VIVAX METROTECH

# VM-500 Series and VM-880 User Handbook

VM-550, VM-560, VM-585, VM-880

(English Edition)

Version 1.0

P/N:4.04.000222

# General Safety & Care Information

### *Who Can Use This Equipment*

- This equipment must only be used by people suitably trained in the use of pipe and cable locators.

### *Work-site Safety*

- Use your company's or other applicable safety codes and rules when using this equipment.
- Unless having the required authorization, license, and appropriate training, do not connect to any pipe, cable, or conductor.
- The equipment should not come in contact with corrosive or hazardous chemicals or gases, or dust.
- **Do not** directly connect this equipment to cables or pipes with a potential difference to ground greater than 25V AC.

### *Equipment Safety*

- **Do not** open the enclosures (housings) of either the transmitter or receiver.
- Place the ground stake firmly in the ground before connecting the cable from the transmitter.
- **Do not** hold any uninsulated portion of the connection leads & clips when the transmitter is switched on.

### *Batteries and Environmental Safety*

Vivax-Metrotech products use four types of batteries:

- Alkaline batteries
- Ni-MH (Nickel-Metal Hydride) batteries – rechargeable
- Lithium-Ion batteries – rechargeable
- Lithium-Metal batteries – (small non-rechargeable button cells for "clock" applications)

#### *1. Alkaline Batteries (Non-Rechargeable)*

- When replacing the alkaline batteries – use only the size and type specified – **do not** mix battery types (rechargeable and alkaline).
- **Do not** mix partially discharged and fully charged cells in the same battery pack – **do not** mix old with new**.**
- **Never** attempt to charge alkaline batteries.

#### *2. Nickel-Metal Hydride Batteries (Rechargeable)*

- When using rechargeable batteries, use only the correct charging device supplied or specified by the manufacturer. The battery pack or the battery charger will contain circuitry to manage the charging process – other chargers (even if they have the same connector, polarity, voltage & current rating will not have the same control circuitry and can cause damage to the product, overheating, and in extreme cases fire or harm to the individual.
- **Do not** assume that if the plug fits, it is the correct charger – a charger with the correct part number **must** be used – just because it is a Vivax-Metrotech charger and the plug fits **does not** mean it is the correct charger.
- Before using for the first time, charge rechargeable batteries for six hours. If the rechargeable batteries do not last as long as anticipated at any time, discharge fully and then charge for six hours.
- Care should be taken when charging batteries – **Never** recharge batteries (or turn the power off & on) without using the instrument. If used with an inverter in a vehicle – charge the product, unplug the charger, and not charge again until the rechargeable batteries have been used for at least ten minutes. Failure to do this could result in the overcharging of the battery, which will shorten the battery's life and could, in some circumstances, cause overheating or fire.
- If ever the product becomes hot during the charging process, **immediately** unplug the charger and use the rechargeable batteries for at least ten minutes before recharging. If this reoccurs the next time the unit is charged – return immediately to Vivax-Metrotech for repair.
- **Do not** charge batteries for prolonged periods without using the locator for at least ten minutes. Charging for a prolonged period could overcharge the battery, reduce battery life, and in extreme circumstances, cause damage to the locator and fire**.**

#### *3. Lithium-Ion Batteries (Rechargeable)*

- Lithium-Ion Batteries – some products use Lithium-Ion batteries – the requirements for marking and transportation are still developing. Please contact Vivax-Metrotech before shipping products containing Lithium-Ion batteries or Lithium-Ion battery packs on their own for any "special instructions."

#### *4. Lithium-Metal Batteries (Non-Rechargeable)*

- Commonly known as "button cells," these are small – non-rechargeable batteries used to power internal "clocks" within some units (similar to computers). Generally, they have a life of three to five years.
- Under no circumstances should any attempt be made to charge these batteries.
- Dispose of following your company's work practice/environmental standards, the prevailing laws, or recognized best practice. Always dispose of batteries responsibly.

### *5. General Rules regarding Disposal of Batteries*

- **Never** disassemble a battery or battery pack.
- **Never** dispose of in a fire or water.
- Dispose of batteries following your company's work practice/environmental standards, the prevailing laws, or recognized best practice. Always dispose of batteries responsibly.

### *6. Transportation of Lithium-Ion and Lithium-Metal Batteries*

- The Lithium-Ion and Lithium-Metal batteries used in Vivax-Metrotech products meet the required safety standards and include the designated protection circuitry.
- Recent regulation changes require that when batteries with Lithium-Ion and Lithium-Metal batteries are transported, the packaging **must** include specified warning labels.
- **Please contact Vivax-Metrotech Customer Service (USA 1-800-446-3392, International +1-408-734-1400 (USA Pacific Time Zone)) for more details.**
- Regulations have also changed regarding the shipping of spare battery packs (battery packs that are not inside a product). There are limitations on the package's weight, and the packaging must be marked with the appropriate warning labels.
- **Please contact Vivax-Metrotech Customer Service (USA 1-800-446-3392, International +1-408-734-1400 (USA Pacific Time Zone)) for more details.**
- Vivax-Metrotech vLoc Series 3 products using Lithium-Ion battery are classified as "not restricted." They can be shipped normally by road/rail/sea & air (passenger & freight aircraft) without restrictions.

**IMPORTANT**

**Batteries contain dangerous chemicals. They can be affected by many things, such as water ingress or heat. In some circumstances, they can explode. They also can cause electric shocks!**

## *Care of Equipment*

- Use equipment only as directed in this User Handbook.
- **Do not** immerse any part of this equipment in water.
- Store in a dry place.
- Keep equipment in the case provided when not in use.
- If left for a prolonged period – remove alkaline batteries.
- Keep the unit clean and free of dust and dirt.
- Protect against excessive heat.

## *Care when Interpreting the Information provided by the Locator*

- Like all locators – this instrument is locating and providing depth and current readings based on electromagnetic signals that radiate from the buried cable or pipe. In most cases, these signals will enable the locator to pinpoint both position depth and current correctly.
- **Beware** – in some cases, other factors will distort electromagnetic fields radiating from the cable or pipe is located, resulting in incorrect information.
- Always locate responsibly and use information learned during your training to interpret the information provided by the locator.
- **Do not** provide information regarding cable or pipe depth to anyone unless authorized to do so by your company.
- **Remember** that depth measurements are to the center of the electromagnetic field or pipe – In the case of pipes, this may be significantly deeper than the top of the pipe.

