480B™

OPERATIONS MANUAL

Pipe and Cable Locator

METROTECH™

SERVICE CENTER, SALES AND TECHNICAL SUPPORT INFORMATION

Corporate Headquarters
3251 Olcott Street
Santa Clara, CA 95054
800-446-3392
408-734-1400 Direct
408-734-1415 Fax
www.metrotech.com
sales@metrotech.com

Metrotech Eastern U.S. Service Center
1824 Murfreesboro Road, Ste. 104
Nashville, TN 37217
800-624-6210
615-366-7323 Direct
615-360-9855 Fax
nashville@metrotech.com

Metrotech European Service Center
Seba KMT
Dr. Herbert Iann St. 6
96148 Baunach, Germany
+49 9544 680
+49 9544 2273 Fax
service@sebakmt.com

Rev 12/18/07: B

ISO 9001 CERTIFIED

Metrotech has received ISO 9001:2000 Quality Management System Certification.

Metrotech adheres to the quality standard guidelines of ISO 9001:2000 and ensures quality in its design/development, production, installation, and servicing disciplines.

Metrotech Corporation
3251 Olcott Street
Santa Clara, CA 95054
USA

Tel: 1.800.446.3392; 1.408.734.1400
Fax: 1.408.734.1415
E-mail: sales@metrotech.com
Internet: www.metrotech.com

Revision B: 12/18/2007

Table of Contents

List of Illustrations

1 INTRODUCTION

The Metrotech Model 480B Pipe and Cable Locator is a versatile locating instrument designed for locating and tracing the path of pipes and cables; detecting energizing 60Hz power lines; and when mounted on an optional carrying handle, conducting blind searches, ground surveys, and locating underground metal masses. Depth measurement is accomplished using the triangulation method.

The 480B is of split-box design, half being the Transmitter and half being the Receiver.

The Transmitter generates a signal which is applied onto the pipe or cable to be traced - referred to from now on as the "conductor". The signal travels along the conductor, becoming weaker as it gets farther away from the Transmitter. The distance that the signal travels before it becomes too weak to be detected depends on the method of connection, the type of conductor, the surrounding soil, and the depth of the conductor.

When you position the Receiver over the targeted conductor, it will detect the signal from the conductor, enabling the operator to trace the path of the pipe or cable. The signal strength reading on the meter and the audio tone directs the operator to the path of the conductor.

As with all electromagnetic locating systems, this unit is designed to locate metallic conductors only. The word "conductor, pipe, or cable" refers to a metallic conductor throughout this manual.

Figure 2-1: Model 480B Pipe and Cable Locator: Standard Equipment

2 480B EQUIPMENT

2.1 Standard Equipment

Part Number	Description	Remarks
480B	Transmitter	
480B	Receiver	
800B004	Conductive Attachment Assembly	Direct Connect Cable, Ground Spike, and Ground Plate
600A080	Operation Manual	

2.2 Optional Equipment

Part Number	Description	Remarks
4820	Metroclamp and jumper cable	For use in inductive coupling mode
4810	Inductive Probe	Upright, standing operation
183045	Headset	For use when locate site is too noisy for audio tone
200766	Carrying Handle	For use when mass metal or blind searching
SON834	Sonde	For tracing non-metallic pipe or conduit
500C071	Carrying Case	Protective ABS material
600A030	VHS Video Tape	Training Tape
600A051	VHS Video Tape	SECAM, PAL, NTSC

* Tape depicts basic training procedures with the Metrotech 480 Pipe and Cable Locator. The same procedures area applicable to the 480B.

Features of the Model 480B Transmitter and Receiver are discussed in detail in Sections 2.4 and 2.5.

