

CABLE LOCATOR

Dynatel Department  
TelComm Products Division/3M

3M

Operating Instructions

Dynatel®

500







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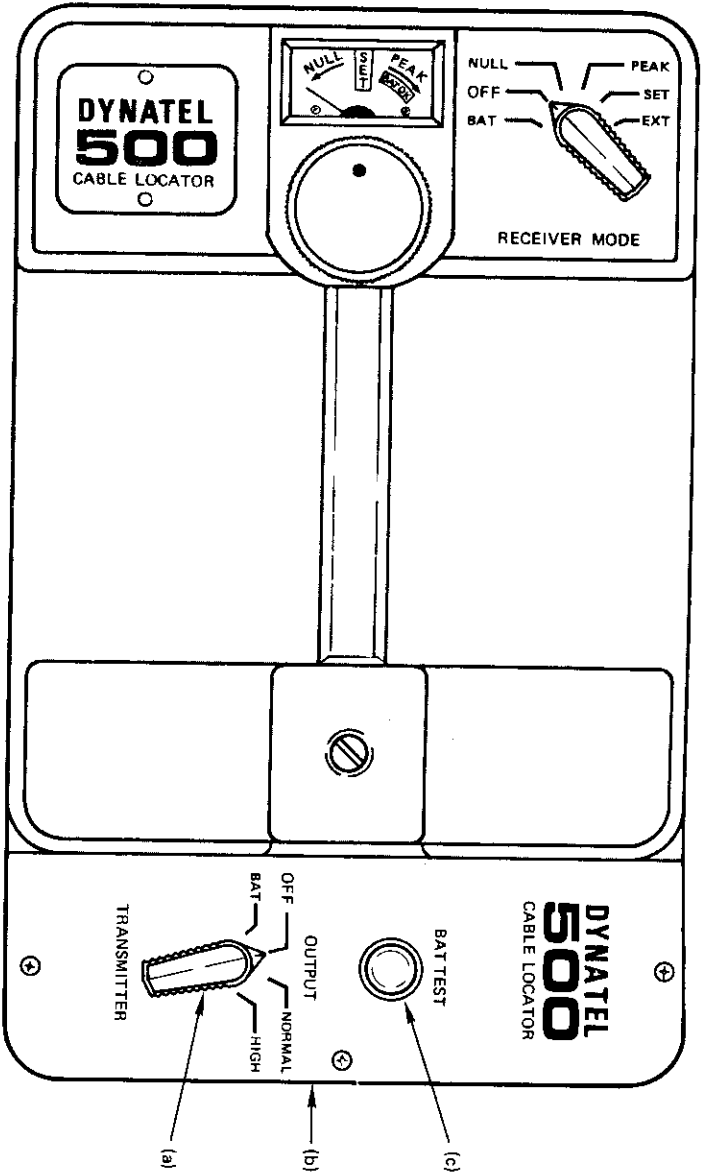


Figure 2. Transmitter Controls  
See Section 1-2



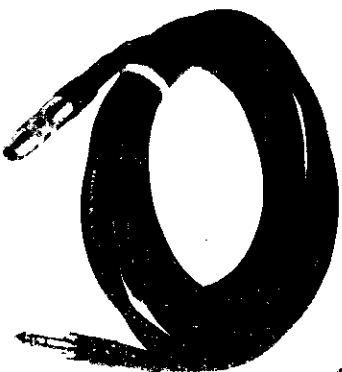


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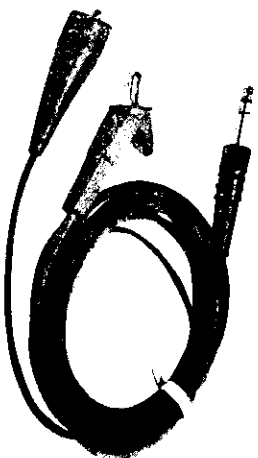
ACCESSORIES



MODEL 3001 DYNA-COUPLER ®

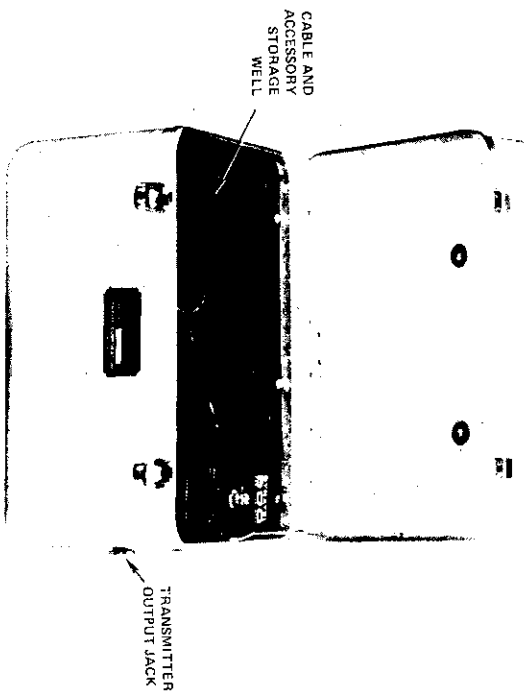


MODEL 9011 ACCESSORY CABLE



MODEL 9012 TRANSMITTER OUTPUT CABLE





A. Transmitter Unit



B. Receiver Unit

Figure 1. Dynatel Model 500 Cable Locator



## SECTION 1 OPERATION

## 1-1. INTRODUCTION

The Dynatel 500 is a portable, battery-operated tone set that locates the path of buried or underground (UG) cables. Applications include locating butt splices, slack loops, unknown laterals, service drops, and encapsulated closures. The cable locator can also be used for positive cable or conductor identification, for finding the depth of buried or UG cables accurately, and for finding clear or severed cable ends.