## *American & Canadian Safety Notices*

**USA**

- This transmitter and receiver comply with the general conditions of operation, according to part 15 of the FCC Rules.
  - o CFR 47 Part 2
  - o CFR 47 Part 15
- Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the products.

**CANADA**

- Equipment is for use by trained operators only and not for general household or consumer use.
- Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference that may cause undesired operation of the device.

**EUROPE**

- Vivax-Metrotech confirms that the location system is compliant with the relevant provision of European directive 1999/5/EC.
  - o EN 55011
  - o EN 61000-4-2: A1 & A2
  - o EN 61000-4-3
  - o EN 61000-4-8: A1
  - o ETSI EN 300 330-2
  - o ETSI EN 301 489-1 and ETSI EN 301 489-3

# Table of Content

# 1. Service & Support

## *1.1 Serial Number and Software Revision Number*

Always quote your receiver and transmitter model number, serial number, and software revision number when requesting product support. They can be found as follows: (for reference only).


**VM-550, VM-560 and VM-585 Locator Kits**


**VM-880 Ferrous Metal Detector**

| | |
|---|---|
| 1 | Model & Serial Number |

**NOTE**
**The product model and serial numbers can be found on the back of the products.**
**The firmware revision of the receivers is shown bottom center of the LCD when the receiver is turned on.**

## *1.2 Distributors and Service Centers Closest to You:*

### Worldwide Sales Offices and Service Centers

**World Headquarters, United States of America**

**Vivax-Metrotech Corporation**
3251 Olcott Street,
Santa Clara, CA 95054, USA

T/Free : 1-800-446-3392
Tel : +1-408-734-1400
Fax : +1-408-734-1415
Website : www.vivax-metrotech.com
Email : SalesUSA@vxmt.com

**Canada**

**Vivax Canada Inc.**
41 Courtland Ave Unit 8,
Vaughan, ON L4K 3T3, Canada

Tel : +1-289-846-3010
Fax : +1-905-752-0214
Website : www.vivax-metrotech.com
Email : SalesCA@vxmt.com

**Germany**

**Metrotech Vertriebs GmbH**
Am steinernen Kreuz 10a, D-96110 Schesslitz

Tel : +49 954 277 227 43
Website : www.vivax-metrotech.de
Email : SalesEU@vxmt.com

**China**

**Vivax-Metrotech (Shanghai) Ltd.**
3/F No.90, Lane 1122 Qinzhou Rd.(N),
Shanghai, China 200233

Tel : +86-21-5109-9980
Fax : +86-21-2281-9562
Website : www.vivax-metrotech.com
Email : SalesCN@vxmt.com.cn

**Central/South America and the Caribbean**

**Ventas para América Latina**
3251 Olcott Street,
Santa Clara, CA 95054, USA

T/Free : 1-800-446-3392
Tel : +1-408-734-1400
Fax : +1-408-743-5597
Website : www.vivax-metrotech.com
Email : LatinSales@vxmt.com

**France**

**Vivax-Metrotech SAS**
Technoparc - 1 allée du Moulin Berger,
69130 Ecully, France

Tel : +33(0)4 72 53 03 03
Fax : +33(0)4 72 53 03 13
Website : www.vivax-metrotech.fr
Email : SalesFR@vxmt.com

**United Kingdom**

**Vivax-Metrotech Ltd.**
Unit 1, B/C Polden Business Centre,
Bristol Road, Bridgwater,
Somerset, TA6 4AW, UK

Tel : +44(0)1793 822679
Website : www.vivax-metrotech.com
Email : SalesUK@vxmt.com

### International Distributors and Service Centers

**Australasia**

**Vivax-Metrotech AUS**
Unit 1, 176 South Creek Road,
Cromer NSW 2099, Australia

Tel : +61-2-9972-9244
Fax : +61-2-9972-9433
Website : www.vivax-metrotechaus.com
Email : sales@vxmtaus.com
service@vxmtaus.com

**China**

**Shanghai Vimap Technology Co. Ltd.**
9/F, Building 89, Xinhuiyuan,
No.1122 Qinzhou North Road,
Shanghai, China 200233

Tel : 4000-999-811
Website : www.vimap.cn
Email : info@vimap.cn

# 2. VM-500 Series Receivers

## *2.1 VM-500 Series Receivers Overview*

This user manual covers the VM-550, VM-560, VM-585 Utility locators, the metal detection mode of the VM-585 Receiver and the VM-880 Metal Detector. For the most part, the features and functions of these receivers are the same. Where different, they will be noted.

The color-coded rubber tips can identify the VM Series receivers.
**VM-550** Receiver = **Orange**
**VM-560** Receiver = **Blue**
**VM-585** Receiver = **Red**
**VM-880** Metal Detector = **Yellow**
These receivers will be referred to as VM series, VM receiver, receiver, or locator for the manual.

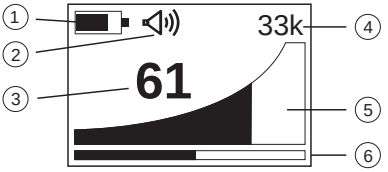
**VM-550, VM-560 and VM-585 Locator Kits**


| | | | |
|---|---|---|---|
| 1 | VM-550 Receiver | 6 | Transmitter Carry Strap |
| 2 | VM-560 Receiver | 7 | User Handbook |
| 3 | VM-585 Receiver | 8 | Ground Stake |
| 4 | Soft Carry Bag | 9 | VM-560 Direct Connection Lead |
| 5 | VM-550FF or VM-560FF Transmitter | 10 | VM-550/VM-585 Direct Connection Lead |

### VM-880 Ferrous Metal Detector

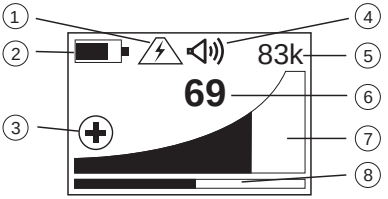

| | |
|---|---|
| 1 | VM-880 Receiver |
| 2 | 2 x AA Battery Holder |
| 3 | Mini USB Cable |
| 4 | User Handbook |
| 5 | Carry Bag |

### The VM-550, VM-560 and VM-585 Series Receivers LCD in Utility Locate Mode




| | |
|---|---|
| 1 | Battery level indicator |
| 2 | Speaker level indicator |
| 3 | Percentage signal level |
| 4 | Selected locate frequency |
| 5 | Signal level indicator |
| 6 | Sensitivity setting indicator |

### The VM-585 and VM-880 Series Receivers in Metal Detection Mode




| | |
|---|---|
| 1 | Power signal warning.<br>(Could be a live cable) |
| 2 | Battery level indicator |
| 3 | Indicates polarity of field (+ or -) |
| 4 | Speaker level Indicator |
| 5 | Selected locate frequency<br>(VM-585 Only) |
| 6 | Percentage signal levels |
| 7 | Signal level indicator |
| 8 | Sensitivity setting indicator |

## 2.2 The Receiver Batteries

The VM series receivers use two AA alkaline batteries.