2.3 Specifications

480B Transmitter

Nominal output power:	
Inductive Mode:	100mW avg. (6.2V p-p across loop)
Conductive Mode:	125mW avg. (65V p-p across 2.7K ohms)
Output frequency:	83kHz CW
Battery Type:	Six size C Alkaline Cells
Battery Life:	400 hours, avg.
Dimensions:	11.63"L x 9"H x 3.13"D (29.5cm x 23 cm x 8 cm)
Weight:	3.5 lb. (1.6 kg)

480B Receiver

Active Operating Mode

Nominal Sensitivity at loop for 50% meter deflection:

Lo Range:	30 microvolts p-p
Hi Range:	2 microvolts p-p

Sensitivity at AUX INPUT:

Increase Over Loop:	20% with 4810 Inductive Probe
	375% with 4820 Metroclamp

50/60 Power Line Locating Mode

Frequency:	50/60Hz
Antenna Mode:	Peak responding gradiometer
Sensitivity:	@3 ft. for 50% meter deflection
Normal:	500ma

Hi:	45ma
Battery Type:	Six size C Alkaline Cells
Battery Life:	250 hrs average
Headphone Impedance:	2K ohms (usable at 100 ohms and up)
Dimensions:	11.63"L x 9"H x 3.13"D (29.5 cm x 23 cm x 8 cm)
Weight:	4.5 lb. (1.9 kg)

Both Transmitter and Receiver

Operation Temperature:	4° F to 122° F (-20°C to + 50°C)
Shipping Weight:	14 lb. (6 kg)
Shipping Dimensions:	19"L x 14"H x 9.5"D (48 cm x 35.6 cm x 24 cm)
Modes of Operation:	Direct Connection, Inductive Coupling, Inductive (Indirect)

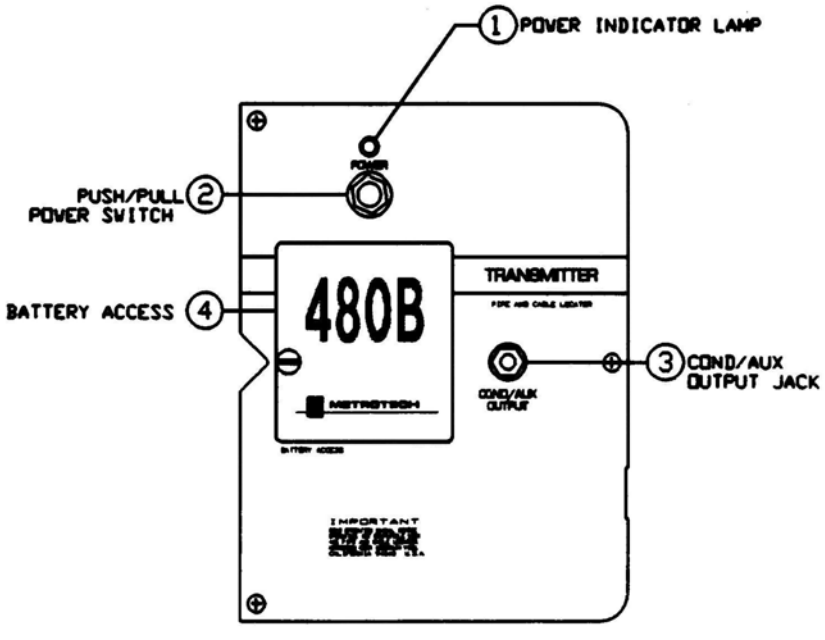

Figure 2-2: 480B Transmitter: Controls and Indicators

2.4 Controls and Indicators of the Model 480B Transmitter

See Figure 2-2 for an illustration of the features described below.

Figure 2-2 Designation

1 **POWER INDICATOR LAMP**
Indicates power is on. Blinks steadily if battery power is good, will slow down according to power left in batteries. When it stops blinking, replace the batteries.

2 **PUSH/PULL POWER SWITCH**
Pull this switch to turn the Transmitter on. Power Indicator lamp will blink.

3 **COND / AUX OUTPUT JACK**
Insert either the direct connect cable or the 4820 Metroclamp cable into this jack. The Transmitter's internal antenna is automatically disconnected when a plug is inserted into this jack.

