VIVAX METROTECH

VM-480B
User Handbook

(English Edition)

Version 1.7

P/N: 4.04.000029

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 companies or other applicable safety code and rules when using this equipment.
- Unless having the required authorization, license, and appropriate training – **Do not** make connections to any pipe, cable, or conductor.
- The equipment should not come into contact with corrosive or hazardous chemicals, or gases, dust.
- **Do not** directly connect this equipment to cables or pipes that have a potential difference to ground of 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

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. 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.

IMPORTANT
Remember – 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 the 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 cable or pipe being 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 the depth of cable or pipe 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.
  - **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.
  - **EN 55011**
  - **EN 61000-4-2: A1 & A2**
  - **EN 61000-4-3**
  - **EN 61000-4-8: A1**

Table of Content

1. Service & Support

1.1 Serial Numbers

Always quote your receiver or transmitter model number and serial number when requesting product support.

1	Model numbers
2	Serial numbers

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. Introduction

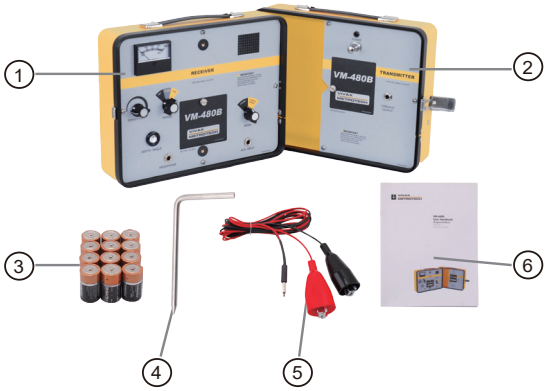
2.1 VM-480B Overview

The VM-480B "Split-Box" buried utility locator is a versatile locating instrument designed for locating and tracing the path of pipes and cables and detecting energizing 50/60Hz power lines. The split-box design makes it easy to conduct blind searches, ground surveys, and locate underground metal masses. The depth of cover to the buried utility can be calculated using the triangulation method.

The VM-480B gets it's Split-Box nickname by its unique design. The box design separates into two parts. One is the transmitter, which sends out the locate signal. The other part being a Receiver which picks up the signal coming from the transmitter or line radiating 50/60Hz.

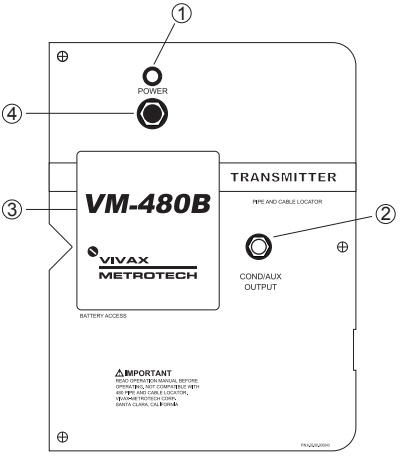
Mounting the locator on the optional Search Handle accessory simplifies the task of conducting blind searches, ground surveys, and locating underground metal masses.

2.2 What's in the box



1	VM-480B receiver
2	VM-480B transmitter
3	C size alkaline battery
4	Ground stake
5	Direct connection lead
6	Manual

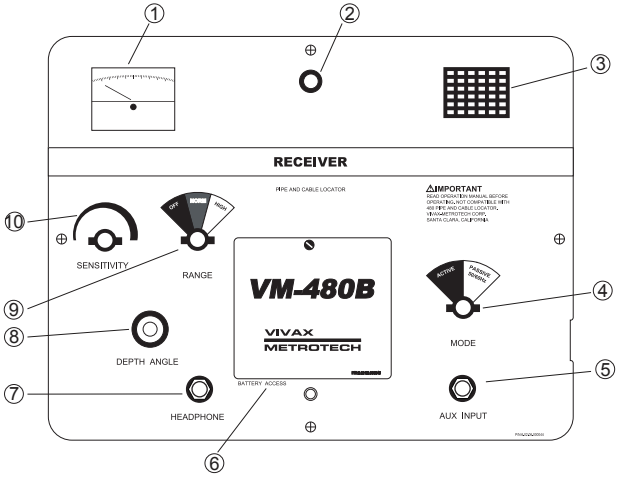
2.3 Controls and Indicators of the VM-480B Transmitter



VM-480B Transmitter: Controls and Indicators

1	Power Indicator & Battery Indicator - Glows when the unit is on. Blinks steadily if battery power is good, blinking will slow according to the remaining battery life. Will stop blinking when batteries need replacing.
2	Direct Connection Lead & Aux Output socket - Plug in the Direct Connection Leads or 4820 Metroclamp Induction Clamp. The transmitter's internal antenna is automatically disconnected when a plug is inserted into this socket.
3	Battery Compartment
4	Power Switch - Pull the switch to power on the transmitter. The power Indicator lamp will blink.