The 500 locates cables without taking them out of service. The transmitter generates a high-frequency tone that can be put on a cable or pair without opening it or noising it up. The tone does not interfere with signals or conversations already on the cable, and it is not sensitive to a-c power-induced noise. The transmitter has two power ranges: normal (for most applications), and high. Power level can be selected for soil conditions or cable length. Ground connections are generally unnecessary for the transmitter setup, and no connections are required for the receiver, which can be operated with one hand at normal walking speeds.

The tone receiver is a very sensitive, tuned unit that receives only the signal from the transmitter. The receiver output can be heard either through the built-in loudspeaker, or through headphones. In addition, the receiver meter indicates the strength of the tone. The volume knob controls the speaker output level, the headphone output level, and the meter sensitivity. Headphones are optional with the Dynatel 500.

The Cable Locator consists of a transmitter, receiver, and accessory units. The transmitter and receiver are made of durable yellow fiberglass for light weight and high visibility, and water-resistance in wet-weather operation. For compact storage and carrying, the receiver and accessory units fit into the transmitter case when not in use.

## 1-2. TRANSMITTER CONTROLS

The Transmitter has a single switch located on the panel next to the accessory storage well, as shown in Fig. 2 and described below:

- (a) The TRANSMITTER output selector is a 4-position switch for testing batteries and setting the transmitter output power level.



The selector performs the following functions (See also Section 3-3):

**OFF:** Turns off transmitter power.

**NORMAL:** Sets transmitter output power at NORMAL level. Use this level for maximum battery life.

**HIGH:** Selects HIGH transmitter output level. Use this position for HIGH transmitter output power; for lead sheath cables, cable location over long distances, etc. High power operation reduces battery life. (See also Section 3-3)

**BAT TEST:** Battery test position; spring-return, momentary-contact switch puts load on the transmitter batteries. See Section 3.

(b) The Transmitter output connector (not shown) is a standard phone jack.

(c) The BATTERY TEST indicator is used with the BATTERY test position of the TRANSMITTER output selector (above). See Section 3 for battery test procedures.

### 1-3. RECEIVER CONTROLS

The Receiver controls are shown in Fig. 3 and described below (See also Section 3-3):

(a) The RECEIVER MODE selector is a 6-position switch that controls the receiver operating modes. The selector performs the following functions:

**OFF:** Turns off receiver power.

**BAT:** Battery test position; momentary-contact, spring-return switch puts load on receiver batteries. See Section 3 for battery test procedures.

**NULL:** Selects receiver NULL mode operation; for use in cable location. See Section 1-7. In NULL mode, receiver meter reading and the tone from the loudspeaker both decrease sharply when receiver is directly over the cable.

**PEAK:** Sets receiver for PEAK mode operation; for use in cable location. See Paragraph 1-8. In PEAK mode, both







Figure 6. Receiver Unit in Null Mode; Note Thumb Operation of Volume Control Knob

#### 1-8. PEAK MODE OPERATION

To operate the receiver in PEAK mode, set the RECEIVER MODE selector to PEAK. In this mode, the tone from the receiver is the loudest when the receiver is right over the cable. Similarly, the meter indication is the highest when the receiver is right over the cable. Use the volume control knob to control receiver sensitivity.

Note: When using the receiver in PEAK mode, be sure that the handle is PARALLEL to the cable run. If you turn the handle so that it is ACROSS the cable run, the receiver output will decrease, and it won't be as accurate. See Fig. 5.

Note that while the PEAK mode is not quite as sensitive as NULL mode, it may allow faster cable path location, and it is convenient for certain applications described in Section 2.

#### 1-9. CABLE DEPTH LOCATION

To find the depth of a buried or underground cable, use the following procedure:



the tone from the loudspeaker and the meter reading are the highest when the receiver is directly over the cable. This is not as sharp (definite) an indication as the NULL. Note that for best results in PEAK mode, the receiver handle must be PARALLEL to the cable.

**SET:** SET mode operation is used for cable depth location. See Section 1-9.

**EXT:** EXT position used for operation of receiver with Dyna-Coupler®. See Section 1-10.

(b) The Receiver Signal Level Meter indicates the strength of the tone being received. Needle deflects to the right for strong signal (PEAK); needle deflects to the left for NULL or weak signal. Yellow center zone (SET) is for cable depth finding (SET mode). BAT OK zone is used for battery testing.

(c) The Volume Control Knob controls the

meter sensitivity, loudness of tone from the receiver loudspeaker, and the headphone output level at the headphone jack.

(d) The Loudspeaker provides an audible tone level indication. An overlapping cover protects the speaker in wet weather.

(e) The PHONE Jack (not shown) is an output connector for use with a 600-ohm headset (optional).

(f) The EXT Jack (not shown) is a signal input jack for use with Dyna-Coupler® (in EXT mode).

(g) The Battery Access Cover Screw secures the battery access cover. For the battery changing procedure, see Section 3-2.

#### 1-4. TRANSMITTER SETUP

**GENERAL.** There are three ways for the transmitter to put tone on a cable: by induction, by direct connection, or with the special Dyna-Coupler®. Instructions for all three methods are included in the following paragraphs. Remove the receiver unit from the transmitter carrying case; close the carrying case in rain or snow.