4 **BATTERY ACCESS**

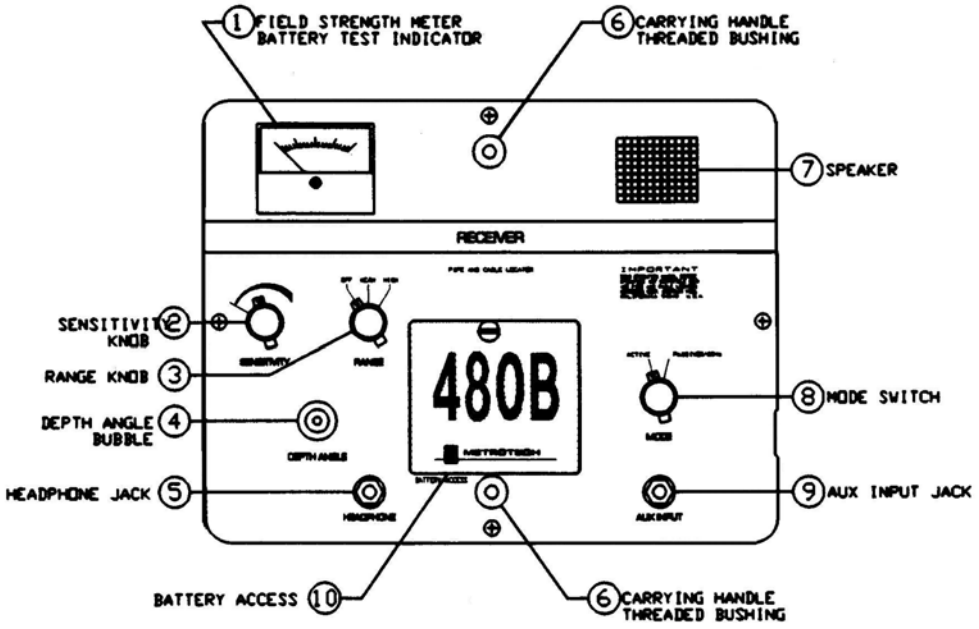

Figure 2-3: 480B Receiver: Controls and Indicators

2.5 Controls and Indicators of the 480B Receiver

See Figure 2-3 for an illustration of the features described below.

Figure 2-3	Designation
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 turned ON, the needle should move into the BATT test area of the meter. If it does not, the batteries need to be replaced.
2	**SENSITIVITY KNOB** Controls the signal gain. Set as low as possible to avoid receiving signal from conductors other than your target conductor
3	**RANGE KNOB** Changes the ratio of the signal amplification.
4	**DEPTH ANGLE BUBBLE** Position the bubble in the indicated area to estimate the depth.
5	**HEADPHONE JACK** Plug in point for headphones.
6	**CARRYING HANDLE THREADED BUSHINGS** Connection point for Carrying Handle screws.
7	**SPEAKER** Emits audio tone which guides operator toward the targeted conductor.
8	**MODE SWITCH** Two operating positions: Active – Direct Connect, Inductive Coupling and Inductive Passive – For tracing energizing 50/60Hz power lines
9	**AUX INPUT Jack** Plug in point for 4810 Inductive Probe, or second 4820 Metroclamp (when using two clamps) into this jack.
10	**BATTERY ACCESS**

3 CHECKOUT PROCEDURE

To insure proper operation of the 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 he site
- If problems arise during a locate

1 Turn the Transmitter on by pulling the PUSH/PULL 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 all the way 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 10-20 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 6, Maintenance for instructions.

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 6, Maintenance for instructions.

IMPORTANT NOTE

The 480B Receiver features a 30-minute automatic shut-off to prevent the Receiver from being accidentally left on. 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 the to "NORM" or "HIGH".

4 OPERATION

Follow the checkout procedure described in Section 3 before operating the equipment.