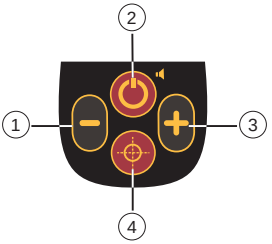
1. The battery icon of the receiver display will flash when the battery is low.
2. To replace the batteries, unscrew the end cap on the handle end of the VM receiver.
3. Remove and replace **both** batteries with fresh 1.5V alkaline AA batteries.
4. Replace end cap.

**WARNING**
**Dispose of all batteries following your company procedures and or Federal/State and local regulations.**

**Never dismantle batteries, put them in a fire, or get wet.**

## 2.3 The VM-500 Series Keypad for Utility Locate Mode

This section covers the **VM-550**, **VM-560** and **VM-585** in **Utility location modes**.
The VM-585 and VM-880 **Metal Detection Mode** is covered in **section 6.0** of this manual.

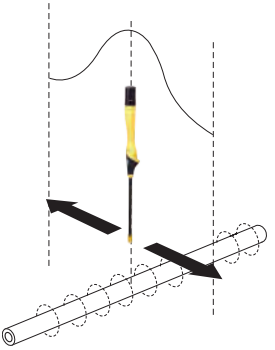



| | | |
|---|---|---|
| 1 | Sensitivity Control (reduce sensitivity) | Reduce sensitivity, or auto-scale down to 50% if off the scale. When in the frequency select menu, use this button to scroll backward through available frequencies. |
| 2 | On/Off Control | Short press to switch on, long press to turn off. When on, short press to change the speaker volume. |
| 3 | Sensitivity Control (increase sensitivity) | Increase sensitivity or auto-scale to 50% if off the scale. When in the frequency select menu, use this button to scroll forwards through available frequencies. |
| 4 | Depth Measurement / Frequency Selection | Short press to initiate depth measurement. Long press to enter frequency select menu then short press to exit the menu. |

## *2.4 A Peak Locator (response)*

The VM series receivers are Peak response locators.

### *2.4.1 Peak Response Locator*

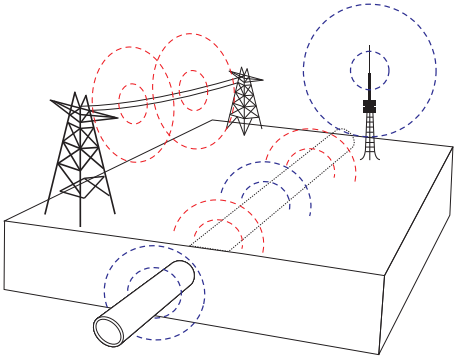


Two horizontal antennas provide a “Peak” or maximum signal response over the buried line's center.

This is an accurate locating method as both horizontal antennas are used to provide a clearly identifiable “Peak.” It is also less prone to the effects of signal distortion.

# 3. Using the VM-500 Series Receivers

## *3.1 Passive Locating*



**Power signals** - are created by mains power running in the supply cables. These signals are 50 or 60Hz, depending on the country. For instance, the UK is 50Hz power, but the USA has 60Hz. When electrical power is distributed throughout the network, some power finds its way back to the power station via the ground. These stray currents can jump onto pipes and cables and also create power signals. Note that there has to be an electrical current flowing to create a detectable signal. For instance, a live cable that is not in use may not radiate a detectable signal. Also, a very well-balanced cable, i.e., the same current flowing in live and neutral, will cancel out and may not create a signal. In practice, this is unusual as there are usually enough imbalances in the cable to create a good detectable signal.

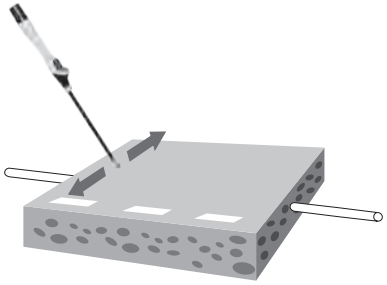
**WARNING**
**The power mode is used to detect signals radiating from cables or services carrying a 50 or 60Hz load. It is possible for a cable to be live but not carry a load. In this case, there may not be a signal to be detected.**
**Similarly, if a cable is exactly balanced, the resulting signal radiating from the cable may be zero and therefore not detectable.**
**Do not use the VM Receiver to identify if cables are live. Always dig with caution.**

### *3.1.1 Detecting Power Signals*

Press and hold the depth measurement/frequency selection pushbutton until the frequency menu is entered. The display will show the present frequency selected in large numbers in the center of the screen. Use the “+” or “–” pushbuttons to select the desired frequency. Press the depth measurement/frequency selection pushbutton to re-enter the locate screen.

**Locating a Cable in the Power (50/60Hz) Mode**

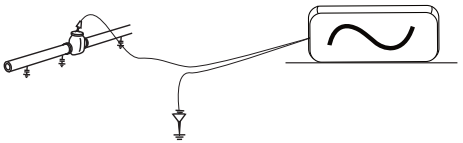
1. Hold the locator vertically in the area that is required to be searched. Then, press the “+” or “-” pushbuttons to set the gain so that the bar graph reads approximately 50%.
2. Hold the locator in front of you in the orientation shown below.



3. Sweep the locator left to right along the suspected route of the cable. As the locator approaches the cable, the meter reading will increase. Pinpoint the position by detecting the largest signal. Adjust the locator's sensitivity by pressing the “+” or “-” pushbuttons to keep the signal on the scale.
4. To confirm the direction of the cable, rotate the locator until the largest signal is detected. The direction of the cable is then directly ahead.
5. Continue to locate the cable along the route.
6. Depth measurements are not possible in the power (50/60Hz) mode. However, if the depth button is pressed, it will show N/A.

## *3.2 Active Locating:- Applying the Transmitter*

Active locating uses a transmitter to apply a precise frequency to a pipe or cable, then uses a receiver turned to detect the signal being radiated at that precise frequency. Active location frequencies can be applied by direct connection, signal clamp, or induction (This is further explained in the following sections).



Unlike passive detecting, active locating has the benefit of the operator controlling the signals and can be more specific about what line is detected. Passive signals are also not always present on a line, so using active signals ensures more lines are detected.