2.4 Controls and Indicators of the VM-480B Receiver



VM-480B Receiver: Controls and Indicators

1	Field Strength Meter - The meter indicates the strength of the signal being received by the receiver. The reading will vary according to how close the receiver is to the conductor. The receiver displays the highest reading when it is directly over the target conductor. Battery Test Indicator - When the receiver is on, the needle should move into the BATT test area of the meter. If it does not, the batteries need to be replaced.
2	Carry Handle Mount - Connection point for Carrying Handle screws.
3	Speaker - Emits an audio tone, which guides the operator toward the targeted conductor.
4	Mode Switch - Two operating positions: Active – Direct Connection, Inductive coupling and inductive Passive – For tracing energizing 50/60Hz power lines
5	Aux/Input Socket - Plugin a second 4820 Metroclamp (when using two clamps) into this socket.
6	Battery Compartment
7	Headphone Socket
8	Depth Angle Bubble - Position the bubble in the indicated area to estimate the depth.
9	Range Knob - Changes the ratio of the signal amplification.
10	Sensitivity Control - Controls the signal gain. Set as low as possible to avoid receiving the signal from conductors other than your target conductor.

3. Check-Out Procedure

To ensure proper operation of the VM-480B Pipe and Cable Locator, use the checkout procedure at the following times:

- Upon receiving the equipment
- Before each job, preferably before you leave for the site
- If problems arise during a locate

1. Turn the transmitter on by pulling the power switch and place the transmitter on the ground. If the batteries are working, the battery lamp will blink.
2. Turn the receiver on (if the batteries are working, the meter will move to the BATT section of the meter) and set to the Active/Norm mode.
3. Set the sensitivity knob to the "SET" line.
4. Hold the receiver in a position parallel to the transmitter. The meter needle should move to the right side of the meter, and the audio tone should be loud.
5. Move away from the transmitter, holding the receiver in the same parallel position. At 10 to 20-feet, the signal level should start to drop - the meter needle will move to the left, and the audio tone will begin to fade.
6. Turn the receiver perpendicular to the transmitter - both the meter reading and the audio tone should suddenly drop.

If either the receiver or the transmitter does not respond to the above tests, check the batteries. Refer to Section 7, maintenance for instructions.

3.1 To Check the 50/60Hz Power Mode

1. Test the receiver only (the transmitter is not required for passive locating). Stand under an indoor AC powered light future.
2. Set the range to "HIGH" and the sensitivity to the 12 o'clock position.
3. Hold the receiver in a vertical position and raise the receiver upward toward the light fixture. The meter reading and audio tone should increase as the receiver gets closer to the light fixture.

If either the receiver or the transmitter does not respond to the above tests, check the batteries. Refer to Section 7, maintenance for instructions.

NOTE
The VM-480B receiver features an automatic shut off after a 30-minute feature. A beep will sound to alert the operator that the receiver is about to shut off. Reactivate the receiver by turning the RANGE KNOB back to “OFF” and then to “NORM” or “HIGH.”

4. Operation

Follow the checkout procedure described in Section 4 before operating the equipment.

To operate the VM-480B pipe and cable locator, use the transmitter to apply the signal to the conductor, and use the VM-480B receiver to trace the signal coming off the conductor.

For a successful locate, you must be sure that you have the best possible connection to the target conductor and that the conductor is well-grounded. If there is a break in the circuit path, very little transmitter signal will reach the receiver. Look for disconnected leads, circuit breakers, open switches, insulators, etc.

Power lines and telephone sheaths are assumed to be grounded. If you are tracing a conductor with an exposed insulated joint, such as a gas pipe with a gas meter, use the jumper cable to bypass the meter (insulator). Attach each end of the jumper cable to opposite sides of the insulator.

To trace non-metallic pipe (sewer line) or duct, send the signal through the conductor by inserting a snake or fish tape into the pipe and connecting the Direct Connect Leads from the transmitter to one end of it.

WARNING
Never make a direct connection to a live power cable. Use a voltmeter to check for active electrical power. Always make sure the power to a cable is turned off before you make a direct connection to it. (Live secondary power can be located safely using an Inductive clamp.)

4.1 To Start Locating

There are three different methods of applying the signal to the conductor with the transmitter - Direct Connection, Inductive Coupling, and Inductive. A description of each method and use instructions follow below.

In addition to three different methods of inducing the signal onto the conductor, there are two methods - PEAK and NULL by which to locate your conductor.