To operate the 480B Pipe and Cable Locator, use the Transmitter to apply the signal to the conductor, and use the 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 fishtape into the pipe and connecting the Direct Connect Cable from the Transmitter to one end of it.

SAFETY 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.)

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 locate of a conductor centerline before determining the depth of a conductor.

PEAK and NULL procedures are described below.

4.1 Direct (Conductive) Connection

This 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 a strong maximum signal to reach the conductor. In this operating mode the Receiver can be closer to the Transmitter, and adjacent buried conductor interference is reduced.

Transmitter:

1 With the Transmitter OFF, plug the Direct Connect Cable into the jack labeled COND/AUX OUTPUT on the 480B Transmitter.

2 Attach the RED lead of the Direct Connect Cable to an electrically clean metallic part of the targeted conductor.

3 Extend the BLACK lead of the Direct Connect Cable 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 /or a weight on it. See Figure 4-1.

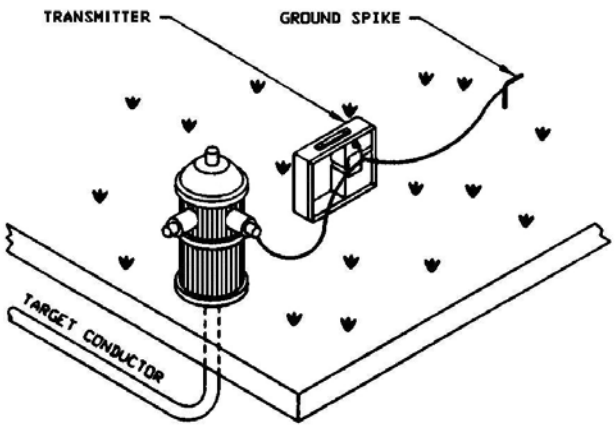

Figure 4-1: Direct (Conductive) Connection

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 needing 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 in order 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 “prelocate” 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.

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. See Figure 4-2.

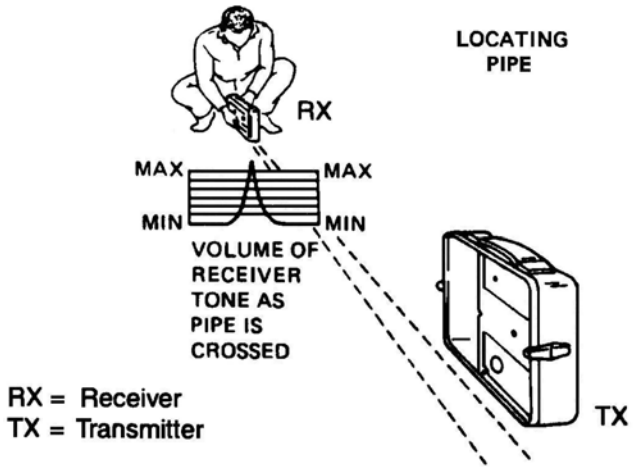

Figure 4-2: Peak 480BB Receiver Response

NULL METHOD

To pinpoint the location of the conductor use the NULL method by holding the 480BB Receiver in a flat, horizontal position. The audio tone will increase and then go silent at the exact location of the conductor. See Figure 4-3.

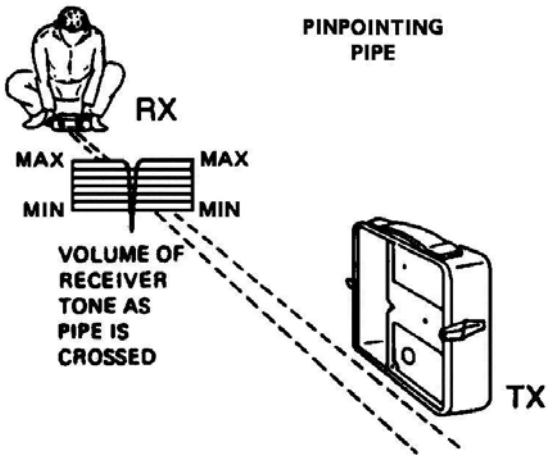

Figure 4-3: Null 480B Receiver Response

DO NOT HOLD THE RECEIVER AT AN ANGLE - INCORRECT INFORMATION WILL RESULT!!