Choosing the correct frequency depends on the application, but as a general rule, select low frequencies as these tend to “bleed off” less than higher frequencies. A good general-purpose frequency is 8.19kHz and is a good starting point if in doubt.

When using “induction” or the “signal clamp,” the frequencies available are limited frequencies optimized for the equipment. However, the full range of frequencies is available in the “direct connection” mode.

For frequencies below 45 kHz, authorities such as the FCC allow higher power output to be used; for frequencies of 45 kHz and above, power output for this type of equipment is restricted to 1 watt. Therefore more power is available when lower frequencies are used.

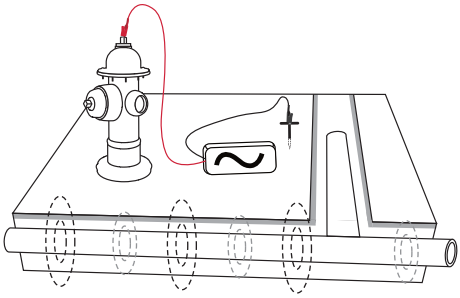
To inject a signal requires the use of a transmitter. The transmitter signal can be injected or applied to the target line in a variety of ways.

### *3.2.1 Direct Connection*

This method involves making an electrical connection to the cable or pipe.

**WARNING**
**The direct connection leads are not designed for connection to live cables.**

**WARNING**
**Do not touch metal parts of the connection clips when connecting to the line or when the transmitter is on.**



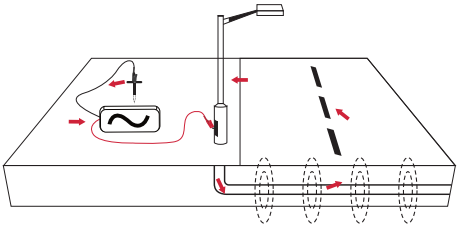
**WARNING**
**Only authorized personnel should make connections to cables.**

To make a direct connection, insert the direct connection connector to the transmitter. Next, insert the ground stake into the ground a few meters perpendicular to the line. Connect the black lead to the ground stake. Now take the red lead and connect to the target line.

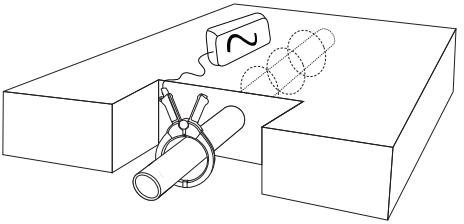
Switch on the transmitter by pressing and holding the on/off button down for a couple of seconds. Select the desired frequency, depending on the application. Check for a good connection noting the change in tone rate when disconnecting and reconnecting the red lead.

Always start with low output and increase the output if the received signal is not strong enough. Setting the output to high when it is not required may result in some of the signal “bleeding off” onto other services and will drain more power than necessary from the battery.

It is sometimes impossible to find a suitable projection to apply the connection clip to a ferrous material. If this is the case, use a magnet to contact the line and then clip the red clip to the magnet. A good example of this is to make a connection to a street lighting circuit. Usually, it is the practice to connect the sheath of a lighting cable to a street lamp's metallic inspection cover. Making a connection to the inspection plate will energize the cable via the plate and sheath. Usually, there is no projection on which to clip, so using the magnet on the plate provides a suitable clipping point.



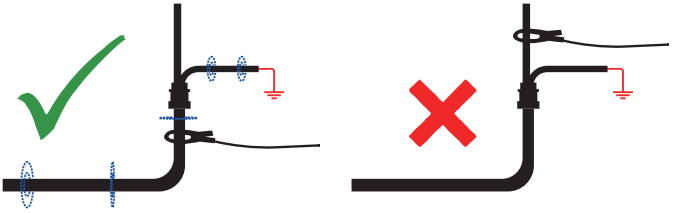
### *3.2.2 Signal Clamp (for frequencies above 8kHz)*



In many situations, it is impossible to gain access to a cable to make electrical contact. Or if there is, it is not safe to do so. The signal clamp provides an efficient and safe method of applying a locate signal onto a cable.

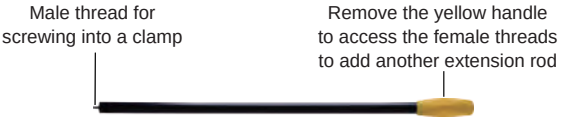
Note that for best results, the cable should be grounded at both ends. The clamp should be fully closed for optimal current induction. A small amount of current will still be induced if the jaws are open.

When clamping around a cable, make sure the clamp is placed below the grounding point, as shown below.



When applying a clamp close to a grounding point where multiple grounds or a grounding bus exists, ensure that you place the clamp around the target line and not to the ground bus/other grounds. This will help focus the applied signal on the target line.

**Clamp Extension Rod**
A useful accessory to the clamp is the extension rod:




The extension rod is fitted with a 10mm threaded male stud. This male thread screws into the handle of the signal clamp to extend the distance of the clamp. This helps areas with difficult access, such as in manholes or trenches.
(not to be used on uninsulated overhead power cables).

The extension rod is fitted with a female thread in the handle. The female thread allows the rods to be joined together to extend the range. To access this thread, slide the yellow handle off the rod.

To operate the clamp jaws when attached to the rod, gently pull on the clamp cord, which will open the jaws. Then, release cable to close them.

**WARNING**
**Always follow the appropriate safety requirements mandated by safety legislation, safety practice, and your company's safety procedures when applying a clamp (coupler) to a cable.**

**BEWARE that when placing a clamp around cables carrying high current, the clamp may vibrate, jump or close violently due to induced current from the target cable.**

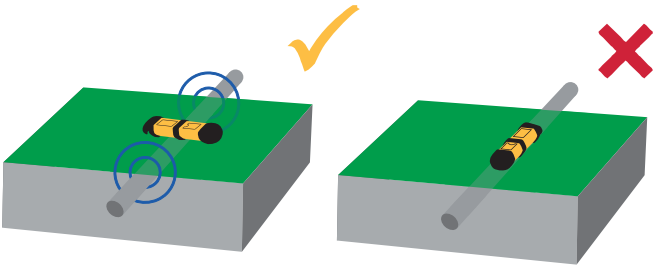
**High voltages can be induced back onto the clamp and be present at the clamp's plug in some situations. Therefore, safety practices should be followed at all times when clamping around live target lines!**

**Always ensure the clamp is connected to the transmitter before clamping around a line.**

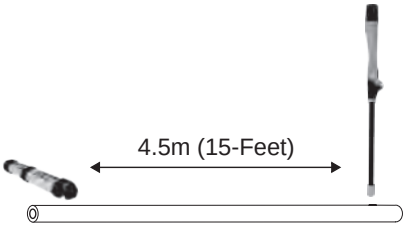
### *3.2.3 Induction (for frequencies above 8kHz)*

When no direct connection lead or signal clamp is connected, the transmitter will automatically start to radiate (induce) a signal around the transmitter. These signals will penetrate the ground and couple onto buried lines. The signal will then travel along the line, which can be detected with the VM series receivers.