The PEAK method is generally used to follow the path or direction of a line. It is the preferred method for general locating because the sensitivity or gain can be kept to a minimum, which prevents bleed-off onto nearby lines.

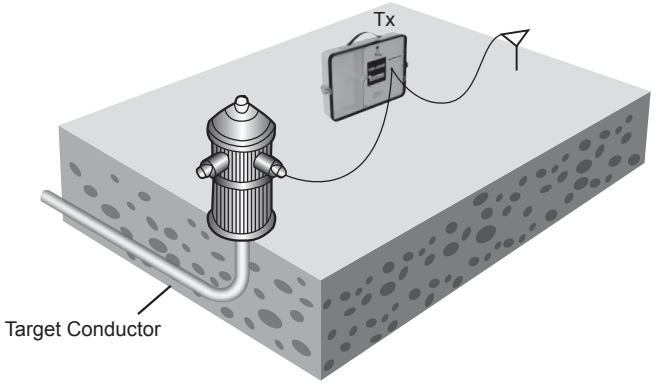
The NULL method is used for more accurate locating of the centerline of a conductor. You would want to get an accurate location of a conductor centerline before determining the depth of a conductor.
PEAK and NULL procedures are described below.

4.2 Direct (Conductive) Connection

Direct connection is the preferred mode of operation because the transmitter is connected directly to a metallic part of the conductor (hydrant, meter, riser, valves, sheath, tracer wire), allowing the strongest signal to reach the conductor. In this operating mode, the receiver can be closer to the transmitter, and adjacent buried conductor interference is reduced.

4.2.1 Transmitter

1. With the transmitter off, plug the direct connection lead into the socket labeled COND/AUX OUTPUT.
2. Attach the RED lead of the direct connection leads to an electrically clean metallic part of the targeted conductor.
3. Extend the BLACK lead of the direct connection leads as far as possible from the conductor, at a right angle. Look for a convenient existing ground, such as a metal street sign. Be careful not to get close to or cross any adjacent buried conductors. If no existing ground is available, use the ground spike as far into the ground as possible, and attach the BLACK lead. If the ground surface is too hard, place the ground plate on the ground and attach the BLACK lead. To improve conductivity, put water and a weight on it.

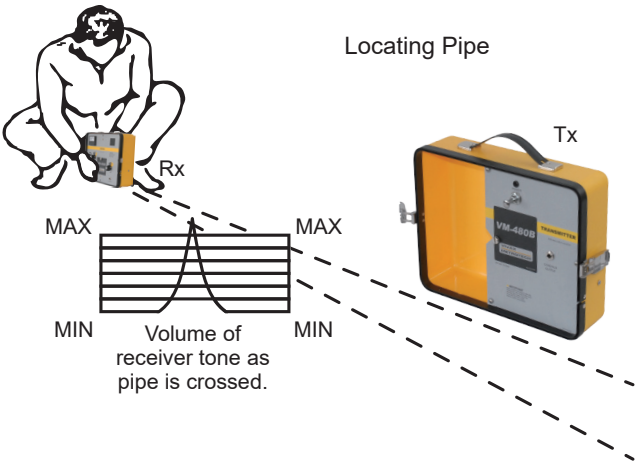


Direct (Conductive) Connection

4. Pull the transmitter POWER Switch ON. Set the MODE switch to POWER TEST. The POWER TEST LAMP should blink steadily, indicating a charged battery.
5. Set the receiver MODE switch to "Active."
6. Set the receiver sensitivity knob to a low setting on the left of the dial, adjusting as needed for good signal reception. As you move farther away from the transmitter, you will need to increase the sensitivity. It is important to tune the sensitivity as low as possible to sharpen the reception and reduce signal bleed-off onto adjacent conductors.
7. Set the receiver RANGE knob to "NORM," adjusting to "HIGH" when necessary.
8. When starting a locate, you need to "pre-locate" the targeted conductor by using the broad range PEAK method first to find the general location of the line. Then hone in on the exact location of the conductor with the precision NULL method.

4.2.2 Peak Method

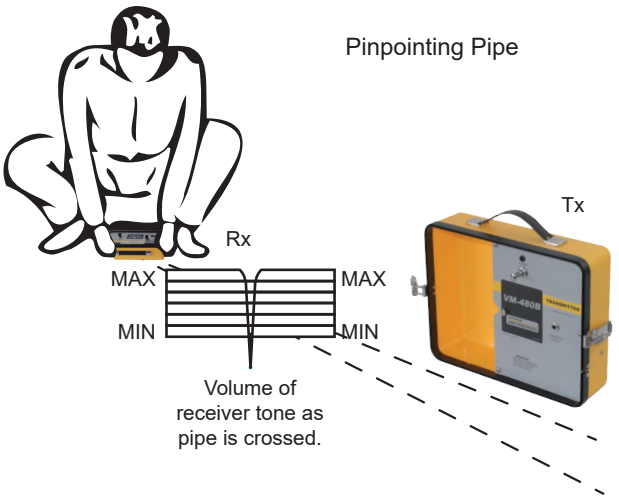
The PEAK method gives a maximum (loud tone) signal. Hold the receiver by the handle in a vertical position and move it from side to side. The audio tone and field strength will increase as you approach the location of the conductor.