9 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.

10 When you have pinpointed the conductor's location, mark it as required. See Section 4.5 for APWA color markings.

11 When you have finished the locate, turn the Transmitter and Receiver off and disconnect the accessories.

4.2 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 cable into the COND/AUX jack on the 480BB Transmitter.

2 Place the Metroclamp around the conductor, below the electrical ground. See Figure 4-4. Make sure that the clamp jaws are completely closed.

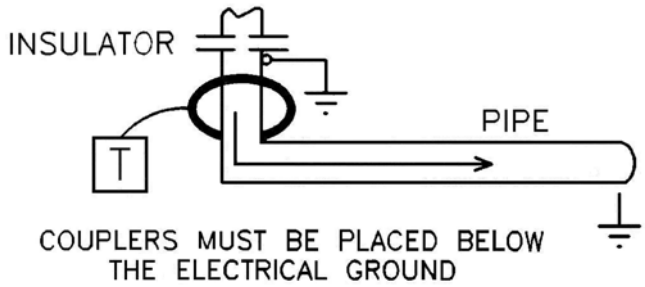

Figure 4-4: Inductive Coupling with the Metroclamp

3 Continue your locate by following steps 4 through 11, Section 4.1 Direct Connection.

4.3 Inductive (Indirect Method)

If you cannot make a direct connection onto the conductor, or use the Metroclamp, 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 cable or Metroclamp is attached to the DIRECT/4820 CLAMP jack, 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.

SAFETY 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 in line directly over the targeted conductor.

2 When using the Inductive method, the receiver must be 35-50 ft. away from the transmitter depending on how high the sensitivity is set. 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 4.1 Direct Connection.

4.4 480B 50/60Hz Power Line Locating

When locating a power line the 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 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 difference audio tone when using the 50/60Hz mode, this is normal.

50/60 Power Line Locating Operation:

1 Move the 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 all the way to the right (clockwise) and/or move closer to the conductor. If you still cannot adjust to the “SET” position, switch the RANGE knob to “HIGH”:, and then attempt to adjust the SENSITIVITY to “SEY”. (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 tone will gradually get louder. The loudest tone will indicate you are over the conductor in the PEAK mode.

6 If the needle is at or close to 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 is 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.)

4.5 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 Figure 4-5.

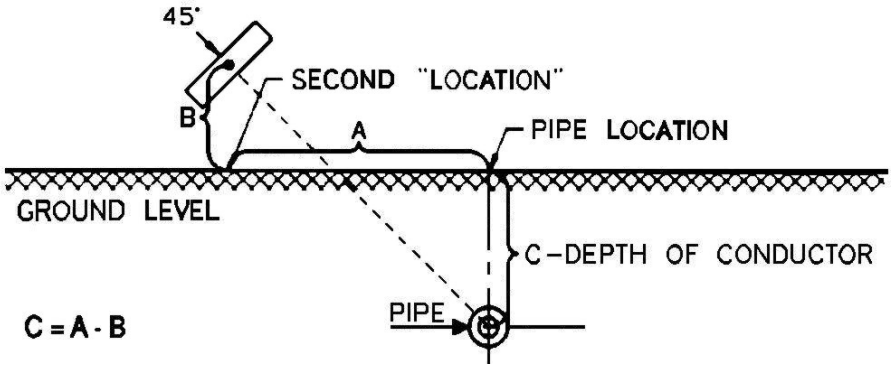

Figure 4-5: Estimating the Depth of a Conductor

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 Figure 4-5.

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.