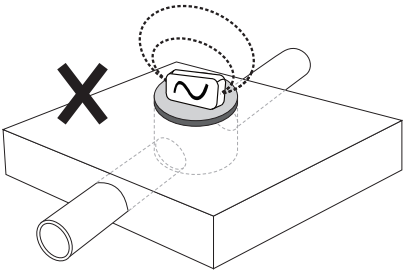
1. Remove all connections from the VM series transmitter.
2. Switch on the transmitter and place it so it is over and perpendicular to the targeted line per the induction direction arrow label and the below illustration.



The induction mode is particularly useful where there is no access to the line, but it should be noted that this is the least efficient method of applying a signal. It is also prone to signals being applied to adjacent lines.




Also, note that the signal will radiate out to the sides and below the transmitter. For this reason, it is recommended that when applying a signal using the induction method, a distance of 4.5m (15-feet) is kept from the transmitter when pinpointing or taking depth readings.

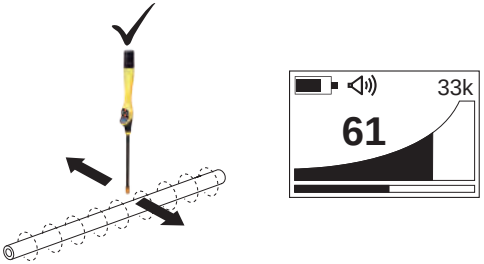


When using the induction mode, avoid placing the transmitter over metallic manhole covers. Doing so will severely reduce the transmitter's effectiveness and, in extreme cases, cause damage to the transmitter's circuitry.

## *3.3 Locating Active Signals*

Apply the transmitter signal to the line.

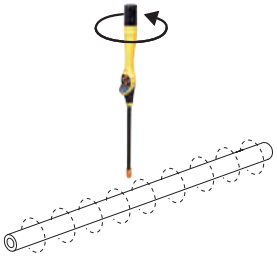
Select a desired locate frequency matching the transmitter.




Adjust the sensitivity control so that the display indicates approximately 50%. Keeping the VM receiver vertical, move to the side slightly. If the bar graph increases, you are moving toward the line. If it decreases, you are walking away from it. Move toward the line until a maximum signal is achieved. It may be necessary to reduce the sensitivity to keep the bar graph on the scale. This is a normal occurrence and should be expected. Try to keep the VM receiver vertical and avoid swinging it, as this may create false readings.

Move the locator side to side to ensure a maximum signal is detected. Use the peak level indicator to assist.

To confirm the direction of the cable, rotate the locator until the largest signal is detected. The direction of the cable is then directly ahead.



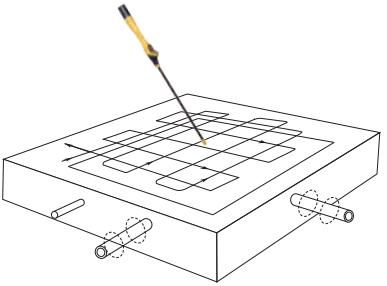
With the maximum signal found, the VM receiver is now directly over the line and exactly across it.

Continue to trace the line to its destination or source.

## *3.4 Searching (sweeping) an Area in the Peak Mode*

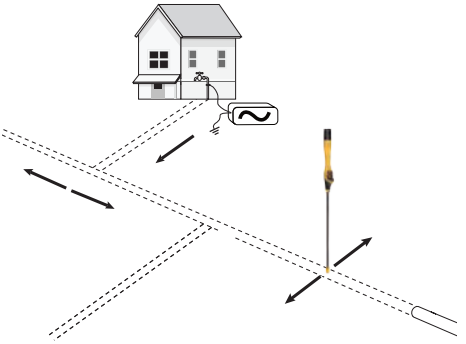
Buried utilities may be parallel to each other and frequently they cross the area being searched at various angles and depths.

As the locator antenna's response is directional, it is important to search the area in the same or similar pattern as shown. This orients the antennas in a way that will locate any signals being radiated from the buried utility.



## *3.5 Tracing a Buried Line*

Where possible trace out from the transmitter connection point. Holding the locator vertically and in front of you, walk forward while moving the locator left to right, then right to the left over the line. Keep the movement over the center of the line, i.e., the largest meter response, adjusting the gain when necessary. Whenever practical it should be traced to the point that provides additional confirmation of what type of service is being located (i.e., a telephone pedestal, a manhole cover, etc.).

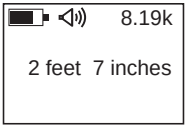


## *3.6 Depth Measurement*

**Depth Measurements** (Not available in Passive locate modes)

To take a depth measurement pinpoint the position and direction as previously described. Now hold the locator vertically and in line with the cable or pipe.

Now press the depth measurement/frequency selection button. There will be a short delay before a depth estimate is displayed.




**NOTE**

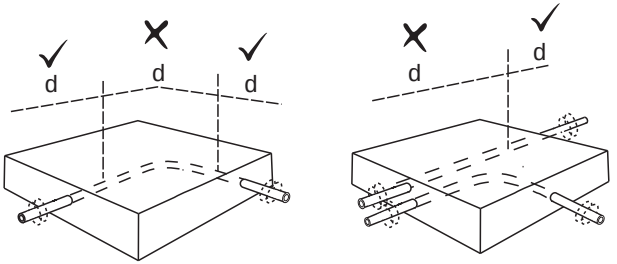
**The depth measurement is an approximation. Depth indications can be affected by field distortion caused by adjacent utility lines or direction and depth changes. Always use depth measurements as an aid to line verification but <u>never</u> use them to decide if mechanical digging is safe. Always dig with care.**

To help determine if the depth is correct is to repeat a depth measurement with the locator a known distance (for example 1ft) above the ground and note if the depth has increased by this amount. If it is different from what is expected, treat the data as suspect.