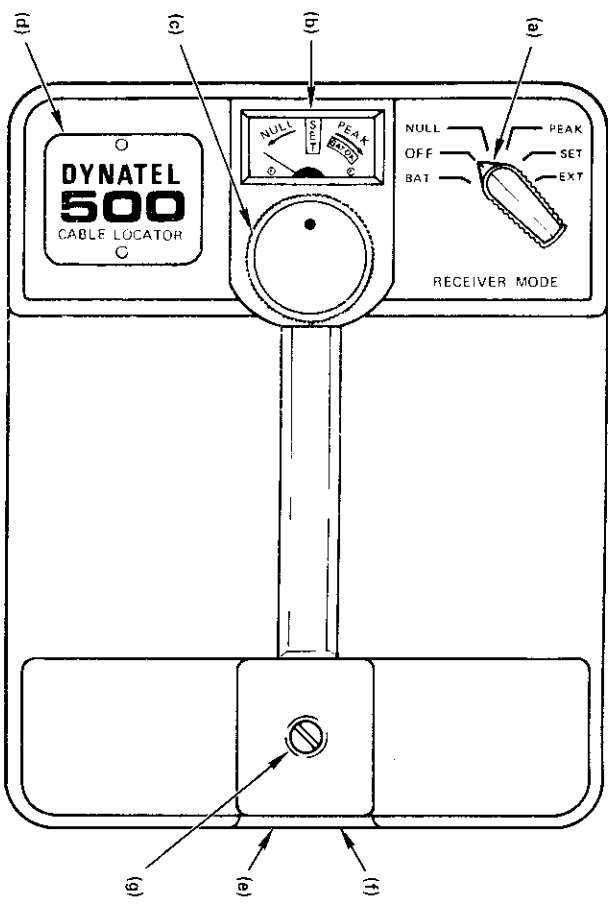


Figure 3. Receiver Controls  
See Section 1-3



Section 1  
OPERATION

INDUCTION. Set the transmitter on the ground over the cable, and turn it ON. The transmitter case handle must be parallel to the cable run. No access to the cable is necessary.

**Note:** To ensure accuracy, observe the following precautions:

- a) Do not use the receiver within 25-50 ft of the transmitter.
- b) Be certain that the transmitter is placed over the cable to be located. Use the Dyna-Coupler<sup>®</sup> or a direct connection if other cables or pipes are in the same area.

DYNA-COUPLER<sup>®</sup>. If access to the cable is available, this is the easiest and most accurate way to put tone on only one cable. Connect the coupler assembly to the Transmitter Output Jack with the 12-foot cable assembly (Fig. 4). Then open the coupler jaws and place them around the desired cable (or conductor). The tone will be loudest on just that one cable. It is unnecessary to remove common bonding or ground, or to open the cable or conductor.

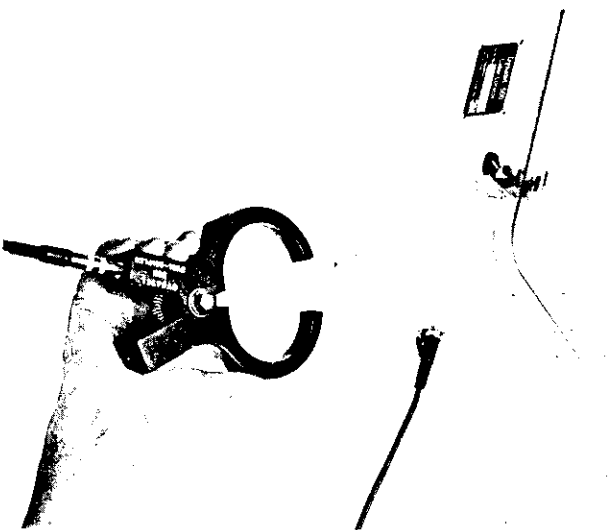


Figure 4. Opened Dyna-Coupler<sup>®</sup>  
In the Background, the Coupler Cable is Shown  
Connected to the Transmitter Output Jack





Section 1  
OPERATION

- 1) With the receiver in PEAK mode and the receiver handle in line with the cable path, carefully locate the cable position; then place the receiver on the ground directly over the cable.
- 2) Put the RECEIVER MODE selector in SET, and adjust the receiver VOLUME control so that the meter needle is centered on the meter in the yellow area labeled SET.
- 3) Set the RECEIVER MODE selector to PEAK. Note that the meter reading and the tone from the loudspeaker will both increase.
- 4) Raise the receiver straight up from the ground until the meter needle returns to the SET area on the dial.
- 5) Measure the distance from the bottom of the receiver to ground. This is equal to the depth of the cable below the surface of the ground. See Fig. 7.
- 6) To locate the depth of underground cable in a duct, be sure to subtract the diameter

of the duct from the depth of the cable. This helps prevent damage to the duct.

The above cable depth location technique is limited by how high the operator can hold the receiver. If the cable goes under a drainage ditch, for example, it may be too deep to use the above method. In this case, use the following triangulation method:

- 1) With the transmission in NULL mode, locate the cable position. Double check it in PEAK mode.
- 2) Mark the position on the ground.
- 3) Hold the receiver so that the handle is PARALLEL to the cable path, and the bottom of the receiver is at 45 degrees relative to the ground. See Fig. 8.
- 4) Walk to one side of the cable until receiver indicates a NULL again.
- 5) Mark the position on the ground beneath the receiver.
- 6) The distance between the first mark and the second mark equals the depth of the cable.



**Note:** Be sure the Dyna-Coupler® jaws are fully closed all the way around the cable. If the jaws do not close around the cable, very little tone will be on the cable. If the jaws do not close, the cable is too big. There is no minimum cable size.