4.6 Using the 4810 Probe with the 480B for Pinpointing and Depth Estimation

The long, pointer like design of the 4810 Inductive Probe provides a much sharper Receiver response than the standard Receiver antenna mounted on the Receiver housing. Because it can be easily held close to the ground, the Probe provides greater accuracy, especially in the presence of adjacent conductors, for pinpointing the location and estimating the depth of a conductor. The 4810 Probe works only in the NULL method.

To estimate the depth of a buried conductor:

1 Locate and mark the position of the targeted conductor.

2 Plug the 4810 Inductive Probe into the AUX INPUT on the 480BB Receiver.

3 Turn the 480B Receiver SENSITIVITY all the way up and turn the RANGE to "HIGH". The thumb knob on the 4810 Probe will then control the 480B Receiver sensitivity.

4 Turn the 480B Receiver MODE SWITCH to "ACTIVE".

5 Adjust the 4810 Inductive Probe SENSITIVITY as needed, keeping it as low as possible to sharpen the Receiver response.

6 Use the same triangulation procedure as described in Section 4.5 Estimating the Depth of a Conductor. Tilt the 480B Probe to a 45 degree angle as indicated by the bubble at the base of the Probe handle and then move off to the side of the conductor. When the conductor is "located" a second time with the Probe at a 45 degree angle, mark the location on the ground. The distance between the two marks is equal to the depth of the conductor. See Figure 4-6.

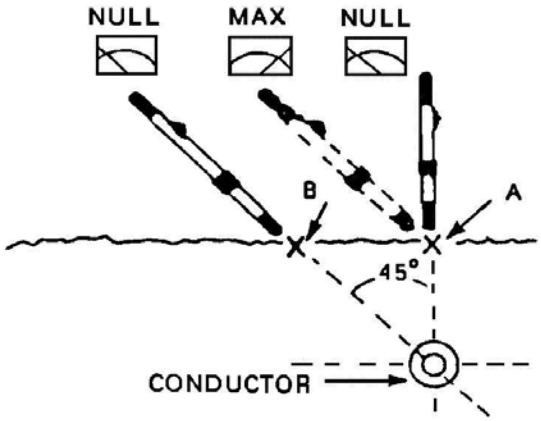

Figure 4-6: Estimating Conductor Depth with the 4810 Probe

7 If your conductor is buried in the shoulder of a hill, compensate for this fact by subtracting "C" from "A" and "B" measurement as shown in Figure 4-7.

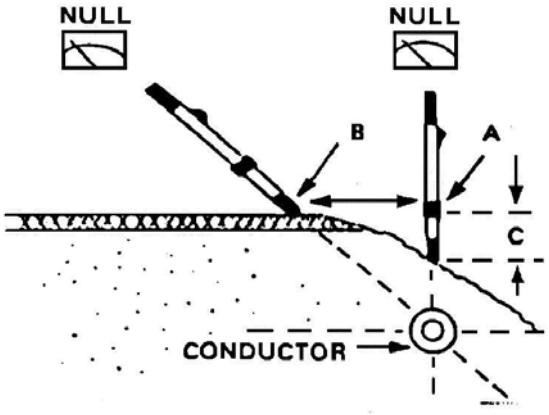

Figure 4-7: Depth Estimation Allowing for Uneven Ground

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 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.

Mounting the 480B Transmitter and Receiver to the Carrying Handle

1 Assemble the Carrying Handle as shown in Figure 4-8. Do not insert the end pieces beyond the stop pins. Secure the screws on the center section.

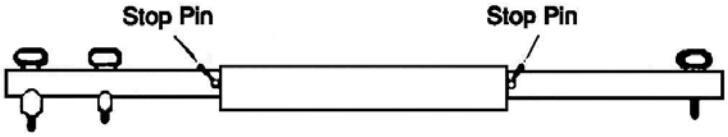

Figure 4-8: Carrying Handle Assembly

2 Mount the 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 Figure 4-9, Step 1.

3 Place the mounted Transmitter on the ground as shown and attach the 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 in Figure 4-9, Step 2.