## *3.7 Distorted Fields*

When locating, always be aware that you are locating the signals radiating from the buried line. These radiated fields can be distorted by other lines or electromagnetic signals from buried lines. Metallic structures like crash barriers or wire mesh fences can also help to distort signals.

- Take a depth reading on the ground and then raise the locator approximately 1ft or 0.25m and repeat the depth measurement. The depth should increase by this amount. If it does not, treat the information with caution.
- A depth reading on congested areas or close to bends or tees may be inaccurate due to distorted fields.

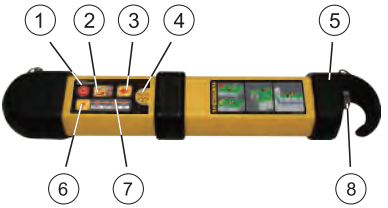


# 4. The VM-500 Series Transmitters

This section of the manual covers the VM-550FF and VM-560FF transmitters.

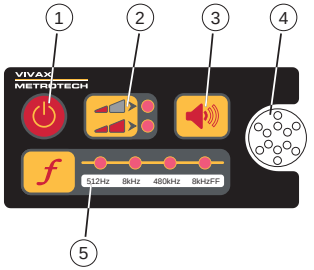
## *4.1 VM-500 Series Transmitter Overview*

The VM-500 series transmitters are rugged portable transmitters powered by alkaline “D” cells or Li-ion rechargeable batteries. The following describes the features and uses of the transmitter.




| | |
|---|---|
| 1 | ON/OFF |
| 2 | Output power select and indicator |
| 3 | Speaker volume select |
| 4 | Speaker |
| 5 | Battery housing cover |
| 6 | Frequency selected |
| 7 | Frequency selected indicators |
| 8 | Battery cover retaining screws |

### *4.1.1 Pushbuttons*




| | |
|---|---|
| 1 | On/Off control |
| 2 | Output Low/High |
| 3 | Volume |
| 4 | Speaker |
| 5 | Frequency indicator |

## *4.2 Transmitter Batteries*

The VM series transmitters use 4 x D cell alkaline batteries. An option Li-ion battery kit is also available.
The low battery status is indicated by the Output Low/High LED flashing.

**VM Transmitter Battery Compartment**

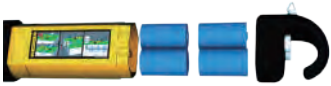

| | |
|---|---|
| 1 | Battery cover retaining thumbscrew |
| 2 | Orientation symbols |
| 3 | Battery polarity indicators |

### *4.2.1 Alkaline Transmitter Batteries*

Note the retaining thumbscrews should only be hand tight. It may be necessary to use a flat blade screwdriver to loosen the thumbscrews. But when installing, hand tightening is enough.

**Remove the discharged alkaline batteries**

1. Unscrew the two-battery cover retaining thumbscrews.
2. Lift the battery cover off.
3. Remove the old batteries and dispose of them according to your companies practices.



**Replacing the D Cell alkaline batteries**

**Installing the custom Li-ion Battery Assembly**

**Installing fresh alkaline batteries or the Li-ion battery assembly.**

**WARNING**
**Mixing good and discharged batteries may result in excessive heat or possibly a fire.**

1. Note the battery orientation symbols on the side of the transmitter body.
2. Install four fresh D cell alkaline batteries in the correct polarity orientation.
3. Replace the battery cover and hand tighten the battery cover retaining thumbscrews.

### *4.2.2 Optional Li-ion Transmitter Battery*

**Charging the Li-ion Battery**

1. Remove the battery from the transmitter.
2. Align the red dot on the charger connector with the dot on the charging socket at the base and connect it.
3. Plug the charger into a mains power socket.

The LED on the charger will illuminate red until the batteries are charged. The LED will then turn green, indicating a full charge.

**Battery charging port and charger plug**


**NOTE**
**The rechargeable pack cannot be charged from a 12V DC source.**

**WARNING**
**Only use a charger supplied by Vivax-Metrotech Corp. Using non-approved chargers may result in damage to the equipment or overheating/explosion.**

## *4.3 Frequencies*

### *4.3.1 Frequencies and Power Output*

The VM series transmitters are supplied with predefined transmitting frequencies.

| **Example of standard frequencies pre-set at the factory are:** | **VM-550FF** | **VM-560FF** |
|---|---|---|
| 512Hz (where electrical systems are 60Hz) direct connection | 1-watt | 1-watt |
| 640Hz (where electrical systems are 50Hz) direct connection | 1-watt | 1-watt |
| 8.19kHz direct connection | 1-watt | 1-watt |
| 83.1 kHz direct connection | 1-watt | 1-watt |
| 480Hz direct connection | 1-watt | 1-watt |

# 5. 8kHz Fault Find

The VM-500 series transmitters are capable of energizing a line with a fault find signal. An instrument known as an A-Frame or Fault Locator can then be used to pinpoint the cable fault or pipeline holiday location. For example, the model VM-510FFL+ is a combination cable locator and Fault Locator. Another option is the Accessory A-Frame which plugs into the vLoc3 series receiver. These faults tend to be cable sheath to ground faults or coating defects (holidays) on pipelines. More information about these products can be found on our website.

This manual gives instruction using the VM550FF or VM-560FF transmitters with the standalone VM-510FFL+ A-frame fault locator.

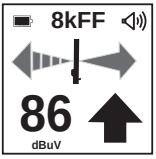
## *5.1 Fault Locating*

To detect a damaged section, the line should be isolated and have all ground bonding removed. This will ensure that the ground fault is not masked by deliberate bonding to the ground. Unfortunately, the A-frame cannot distinguish between these two situations.

Connect the transmitter to the target line using the red connection lead. A ground stake needs to be pushed into the ground, and the black connection lead clipped to it. Try to place the ground stake as far as possible from the line to be evaluated. This ensures return currents do not distort the results. Switch on the transmitter and make sure the A-frame and transmitter are both set to 8kHzFF. Note the 8kHzFF defaults to the high setting on the transmitter. It is not possible to select low output when in the 8kHzFF mode.

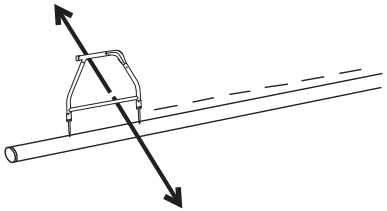
Remove the rubber spike covers from the A-frame

Make a momentary push on the on/off button of the A-frame. It will automatically default to the A-frame screen.




Note that if the spikes are not in the ground or there is only a very small signal, the dB reading and arrow may not be visible. These are only shown when there is a valid fault find signal.