Peak VM-480B Receiver Response

4.2.3 Null Method

To pinpoint the location of the conductor, use the NULL method by holding the VM-480B receiver in a flat, horizontal position. The audio tone will increase and then go silent at the exact location of the conductor.



Null VM-480B Receiver Response

WARNING
Do not hold the receiver at an angle – Incorrect information will result!

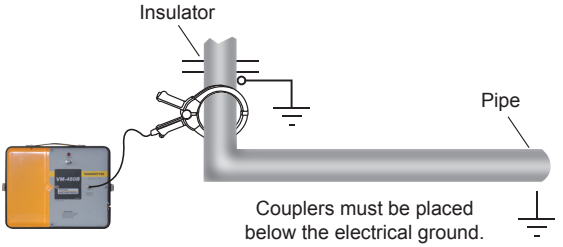
1. To determine the direction of the conductor, stop and vertically rotate the receiver to the left and right. The highest signal strength reading indicates the direction of the conductor.
   Continue to trace the conductor in the direction indicated by the indicators on the receiver. If the signal strength drops abruptly, the conductor may have changed direction or stopped.
2. When you have pinpointed the conductor's location, mark it as required. See Section 5.6 for APWA color markings.
3. When you have finished the locating, turn the transmitter and receiver off and disconnect the accessories.

4.3 Inductive Coupling with the 4820 Metroclamp

Use this method if Direct Connection is not possible, but you can position a Metroclamp around the conductor you want to trace. The Inductive Coupling method uses the 4820 Metroclamp to induce a signal onto the conductor when direct metallic contact is not possible. The clamp is placed around the target conductor. The transmitter then induces a signal through the clamp.

When using the Metroclamp, the conductor must be well-grounded, i.e., with sheaths and neutrals. When tracing lines that have insulators, the insulators should be bypassed, using the supplied jumper cable.

1. With the transmitter OFF, plug the 4820 Metroclamp into the COND/AUX socket on the transmitter.
2. Place the Metroclamp around the conductor, below the electrical ground. Make sure that the clamp jaws are completely closed.



Inductive Coupling with the Metroclamp

3. Continue your locating by following steps 4 through 11, Section 5.2 Direct Connection.

4.4 Inductive (Indirect Method)

If you cannot make a direct connection onto the conductor, or use the induction clamp, use the antenna that is mounted on the transmitter case to induce signal onto the conductor.

This is the least preferred method of inducing signal onto a conductor because the signal is broadcast through the soil and air and can be picked up by other conductors in the area. In this mode, the signal radiates from the antenna mounted on the transmitter case and couples to the conductor by electromagnetic induction.

If no direct connect lead, or induction clamp is attached to the DIRECT/4820 CLAMP socket, the transmitter automatically broadcasts the signal through the antenna mounted on the transmitter case.

No ground connection is needed when a signal is induced onto the target conductor.

WARNING
Do not operate the transmitter in the Inductive Mode while it is resting on or near a metal surface or large metal object. Incorrect test readings and damage to the transmitter may result.

1. Position the transmitter over the buried conductor, making sure that the transmitter is parallel or inline directly over the targeted conductor.
2. Depending on how high the sensitivity is set, the receiver must be 35 to 50-feet from the transmitter. The higher the sensitivity, the farther from the transmitter the receiver must be to avoid picking up the transmitter signal traveling through the air.
3. Continue your locate by following steps 4 through 11, Section 5.2 Direct Connection.

4.5 VM-480B 50/60Hz Power Line Locating

When locating a power line, the VM-480B transmitter is not required as you are locating the power line by tracking the path of the 50/60 current coming off the line (the line must be loaded).

This method gives a maximum (loud tone) signal. The VM-480B receiver is held in a vertical position at right angles to the line for maximum signal. (Note the logical path of the line from the source).

You will notice a different audio tone when using the 50/60Hz mode; this is normal.