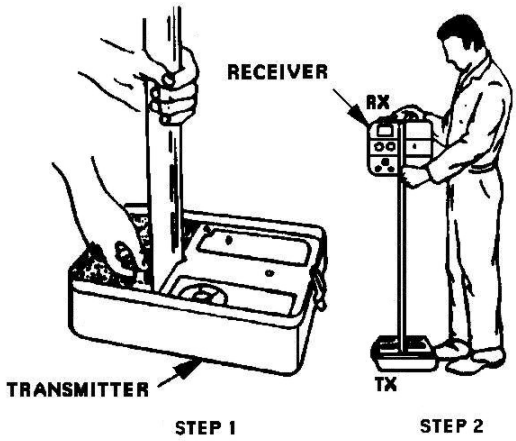

Figure 4-9: Mounting the Transmitter and Receiver onto the Carrying Handle

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. In order 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 arms length, parallel to the ground with the Receiver facing up as shown in Figure 4-10. First turn the topmost knob clockwise until 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.

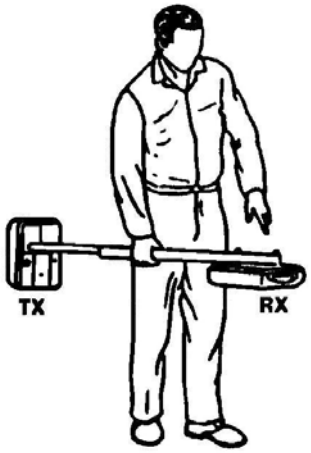

Figure 4-10: Adjusting for Audio Balance

Locating with the Handle-Mounted 480B

1 Holding the handle-mounted 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 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.

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 ending. The 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 jack 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. (Figure 4-11)

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

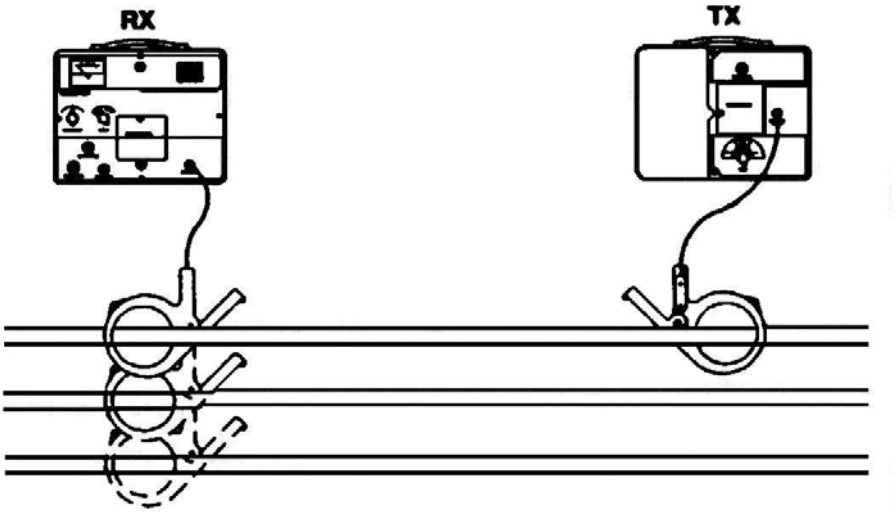

Figure 4-11: Position of Metroclamps When Using Two

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 on Line 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 4.1 - 4.3, 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 5 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 able, the 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. In addition, 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 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 main line, and maintaining a minimum of 100 ft. 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 in Figure 5-1. 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 he/she marks the lateral locations on the ground.