For best results, do not use the Dyna-Coupler® on a cable that is clear at both ends. Connect a jumper between one of the conductors (or the sheath) and ground. If no ground point is available, or if the cable length is short, use a direct connection to the sheath or to one conductor.

**DIRECT CONNECTION.** Connect the phone plug on the 5-foot output cable to the TRANSMITTER OUTPUT jack, then connect the red clip lead of the output cable to the cable shield. If the cable is not shielded, open any one conductor in the cable, and connect the red clip lead to that conductor. Keep the black clip lead clear. Then set the transmitter on the ground. If the transmitter cannot be placed on the ground, then connect the black clip to ground. This completes

the transmitter setup instructions. See Section 2, Applications, for suggestions on using the Cable Locator.

#### 1-5. TRANSMITTER OPERATION

The only transmitter control is the TRANSMITTER output selector. Turn the transmitter ON by turning the selector either to NORMAL or HIGH. The NORMAL and the HIGH positions on the TRANSMITTER output selector determine the transmitter output power. For most situations, set the switch to NORMAL. Use HIGH power only for extra power, such as locating cable paths over very long distances, in very wet ground when the signal falls off rapidly, or when the soil is sandy and dry, and it is difficult to put tone on the cable. Also see Section 3-3.

#### 1-6. RECEIVER OPERATION

The receiver has only two controls: a VOLUME control and a RECEIVER MODE selector. To turn the receiver ON, set the RECEIVER MODE selector to any one of the four positions clockwise from OFF. Also see Section 3-3.



## F2. NULL MODE OPERATION

Generally, the NULL mode is the most sensitive. In NULL mode, the tone received is least when the receiver is directly over the cable; the loudspeaker is the quietest, and the meter indicates a null (the needle goes to the left side of the meter). When the receiver is moved to either side of the cable, the tone from the loudspeaker increases, and the meter needle swings to the right.

To operate in NULL mode, set the RECEIVER MODE selector to NULL, and bring the receiver into the general area of the cable. The cable can then be located by moving the receiver to the point where the tone is minimum, and the level meter is NULL. FOR BEST RESULTS, HOLD THE RECEIVER LEVEL. When the cable has been located, it can be followed with the receiver in NULL mode. See Fig 5.

The control knob at the front end of the handle controls both the loudspeaker volume and the meter sensitivity. Cable location accuracy is

increased by turning up the volume control (this also increases the meter sensitivity). As the volume control is increased, the null becomes sharper.

The receiver is most sensitive in NULL mode. However, if the tone is put on the cable by induction, and the cable is in a joint trench, or there are aerial cables nearby, the pulling effect may make the cable location inaccurate. For best results, put the tone directly on the cable with the Dyna-Coupler ® or with a direct connection. This eliminates the possibility of the receiver indicating a null in the wrong position. Another possibility is to double check the cable position by switching from NULL mode to PEAK mode. THIS IS ALWAYS RECOMMENDED WHEN USING NULL MODE.

When using the induction method, do not attempt to locate cable in the immediate vicinity of the transmitter. If it is necessary to use the receiver in an area near the transmitter, then the transmitter should be moved down the cable.



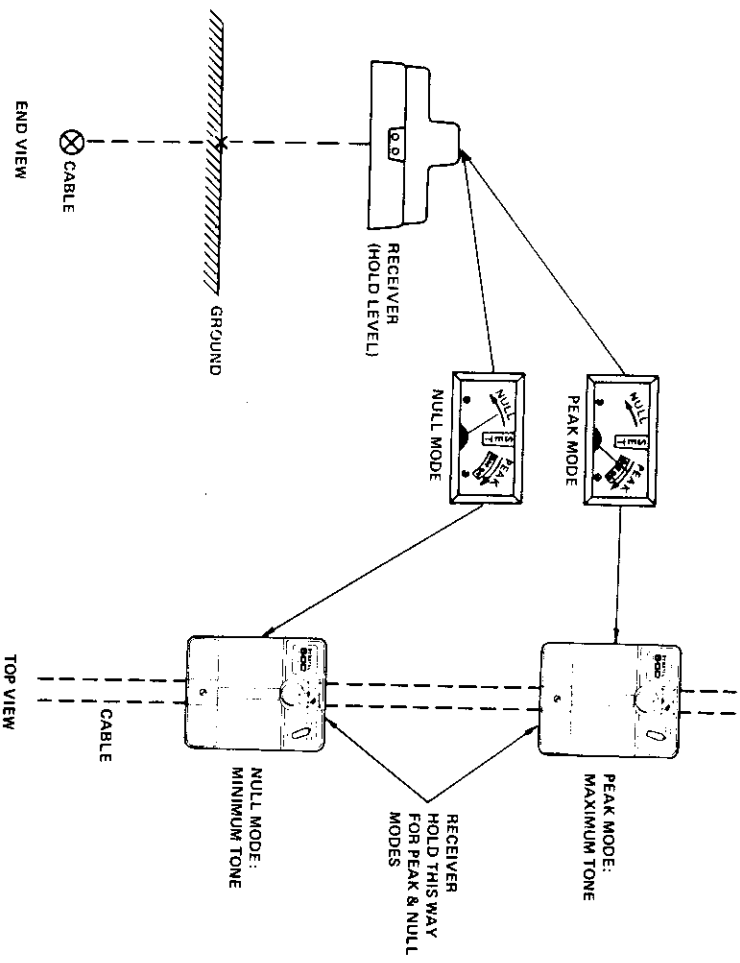
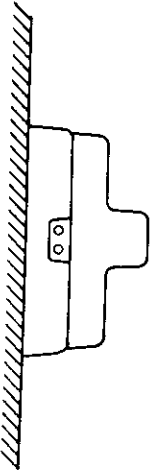