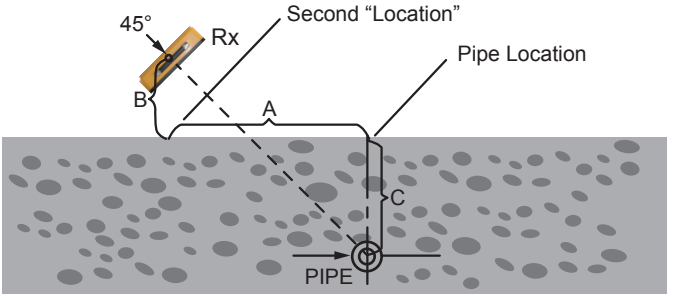
50/60 Power Line Locating Operation:

1. Move the VM-480B receiver a few feet away from where you want to start searching.
2. Turn the receiver MODE Switch to "Passive 50/60Hz".
3. Hold the receiver in a vertical position. Then adjust the sensitivity knob to bring the needle within the "SET" zone. If the meter does not adjust to "SET," turn the sensitivity knob to the right (clockwise) and move closer to the conductor. If you still cannot adjust to the "SET" position, switch the RANGE knob to "HIGH," then attempt to adjust the sensitivity to "SET." (If no current is present you will be unable to adjust to "SET").
4. Hold the receiver in an upright, vertical position with the face of the receiver facing you, and at right angles to the targeted conductor.
5. Move the receiver from side to side over the targeted conductor location until you obtain the maximum PEAK response. For better signal reception, hold the receiver close to the ground. As you move closer to the targeted conductor, the speaker's tone will gradually get louder. The loudest tone will indicate you are in the PEAK mode and over the conductor.
6. If the needle nears the end of the meter scale, adjust the sensitivity knob to bring the needle back to the middle of the meter. (Decreasing the sensitivity will give a sharper receiver response as you move closer to the target conductor.) Then move to a new position and note the meter response. The meter reading will increase if the signal gets stronger (closer to the conductor), or decrease if the signal gets weaker (further from the conductor).
7. Keep adjusting the sensitivity knob and the position of the receiver until you find a place that gives a maximum reading. (This will occur when the receiver forms an angle of 90 degrees with the target conductor.)

4.6 Estimating the Depth of a Conductor

Follow this procedure to estimate the depth of a buried conductor:

1. Using the NULL method, find the exact location of the conductor. At a minimum distance of 35 feet from the transmitter (to prevent air coupling between the transmitter and receiver), locate and mark the conductor.
2. Then, still in the same mode of operation (NULL), tilt the receiver to 45 degrees (aligning the bubble), and move off to the side of the conductor. See the below graphic.



C (Depth of Conductor) = A-B

Estimating the Depth of a Conductor

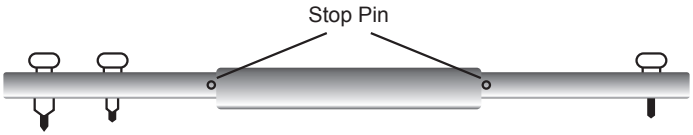
3. When you "locate" the conductor a second time, with the receiver at a 45-degree angle, mark the spot on the ground. The distance between this second spot and the true location of the conductor (A), less the distance between the center of the receiver and the ground (B), is equal to the depth of the conductor (C). See the graphic above.
4. Measurement accuracy is affected by the ratio of the conductor diameter compared to how deep the conductor is buried. (The larger the pipe, the less accurate the depth measurement.) Depth measurements are also affected by soil conditions, overhead lines, and adjacent conductors.

4.7 Using the Carrying Handle for Blind Searching, Ground Surveys, and Metal Mass Location

To conduct a blind search, a ground survey, or to locate an underground metal mass, the VM-480B transmitter and receiver must be mounted on a carrying handle (Part# 200766). The handle positions the receiver and the transmitter in correct relation to each other.

4.7.1 Mounting the VM-480B Transmitter and Receiver to the Carrying Handle

1. Assemble the Carrying Handle, as shown below. Do not insert the end pieces beyond the stop pins. Secure the screws in the center section.



Carrying Handle Assembly

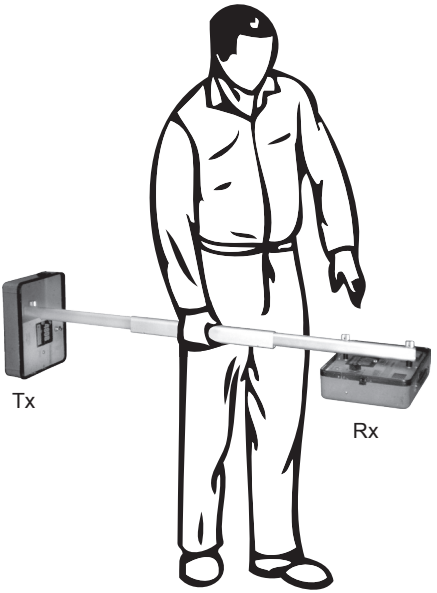
2. Mount the VM-480B transmitter onto the Carrying Handle by placing the single screw-end of the handle into the transmitter and securing it to the transmitter with the handle screw. See below graphic, Step 1.
3. Place the mounted transmitter on the ground as shown and attach the VM-480B receiver to the handle, screwing the two handle screws into the two threaded bushings on the receiver. The receiver should be perpendicular to the transmitter, as shown below, Step 2.