Use the left/right indicator to position yourself over the cable. The correct position is indicated by the bar being centralized on the display.
If using the default FF screen as indicated above, there is no need to adjust the gain using the “+” and “–” buttons as the unit does this automatically for you.

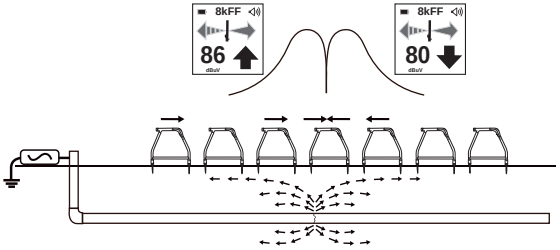


The speaker will also emit a pulsed tone on one side of the cable and a solid tone on the other, so it is possible to locate without looking at the screen. If necessary, adjust the volume by using short presses on the on/off button.

Hold the A-frame in line with the suspected route of the cable.

Walk along the line's route placing the A-frame's spikes in the ground (with the green leg pointing away from the transmitter connection point) every two or three paces. Allow a couple of seconds for the electronics to settle before moving off to the next position.

If starting near the transmitter, the arrow on the display will point away from the ground point. As the transmitter's distance increases, the dBuV reading will reduce and eventually, the arrow will fluctuate or disappear altogether. This is because the fault location is further along the line. Use the left/right indicator to ensure the A-frame is positioned over the line and continue placing the A-frame in the ground every two or three paces.



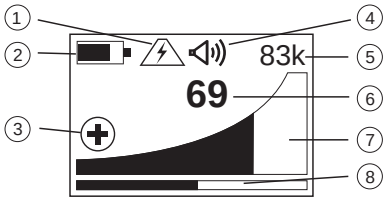

Eventually the A-frame will detect the fault signal and the “fault direction indicator” arrow will point forward.

Continue moving forward. It may be worth reducing the distance between measurement points as the fault is neared. The dBuV reading will increase as the fault is neared. Maximum reading will be just before and just after the fault.

When over the fault, the dBuV reading will drop and the arrow will flip backward indicating that the position of the fault has been passed. Carefully place the A-frame before and after the fault to pinpoint the position. Repeating this across the line direction will pinpoint the fault laterally. The fault will be at the point where the lateral fault is identified.

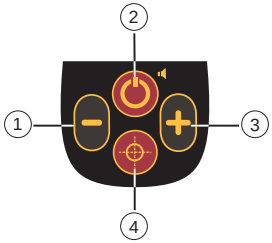
# 6. Metal Detection with the VM-880 and VM-585

**The VM-585 and VM-880 Series Receivers in Metal Detection Mode**




| | |
|---|---|
| 1 | Power signal warning.<br>(Could be a live cable) |
| 2 | Battery level indicator |
| 3 | Indicates polarity of field (+ or -) |
| 4 | Speaker level Indicator |
| 5 | Selected locate frequency<br>(VM-585 Only) |
| 6 | Percentage signal levels |
| 7 | Signal level indicator |
| 8 | Sensitivity setting indicator |

**The VM-585 and VM-880 Series Receivers keypad in Metal Detection mode**




| | | |
|---|---|---|
| 1 | Reduce Sensitivity | Reduce sensitivity when off the scale |
| 2 | On/Off Control | Short press to switch on, long press to turn off. When on, short press to change the speaker volume |
| 3 | Increase Sensitivity | Increment sensitivity |
| 4 | Depth Measurement / Frequency Selection | VM-880 and VM-585 in Metal mode: Short press to Autoscale the sensitivity<br><br>VM-880: Long press – Turn the display 180° |

## *6.1 Ferrous Metal Detect Mode*

The VM-585 in Metal Mode and the VM-880 will locate buried magnetic (iron and steel) objects. Non-metallic objects, i.e., aluminum cans, bottle caps, etc., will be rejected. The “finely tuned” sensitivity of the VM-585 and VM-880 makes it possible to locate magnetic objects at greater depths.

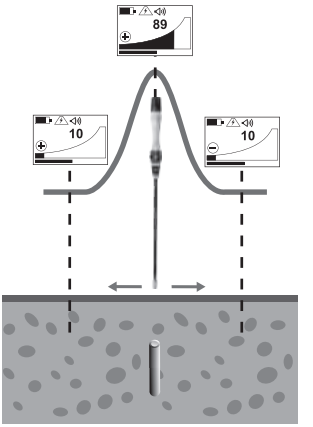
### *6.1.1 Checkout Procedure*

1. Hold the unit in a vertical position well away from any metallic objects and turn on the receiver.
   When using a VM-585 model, switch it to **M** mode. Check that the battery is good by looking at the battery icon. Replace the battery if necessary.
2. Now momentarily press the auto sensitivity pushbutton. The sensitivity setting indicator should show maximum. (if not, find another test site) The display should read less than one-half, and the numeric value should be less than 50.
3. Now lower the receiver down towards the PK nail. Stop when the numeric value increases by approximately ten and the speaker pitch increases. The distance from the nail should be greater than 2" *(50mm)*. This will vary greatly due to site condition and PK nail tolerance.
4. If the unit fails this test, it should be returned to the factory or approved service center as there are no user-serviceable parts.


### *6.1.2 Operation*

Only ferrous metals that attract the earth's magnetic fields, such as iron, nickel, cobalt and their alloys, as well as magnets, such as magnetic markers, can be located.

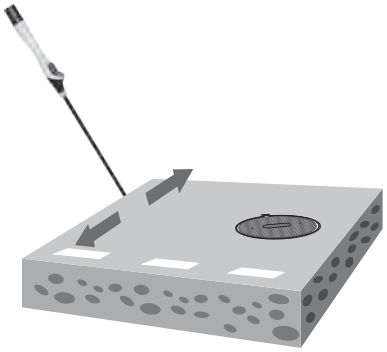
Utility objects that contain these metals would include PK nails, marker stakes, valve boxes, cast iron pipe, manhole covers and large iron tanks. It also locates objects that generate their own magnetic field, such as magnets. This discriminating feature of the VM-585 simplifies the operator's search for a specific magnetic target. The size, shape, depth and orientation of the target object will define the profile" or "signature" indicated on the VM-585 meter.




### *6.1.3 Operation in Metal Detection mode:*

1. Turn on the unit by pressing the ON/OFF /Speaker push button. If using the VM-585 make sure the unit is set to Metal Detection mode.
2. The sensitivity of the instrument will automatically set itself to mid-gain.

