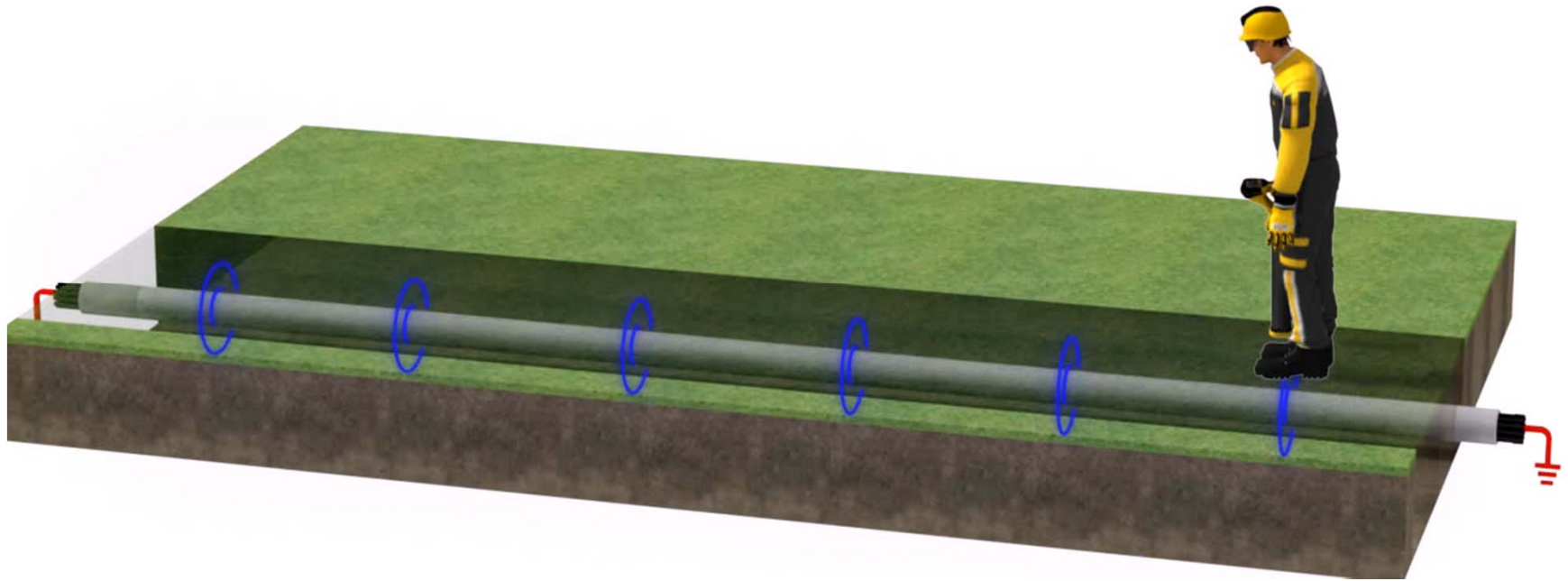


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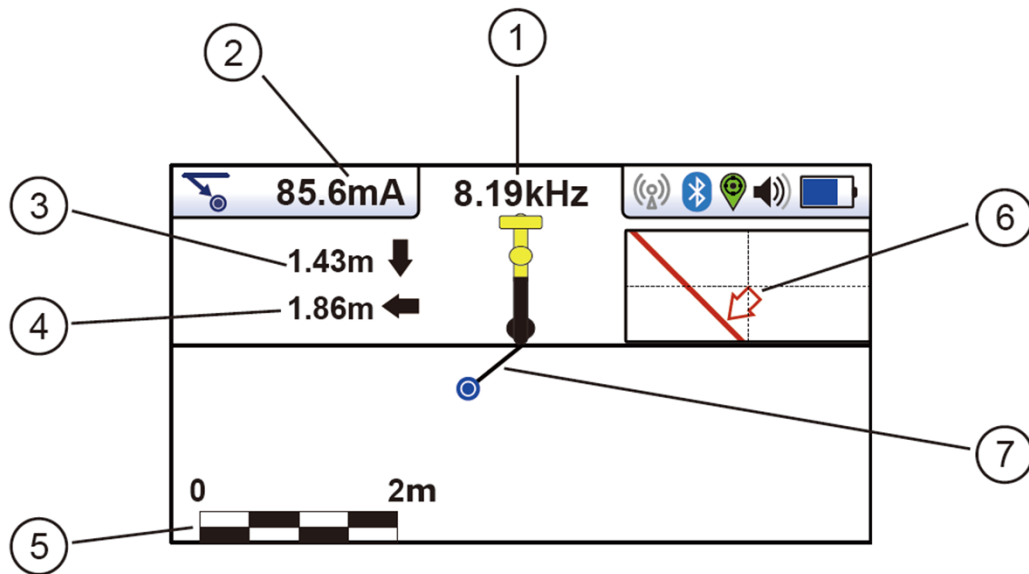