Step1 Step2

Mounting the Transmitter and Receiver onto the Carrying Handle

4. Pull the transmitter POWER switch on.
5. Set the receiver RANGE switch to "Norm" (the receiver will turn on).
6. Set the receiver sensitivity Switch to "11 o'clock position."
7. Set the receiver MODE Switch to "Active."
8. Because the receiver is operating close to the transmitter, the receiver will detect the transmitter output by air coupling and emit a tone. To cancel the air coupling, the receiver must be positioned exactly perpendicular to the transmitter: The operator must be a least 15 feet from all metal objects, pipes, fences, cars, etc.

Hold the instrument at arm's length, parallel to the ground with the receiver facing up as shown in the below graphic. First, turn the topmost knob clockwise until a full tone is indicated, and the spring is compressed. Then turn this same knob in a counterclockwise direction until you have a zero audible and visual signal. Continue to turn through this "no signal" area until a slight signal is heard, and the visual indicator reads within the "SET" area. Leave the topmost knob at that position. If you are unable to find a "no signal" area, lower the sensitivity.



Adjusting for Audio Balance

4.7.2 Locating with the Handle-Mounted VM-480B

1. Holding the handle-mounted VM-480B with the receiver face up and the transmitter on the back end, start traversing the area you need to blind search.
2. As you cross a conductor at right angles - the point of a maximum audio and visual signal, make a mark on the ground.
3. Continue to walk in the same direction until "no signal" is registered. At this point, make a 180 degree turn and walk back over the same path until the maximum signal registers on the meter and audio tone again. Make a second mark on the ground at this point. The true location of the conductor is midway between the two marks.

4.7.3 Blind Search, Metal Mass Location, Ground Survey with the Carrying Handle

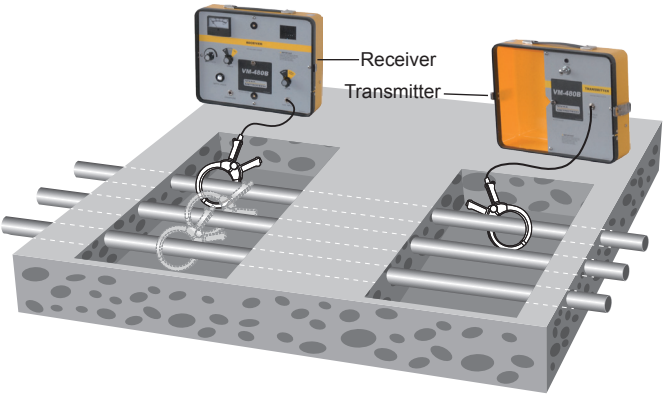
A "blind search" is a search for the location of a conductor with an unknown source or end. The VM-480B must be operated in the Inductive Mode using a systematic grid approach. Looking for a "metal mass," such as a manhole cover or steel drum, is the same as a "blind search" with the exception that the search paths need to be closer together so as not to miss the metal object. A "ground survey" is a process by which an operator can locate all the underground conductors within a particular area.

4.8 Conductor Identification Using a Second 4820 Metroclamp

When exposed, multiple conductors are present, for example, in conduits, ducts, or pedestals, use the method described below to identify a specific conductor.

1. Apply transmitter signal to the target conductor using a 4820 Metroclamp, as described in Section 4.2.
2. Plug a second Metroclamp cable into the socket marked AUX INPUT on the Receiver.
3. Set the RANGE switch on the receiver to "Norm." Set the MODE switch to "Active."
4. Place the Metroclamp around each conductor in succession, making sure that the jaws are fully closed. The conductor with the highest field strength indication is the target conductor. See the below graphic.

NOTE
This method will only work if there is no cross bonding on the length of the conductor between the conductor and the receiver.



Position of two Metroclamp's

4.9 Marking the Conductor

The following color markings have been established by the American Public Works Association (APWA):

Conductor	Color
Electric power lines, cables, or conduits	Red
Communication lines, cables, conduits, CATV	Orange
Gas, oil, petroleum, or other gaseous materials	Yellow
Storm and sanitary sewers, drain lines	Green
Water, irrigation, or slurry lines	Blue

NOTE
If you have any questions regarding marking requirements or procedures, please call your local One Call Center.