Figure 5. Cable Location for Peak & Null Modes



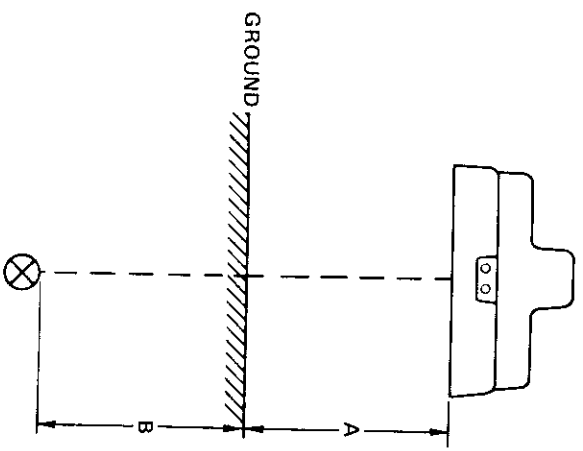


1) FIRST THIS...  
PLACE RECEIVER ON GROUND  
OVER CABLE.  
SET RECEIVER MODE TO SET.  
ADJUST THE VOLUME CONTROL SO  
THE METER INDICATES SET.



⊗ CABLE

2) THEN THIS...  
SET RECEIVER MODE TO PEAK.  
LIFT RECEIVER UNTIL METER  
NEEDLE RETURNS TO SET.



DISTANCE A  
EQUALS  
DISTANCE B

Figure 7. Cable Depth Location



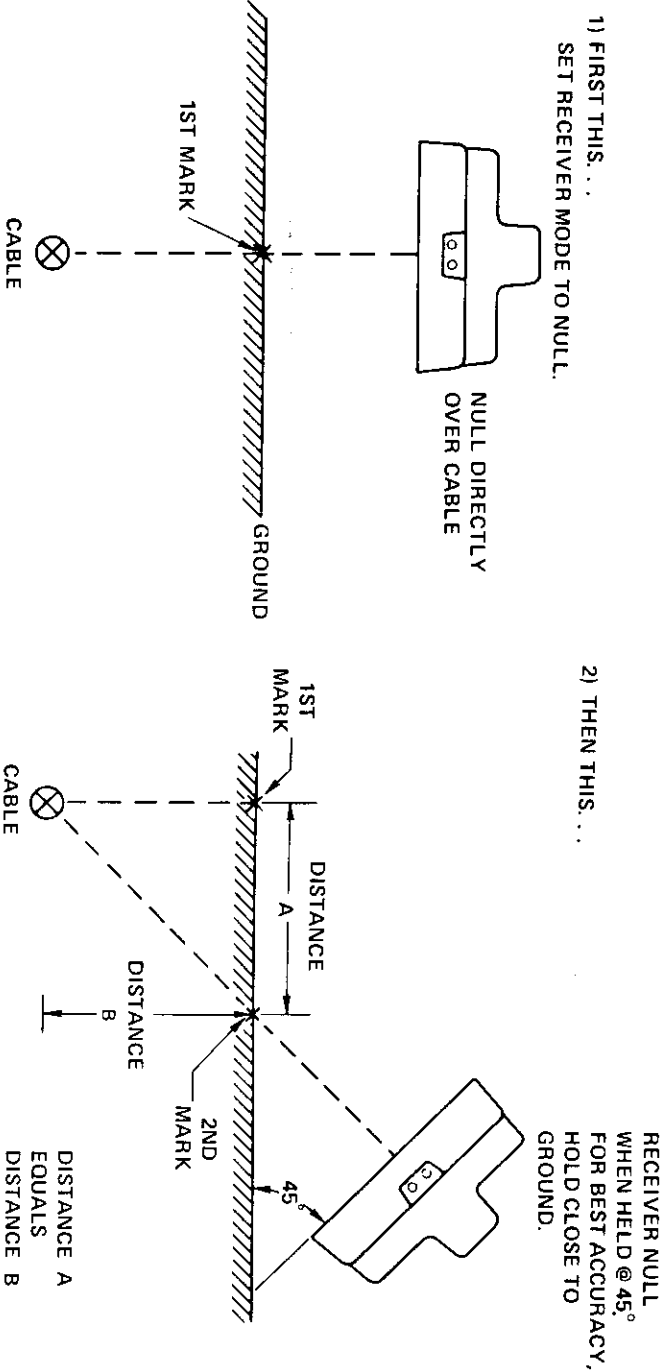


Figure 8. Cable Depth Location (Triangulation Method)



## 2.2 LOCATING UNKNOWN LATERALS

**UNKNOWN LATERALS.** To check for unknown laterals from a closure, first set up the transmitter and locate any splices or loops as outlined in Section 2-1. Mark each splice or loop.

To find laterals, splices or drops from any of the places marked, switch the receiver to **PEAK** mode. Then walk about 10 to 25 ft away from the mark, and circle the mark. **BE SURE TO HOLD THE RECEIVER SO THAT THE METER END OF THE HANDLE POINTS AWAY FROM THE MARK.** If the receiver is held any other way, it may miss any laterals or service drops. See Fig. 11.

The receiver will remain relatively quiet until it crosses a lateral. The tone will be loudest directly over the lateral. There may be more than one lateral, so be sure to walk all the way around the mark. After all laterals are located, the paths can be located and marked.