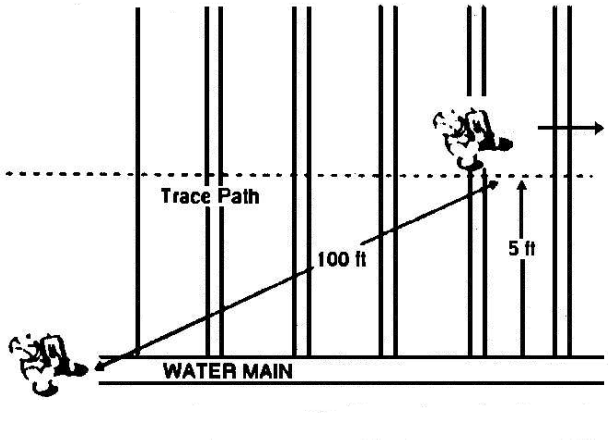

Figure 5-1: Locating Service Laterals

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 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 cable or the ground cable 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 480BB Pipe and Cable Locator will jump pipe insulators, however, 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 insure 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. This can be accomplished by temporarily connecting a jumper cable to a ground spike at the end of a service, where the pipe or tracer wire comes out of the earth. Be sure to remove the ground connection after completing the locate so as not to defeat the cathodic protection system.

6 MAINTENANCE

The only routine maintenance required for the Model 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 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 To replace batteries in either the Transmitter or the Receiver, 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 480B is designed for rugged outdoor use, but rough handling should be avoided. Keep the equipment dry, clean, and free of grit.

Service Center Information

If the equipment does not function properly, replace or recharge the batteries as described in the sections above. If the equipment still malfunctions, contact a Metrotech Customer Service Center.

Metrotech Worldwide Headquarters

Western United States Service Center
3251 Olcott Street, Santa Clara, CA 95054
Service Tel: 1-800-638-7682 (U.S. and Canada only)
Sales Tel: 1-800-446-3392 (U.S. and Canada only)
Fax: 1-408-734-1415
Email: service@metrotech.com; sales@metrotech.com
Internet: www.metrotech.com

Metrotech Eastern United States Service Center
1824 Murfreesboro Road, Suite 104
Nashville, TN 37217
Tel: 1-800-624-6210 (U.S. and Canada only)
International Inquiries Tel: 1-615-366-7323
Fax: 1-615-360-9855
Email: nashville@metrotech.com
Internet: www.metrotech.com

Metrotech European Service Center
Seba Dynatronic GmbH
Dr.-Herbert-Iann-Str. 6
D-96148 Baunach, Germany
Tel: +49-9544-680
Fax: +49-9544-2273
Email: service@sebadyn.de
Internet: www.sebadyn.de

Additional Metrotech Instruments: Multiple and Dual Frequency Locators, Fiber Optic Cable Locating System, Pipe and Cable Locators, Magnetic Locators, Sheath Fault Locators, Leak Detectors, Valve Box Locators, 50/60Hz Detectors, and a variety of transmitting sondes and flexi-sondes.

DISCLAIMER

When hooking to live power via an inductive clamp, be certain clamp is connected around power line, not directly onto the power line. Please follow your own company's safety standards, and OSHA requirements.

WARRANTY

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, BEYOND THOSE STATED HEREIN.

Metrotech warrants its equipment to be free from defects in workmanship and material under normal and proper use and service for one year from date of purchase by original user. Metrotech assumes no obligation to repair or replace equipment which has been altered or repaired by other than a Metrotech-approved procedure, been subject to misuse, misapplication, improper maintenance, negligence, or accident; has had its serial number or any part thereof altered, defaced or removed; or been used with parts other than those approved by Metrotech. Warranty does not include batteries. Expendable items such as fuses and lamps are excluded.

Any detection product proved defective under this warranty will be repaired or replaced free of charge at the Metrotech Corporation factory or approved Metrotech repair station. The equipment should be returned to our factory by prepaid transportation after requesting and receiving return authorization from our Customer Service Department. Metrotech's obligations are limited to repair or replacement of broken or defective parts which have not been abused, misused, altered, or accidentally damaged, or at the option of Metrotech, to refund of the purchase price. Metrotech assumes no liability for removal or installation costs, consequential damages, or contingent expenses of any other nature.

Part#: 600A080B
Price $10.00