5. Tracing Factors and Helpful Information

Many variables affect the process of locating a pipe or cable. The following information gives guidelines for various problem situations.

5.1 Soil Conditions

Generally, the effect of soil types on line tracing is as follows:

Soil Type	Effect online Tracing
Moist, compact	Ideal
Dry, sandy, or rocky	Little or no moisture content creates a poor tracing environment
Alkaline, high iron content	Poor tracing environment

5.2 Field Strength of the Signal

When the signal is applied to the conductor using any of the three "Active" methods covered in Section 5.2 – 5.5, an electromagnetic field is created around the conductor. The receiver measures the strength of this field, displaying it on the field strength meter.

The field strength decreases as you move away from the target conductor and as you move farther away from the transmitter (in the "Active" mode). For optimum tracing accuracy, the field strength should read at least five on the meter at maximum gain.

5.3 Verifying Versus Tracing

Verifying means to confirm that a conductor if present, and tracing means to map out its route along the ground. Besides its use for locating a cable, the VM-480B's 50/60Hz power line locating mode is also helpful for determining the presence of energizing power lines and other conductors. The active range using the transmitter generally produces the best accuracy when tracing.

5.4 Adjacent Conductors

When the meter reading drops off more on one side of the conductor than it does on the other, the receiver may be picking up interference from an adjacent or parallel conductor. Adjust the sensitivity to compare the signal strength of the conductors. In most cases, the conductor with the stronger signal is the target conductor. If you are using the Active Mode, confirm the exact location of the adjacent conductors. Place your ground lead so that it does not cross over any adjacent conductors, is perpendicular to, but as far away from your target conductor as possible.
Note evidence of other underground utilities in the area, such as transformers, pedestals, hydrants, meters, etc. which indicate the presence of other underground conductors.

5.5 Deep Conductor

Signals picked up by the receiver from deep-buried pipes are weaker and not as directionally distinct as those from pipes closer to the surface. Also, the meter reading will only change by small increments in relation to moving the receiver antenna.

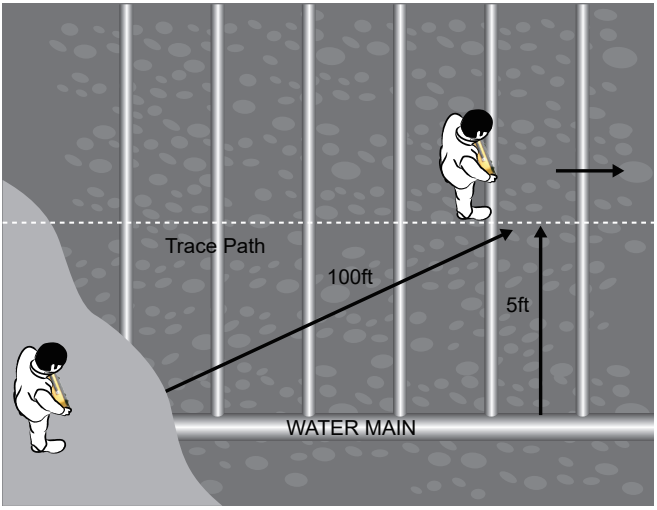
Using the Inductive (Indirect) Method of coupling signal to the conductor may be difficult if the target conductor is buried four feet or more. For best results, use the Direct (Conductive) Connection method of the coupling signal to the targeted conductor.

5.6 Tracing Long Runs

Signals picked up by the receiver get weaker as you move further and further away from the transmitter coupling point, especially on long pipe runs. To get a stronger signal, move the transmitter coupling point closer to the receiver. If forced to use the Inductive Indirect mode, your tracing job will be easier if an assistant follows behind with the transmitter as you trace with the receiver.

5.7 Locating a Service Lateral - Active Range/Inductive Mode

After you have traced the main, you may want to go back and locate the service laterals off the main. Service lateral traces are easiest to conduct in the Inductive Mode. Two operators are required for this procedure - Operator 1 remains stationary holding the receiver as if to trace over and parallel to the main. Operator 2, carrying the transmitter, holding it perpendicular to the mainline, and maintaining a minimum of 100-feet between himself and the receiver, walks parallel but 5 feet from the main on the side he expects to find the service laterals as shown below. The meter reading on the receiver will increase as Operator 2 crosses over the service lateral with the transmitter. Each time the meter reading increases, Operator 1 signals Operator 2, and they mark the lateral locations on the ground.



Locating Service Laterals

5.8 Locating a Bend or Dead End

While tracing a line, you may find that the meter reading drops off suddenly and that there is no distinct reading when the receiver antenna is moved left or right. Stand in place and continue sweeping the antenna from side to side but, at the same time, slowly pivot your body.