## 2.3. LOCATING CABLES FROM PEDESTALS OR ACCESSIBLE CLOSURES

To locate cables or service drops coming out of

ready-access closures or pedestals, use the Dyna-Coupler® to put tone on the one cable to be located. **BE SURE TO PLACE THE COUPLER BETWEEN THE COMMON BOND AND THE POINT WHERE THE CABLE GOES UNDERGROUND.** Set the transmitter power to **NORMAL**, unless the cable is to be traced a long distance.

To locate the cable, set the **RECEIVER MODE** selector to **PEAK**. Then circle the closure at a distance of 10 to 15 feet. **BE SURE TO HOLD THE RECEIVER SO THAT THE METER-END OF THE HANDLE POINTS AWAY FROM THE CLOSURE.** If the receiver is held any other way, it may miss the cable.

The receiver will remain relatively quiet until it crosses a cable. The tone will be loudest when the receiver is directly over the cable. Note that the meter will also point to the right of the scale. There may be more than one cable, so be sure to walk all the way around the mark. The strongest meter signal indicates the proper cable; its path can then be located.



Note: The accuracy of this method depends on two things:

- a) The handle of the receiver must be parallel with the cable path, and it must be level.
- b) The bottom of the receiver must be held at exactly 45 degrees.

If the receiver is held incorrectly, the cable depth measurement may be incorrect.

#### 1-10. CABLE/CONDUCTOR IDENTIFICATION

By putting tone on the cable to be identified, the Dyna-Coupler® can then be used with the receiver, positively identifying the conductor or cable with the tone. Use the following procedure:

- 1) Put the tone on the cable. Use either a Dyna-Coupler®, or make a direct connection. See Section 1-4.

Notes: a) If a Dyna-Coupler® is used

to put the tone on the cable, then a second coupler will be required for cable identification.

- b) For underground or buried cable, put the coupler between any common bonding point, and the point where the cable goes underground.

- 2) With the coupler cable, connect the Dyna-Coupler® to the receiver EXT input jack. Set the RECEIVER MODE selector to EXT. See Fig. 9.

- 3) To identify the cable, place the Receiver Dyna-Coupler® around each cable one at a time to locate the one with the greatest tone. This identifies the cable positively.





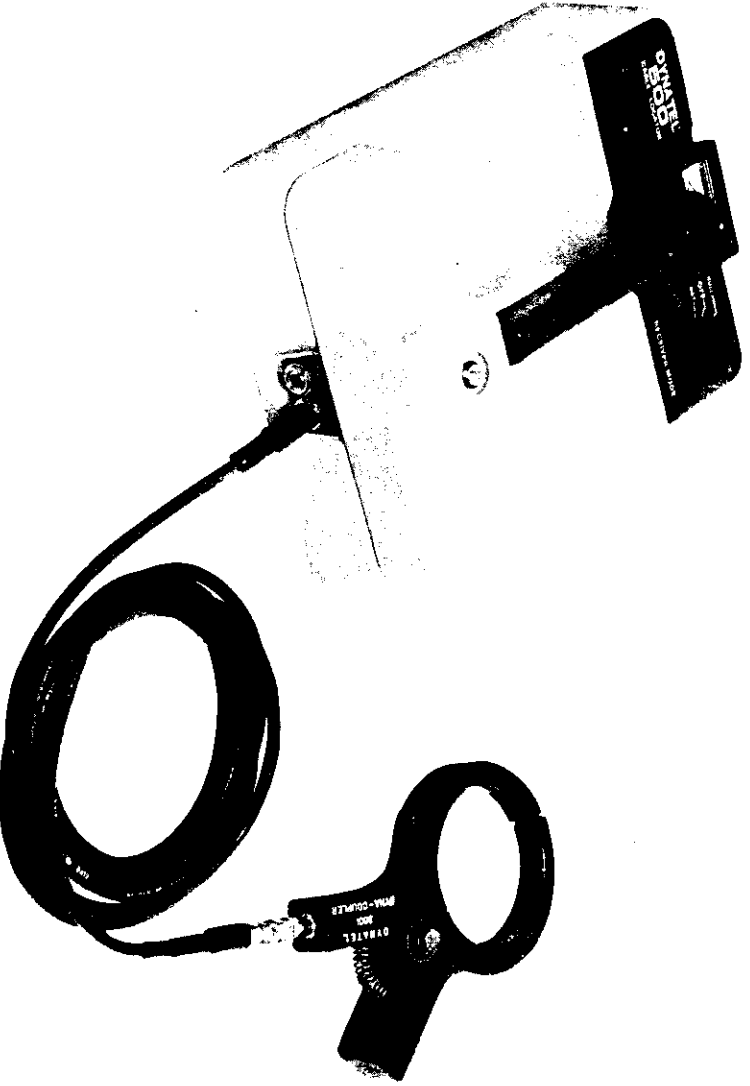


Figure 9. Receiver Setup for Cable Identification



SECTION II APPLICATIONS

2.1. LOCATING SLACK LOOPS AND BUTT SPLICES

To find slack loops or butt splices, first locate and mark the path of the cable. Then set the RECEIVER MODE selector to PEAK, and retrace the cable path. HOLD THE RECEIVER SO THAT THE HANDLE IS PERPENDICULAR TO THE CABLE PATH, and the tone from the receiver is minimum (see Fig. 10). When the receiver passes over a slack loop or a butt splice, the tone from the receiver will increase, and the meter needle will go to the right. This indicates a sudden curve in the cable path, and it could be a butt splice or a loop.