3. There will also be a “+” or “-” icon on the screen. This indicates the polarity of the magnetic field which will be explained later.



4. Sweep the area while holding the unit at an angle of about 45 degrees. Walk forward slowly sweeping left to right and keeping the tip an even and close distance from the ground.
5. When a ferrous object is approached, the bar graph will expand, and the speaker's pitch will increase. (Set the speaker volume with a momentary press of the ON/OFF push button).
6. Hold the unit exactly vertical to pinpoint the highest pitch and largest bar graph deflection. If preferred, invert the screen by a long press of the auto sensitivity pushbutton. The numeric value can be used to aid the pinpointing process. For example, refer to the below picture. Pinpoint in two directions to ensure the exact location is found.
7. If the signal over ranges, use the “+” and “-” keys to bring the signal back into the bar graph's range.
8. Alternatively pressing the auto sensitivity push button will alter the gain automatically so that the bar graph is set to approximately 50%.

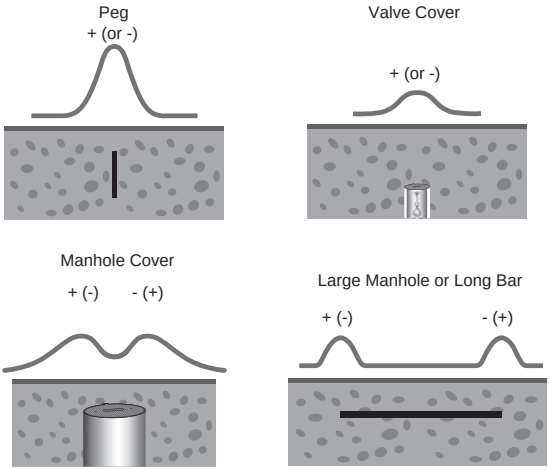
### *6.1.4 "Signatures" of Different Targets*

The following figures illustrate typical responses to common targets. With a little experimentation you will become familiar with the "profile" or "signature" of each object you are trying to locate.

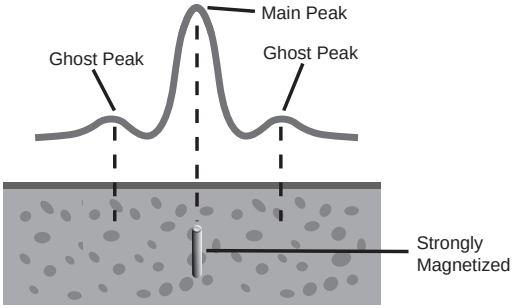
All magnetic fields have a positive or negative polarity. For instance, a long bar will be positive on one end and negative the other. Knowing the magnetic field's polarity helps identify the object's shape and length and helps distinguish it from other objects in the ground.

The polarity is indicated by the "+" or "-" icon. The polarity of the field depends on several factors. Magnets are polarized North and South. The polarization that the locator will detect depends on the way the magnet was inserted in the ground. The earth's magnetic field polarizes others.

The shape of the response depends on how big and deep the object is. Larger objects will peak at the object's extremities. These peaks will be opposite polarities. Smaller or deeper objects will have just one peak and may have a "+" or "–" polarity.




Very strong magnetic fields may have ghost signals on either side of the main peak signal. Buried magnets, for instance, may exhibit this effect.



# 7. Accessories & Options

## *7.1 Transmitter Signal Clamps*

Clamps are accessories used to apply the transmitter signal to an insulated line, removing the need to connect the transmitter signal directly to a conductor or cable sheath.
Clamps are available in 2-inch *(50mm)*, 4-inch *(100mm)* and 5-inch *(125mm)* sizes. An 18-inch *(45cm)* flexible version is also available.

## *7.2 VM-510FFL+ A-Frame Fault Locator*

Finding the location of an underground cable fault just became easier with the **VM-510FFL+ Standalone A-frame locator**. Now locating a suspect cable and finding the fault can be done with the **VM-510FFL+** and a compatible transmitter.

**Visit us at www.vxmt.com to see the full range of receiver and transmitter accessories and available options.**

# 8. Glossary

| | |
|---|---|
| Active Locate | A locate where a transmitter is used to apply a signal to a buried pipe or cable, the position of which is then located by a receiver tuned to the same frequency. |
| Active Signal | A signal is applied by the locator transmitter to a buried line. Typical, this is a very precise frequency. |
| Attenuation | The reduction of an electromagnetic signal from a pipe or cable. |
| Clamp (or Coupler) | An accessory used to apply the transmitter signal to an insulated line, removing the need to connect the transmitter signal directly to a conductor or cable sheath. |
| Compass | Line direction indicator (although visually like a compass, this is the only relation to a compass.) |
| Coupling | The act of signals transferring to lines to which they were not originally applied. The coupling can be “direct” where the target line has an electrical connection to another line or “induced,” where the signal radiates from the target line to another line or lines. |
| Display | The information visually available on the dot matrix display. |
| Line | A generic term for any buried pipe or cable. |
| Null | A minimum response to a buried line.  |
| Passive Locate | A locate where the receiver searches for a wide range of signals that radiate from buried pipes or cables. These signals come from various sources in the environment and couple to the buried (& overhead) lines. Typical examples 50 / 60Hz and LF/VLF radio. |
| Passive signals | A wide range of signals that radiate from buried pipes or cables. These signals come from various sources in the environment and couple to the buried (& overhead) lines. Typical examples 50/60Hz and LF/VLF radio. |
| Peak | A maximum response to a buried line.  |
| Pinpoint | Using a receiver to identify the exact position of a buried line. |
| Response | The indication that the receiver gives, which is caused by the signals it is receiving. This can be visual, audio, or both. Typically, it is displayed on the locator’s dot matrix display and audibly from a loudspeaker in the receiver housing. |
| Search (sweep) | This describes the act of looking for a buried line within a given area. |
| Sonde | A small transmitting coil be built into a product such as a sewer camera or packaged as a small self-contained battery-powered transmitter. A receiver tuned to the same frequency can locate the Sonde's position and hence whatever it is attached to or in. Frequently used for locating sewer cameras and nonmetallic pipes. |

| | |
|---|---|
| Target Line | The buried pipe or cable to be located. |
| Trace | Using a locator to following the path of a buried line. |

Illustrations used in this manual's preparation will inevitably show some resemblance to similar illustrations from other manufacturers. This is because manufacturers have permitted the use of their graphics. This statement is intended to attribute such credit.

**Disclaimer**: Product and accessory specification and availability information are subject to change without prior notice.

***Notes:***

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