If you find a pivot angle at which the meter reading picks up again, it means you've located a bend and can resume tracing in the new direction.

If you pivot all the way around (360 degrees), without getting any noticeable meter reading, it means you've reached a dead end.

5.9 Valves, Manhole Covers, Tees and Risers

If the meter reading suddenly increases and then falls back while tracing a pipe, you have probably passed over a buried valve, manhole cover, tee, or riser.

5.10 Common Bonded Conductors

Telephone, power, and CATV sometimes use a common ground bond. If other conductors are connected to your target conductor, putting a signal on the target can cause all the conductors to carry the same signal, making it difficult to identify the target conductor.

To verify that you are tracing the targeted conductor, note the field strength at a known location of the conductor. As you trace, any change in field strength should be gradual. If either reading changes abruptly, you are probably no longer over your targeted conductor.

5.11 Congested Areas

If you suspect that coupling from adjacent conductors is causing interference in the signal picked up by the receiver try increasing the strength of the signal received from the transmitter and decreasing the strength of the signal from the interfering conductors by:

1. Changing to a different transmitter coupling point or coupling mode.
2. Improving the grounding connection or moving the grounding point.
3. Determine the location of the adjacent conductors. Then check to be sure that neither the direct connect leads cross over any of the adjacent conductors. Re-position them if necessary.
4. If you are using the Inductive (Indirect) mode, you may be able to decrease the amount of interfering signal by changing the orientation of the transmitter to the targeted conductor. Determine the location of the interfering conductor.

5.12 Pipes with Insulated Junctions

The high radio frequency signal of the VM-480B Pipe and Cable Locator will jump pipe insulators, but the signal will proportionately decrease each time it crosses an insulator. When possible, such as when tracing a pipe with a meter, bypass the meter (insulator) by using a jumper cable. Attach each end of the jumper cable on opposite sides of the insulator.

5.13 Metroclamp Ground Requirements

If you are using the Metroclamp around a cable, both ends of the target conductor must be grounded to ensure sufficient field strength. Power lines and telephone sheaths are assumed to be grounded.

5.14 Grounding Safety

If you use the direct connect method, be sure that there is no power flowing through the target conductor. If you use the Metroclamp on energized lines, follow established safety procedures.

5.15 Distribution Systems

To locate short gas services on a gas distribution system, you should temporarily ground the end of the service. Accomplish this by temporarily connecting a jumper cable to a ground spike at the end of a service where the pipe or tracer wire is exposed. Be sure to remove the ground connection after completing the locating so as not to defeat the cathodic protection system.

6. Maintenance

The only routine maintenance required for the Model VM-480B equipment and accessories is to test and replace, if necessary, the batteries in the transmitter and the receiver. Both possess battery test features, making it easy to check the condition of the batteries at any time.

We recommend checking the transmitter and receiver batteries before each use, preferably before leaving for the job site.

6.1 Checking and Replacing the VM-480B Transmitter and Receiver Batteries

Check and replace the transmitter and receiver batteries as follows:

1. Have ready 6 C Cell batteries.
2. To test the transmitter batteries, pull the power switch on. The LED will blink steadily if the batteries are in good condition. It will begin to slow down as the batteries lose power. If it does not blink at all, the batteries need to be replaced.
3. To test the receiver batteries, turn the Range Knob to "NORM." The needle on the field strength indicator should move into the BATT test area. If it does not, the batteries need to be replaced.
4. Open the BATTERY ACCESS door on the front of the unit. Extract the battery holder and replace batteries, positioning according to the indications shown inside the battery holder.
5. Close the battery access panel, ensuring that there are no wires caught between the receiver body and the access panel. Make sure the latch is securely fastened.

6.2 Basic Preventive Maintenance

The Model VM-480B is designed for rugged outdoor use, but rough handling should be avoided. Keep the equipment dry, clean, and free of grit.

7. 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. Typically, 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.
Coupling	The act of signals transferring to lines to which they were not originally applied. 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 a variety of 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 a variety of 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 meter or dot matrix display and audibly from a speaker.

Search (sweep)	This describes the act of looking for a buried line within a given area.
Sonde	Sondes are small self-contained battery-powered transmitters. Sondes are propelled through non-metallic pipes and ducts and can be located on the surface by a sonde locator or buried utility locator with a sonde mode. Sondes are also built into other products such as a sewer push camera, robotic crawler camera, or attached to a jetter hose.
Target Line	The buried pipe or cable to be located.
Trace	Using a locator to follow the path of a buried line.

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

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

Notes:

Vivax-Metrotech Corporation

3251 Olcott Street, Santa Clara, CA 95054, USA
Toll Free: 1-800-446-3392
Phone: +1 (408) 734-1400
Website: www.vivax-metrotech.com