**Note:** The receiver can sense loops and butt splices only if the handle is held perpendicular to the cable path; if it is parallel, the receiver senses the cable itself, and misses the loops, etc.

This method also locates buried closures with laterals. Whenever a slack loop or a splice is located, it is also a good idea to check it for unknown laterals. See Section 2-2.

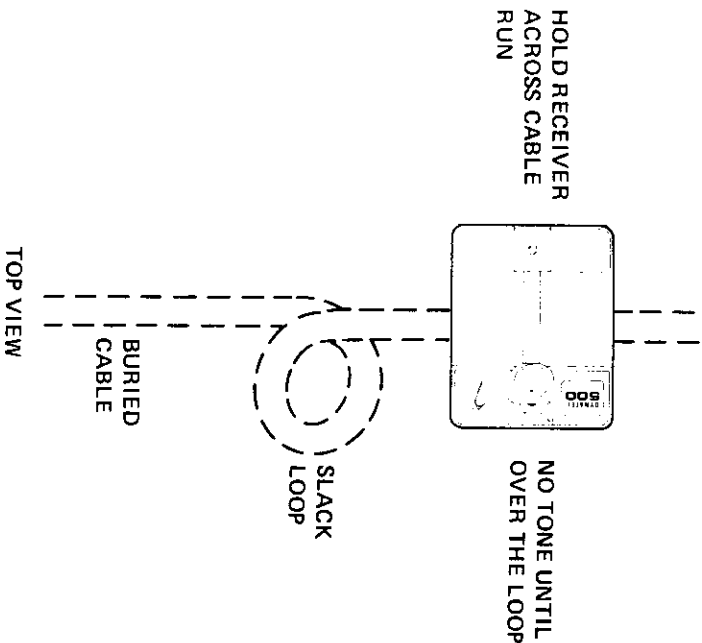


Figure 10. Slack Loop or Butt Splice Location



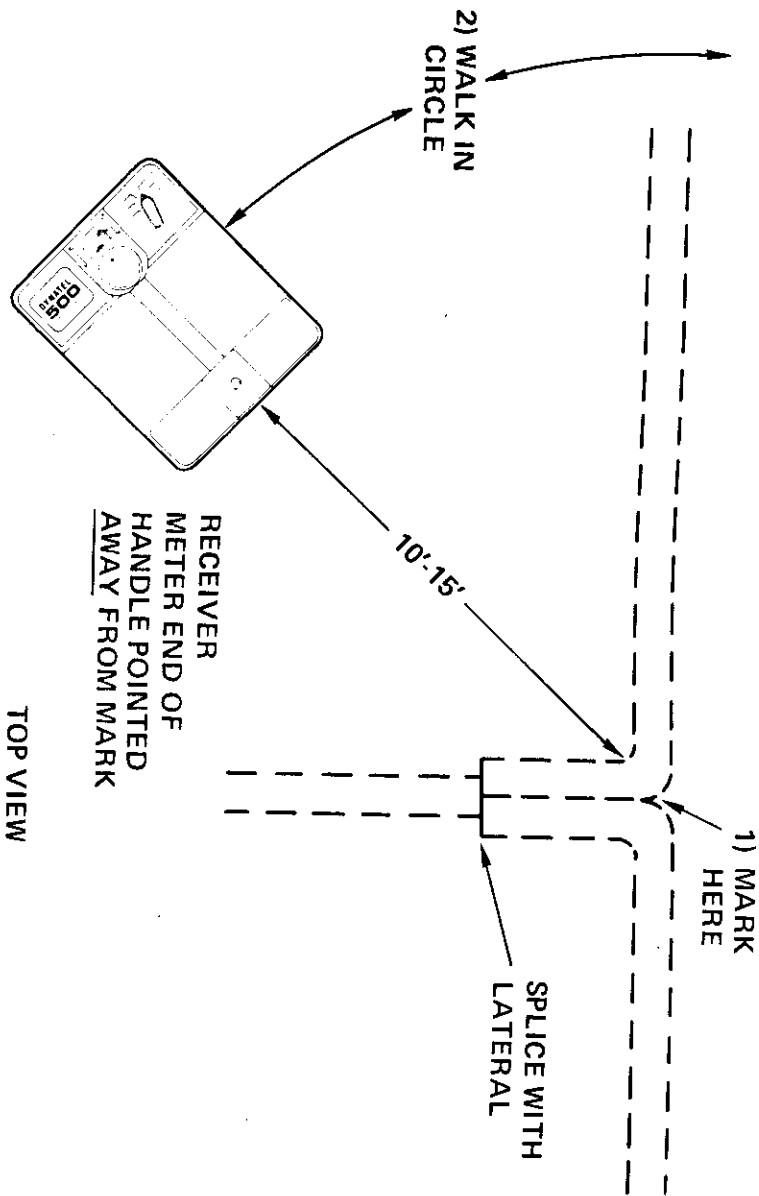


Figure 11. Locating Laterals, Drops from Splice, Encapsulation, Riser, etc.



Section III  
BATTERY OPERATION/REPLACEMENT

SECTION III BATTERY OPERATION/REPLACEMENT

3-1. BATTERY TESTS

**TRANSMITTER.** The **TRANSMITTER** output selector has a momentary-contact **BAT TEST** position. To check the batteries, hold the switch fully counterclockwise for 5 to 10 seconds. The batteries are good if the **BAT TEST** light turns ON (see Section I). As the batteries age and the light gets dimmer, the transmitter output power decreases. When the light is barely visible, replace the batteries. Note that the transmitter will operate, if necessary, on low batteries.