Peak Mode

- What is gain and what do I set it to?
- Most accurate mode
- Smooth rise and fall
- Traditionally Directional Signal
- Grounding
- Omni Direction



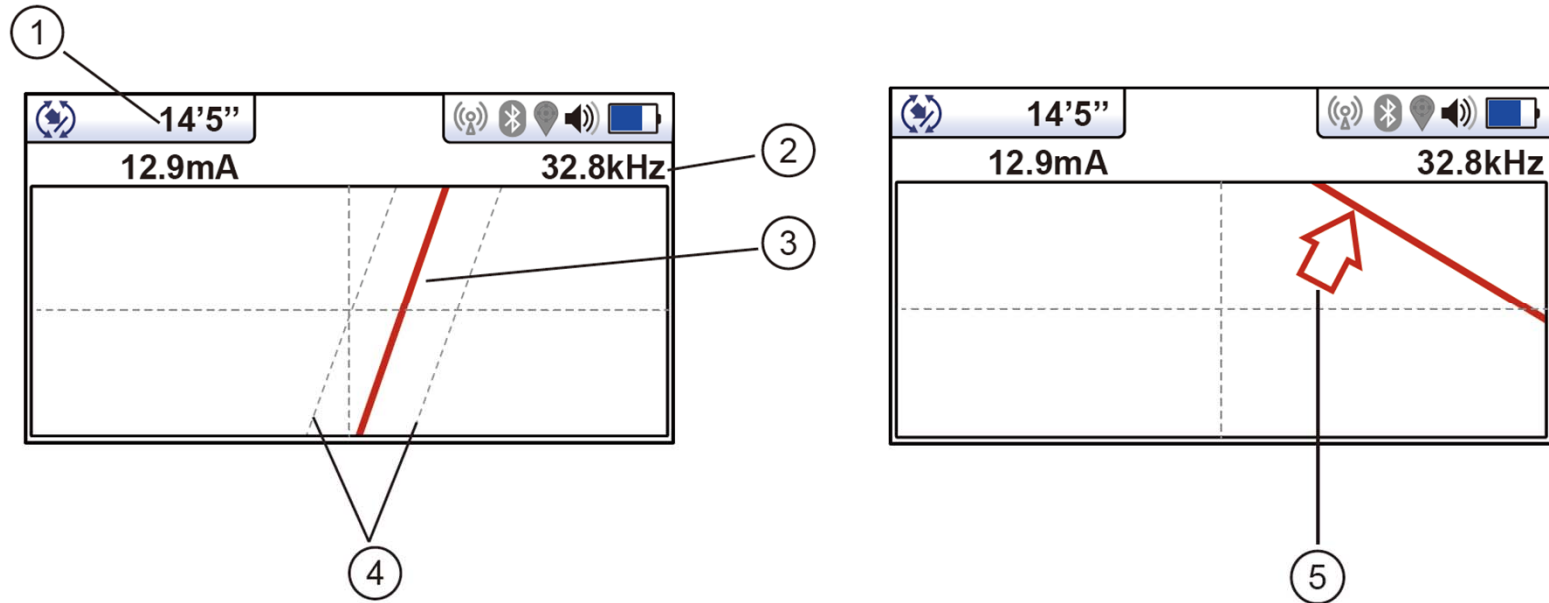
Vector Locate Screen



- 1 - Frequency selected
- 2 - Signal current
- 3 - Vertical distance to target
- 4 - Horizontal distance to target
- 5 - Scaling (adjust with +/- keys)
- 6 - Shows plan view of target
- 7 - Cross section view that shows vectors to target



Plan View Locate Screen



- 1 - Depth and current readings
- 2 - Frequency selected
- 3 - Target line
- 4 - Lines of confidence (closer these are to the target line indicates more confidence)
- 5 - Arrow indicates direction to move towards line, it only shows when the distance to the target line is far away



Vector Locate and Plan View Mode

- Automatic Gain
- Three sounds to help identify target
- No requirement to swing locator
- Able to locate pipes from safe location
- Constant depth and current
- Omni direction (Plan view)

Pipe materials and other factors

- What can be located
- Good conductor but can't locate?
- Ground condition
- Connection point
- Repairs



Which signal is the right one?

- Signal Strength
- Depth
- Current
- Follow the signal



Questions

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