**RECEIVER.** Remove the receiver from the transmitter case and hold the **RECEIVER MODE** selector fully counterclockwise for 5 to 10 seconds. The meter should indicate **BAT OK**; if not, replace the batteries.

3-2. BATTERY REPLACEMENT

**TRANSMITTER.** The transmitter uses two 6-volt carbon-zinc lantern cells. See Table A for replacement types. To change the transmitter batteries, use the following procedure:

- 1) For access to the transmitter battery com-

partment, take the receiver out of the transmitter. The batteries are located in the bottom of the carrying case, beneath a plastic storage tray. The storage tray is retained by four screw fasteners. Release the fasteners and lift the storage tray out of the transmitter carrying case. See Fig. 12.

- 2) Disconnect each battery; lift it from the case, and replace it with a fresh battery. Place new batteries in the battery compartment in the same position as the old batteries. Be sure to connect the red wire to the (+) positive terminal, and the black wire to the (-) negative terminal on each battery. Always replace both batteries at the same time.

Note: The transmitter has a protection circuit that prevents damage if the leads are connected incorrectly; however, THE TRANSMITTER WILL NOT OPERATE IF THE BATTERIES ARE CONNECTED INCORRECTLY.





#### 2-4. SERVICE DROP PATH LOCATIONS

To locate the path of a service drop from a house or other building, use the standard cable location procedure. In this case, it may be more convenient to make a direct connection to the service drop at the protector. Connect the transmitter output cable (red clip) to the protector, and place the transmitter on the ground (or connect the black clip to ground). Set the transmitter output power to NORMAL. Then locate the cable path using the standard NULL or PEAK mode techniques outlined in Section 1.

#### 2-5. CLEAR END LOCATION

To find the clear or severed end of a cable or service drop, put the tone on the cable with the transmitter. If the cable is bonded at one end, or otherwise connected, put the Dyna-Coupler® around the cable between the bonding (or connecting) point, and the point where the cable goes underground. If the cable is clear at both ends, the direct connection is suggested. Set the

receiver in PEAK mode and follow the cable path until the tone suddenly decreases. That will be the clear (or severed) end of the cable.

#### 2-6. TIPS ON CABLE HOOKUPS

**RISERS.** To locate a cable going underground from a riser, use the Dyna-Coupler®. Reach above the U-guard and pull the cable away from the pole, and place the Coupler around the cable. Once the coupler is connected between the transmitter and the riser, turn the transmitter on to the NORMAL power mode. The path of the cable can now be located.

**PRESSURIZED CABLES.** To put tone on a pressurized buried or toll cable, locate a pressure valve. Then make a direct connection from the transmitter to the valve. Use the transmitter output cable, and connect the red clip lead to the valve assembly. For best results, place the transmitter as far away from the valve assembly as possible. It may be necessary to use the Coupler cable assembly (12 ft) as a cable extension.



Section III  
BATTERY OPERATION/REPLACEMENT

- 3) After the batteries have been replaced, replace the storage tray, and fasten.

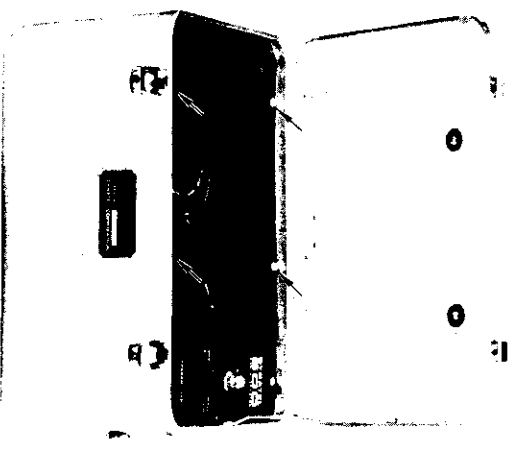


Figure 12. Transmitter Battery Access. For Access Remove Screws (Arrows); Lift Out Plastic Storage Well.

Table A  
Cable Locator Replacement Batteries

Unit*	Voltage	NEDA	Eveready	Burgess
Transmitter	6V	915	510S	F4BP
Receiver	9V	1602	246	2N6

\*Each unit requires two batteries.



Section III  
BATTERY OPERATION/REPLACEMENT

**RECEIVER.** The receiver uses two 9-volt carbon-zinc batteries, which are located under the access cover at the opposite end of the Receiver from the controls. See Table A for replacement types. To change the batteries, use the following procedure:

- 1) Loosen the battery access cover screw, and remove the access cover (see Section 1-3).
- 2) Disconnect each battery; lift it from the receiver, and replace it with a fresh battery. Always replace both batteries at the same time.
- 3) Replace the battery access cover, and tighten the cover screw.

3-3. BATTERY OPERATING INFORMATION

**Note:** Locators with serial numbers 012-016 and up have battery interlock switches in both the receiver and the transmitter. All batteries are disconnected when the receiver is placed in the transmitter case. To use the locator or to check the batteries, remove the receiver.

**TRANSMITTER.** The Transmitter battery life is normally greater than 500 operating hours, providing that the transmitter is used in a NORMAL power mode (TRANSMITTER OUTPUT switch set to NORMAL). In the HIGH power mode, battery life is approximately 100 hours. Note that the transmitter will continue to operate until the batteries are nearly exhausted. However, the transmitter tone output drops as battery voltage decreases.

**Notes:** For maximum battery life, be sure to:

- Always turn transmitter power off when transmitter is not in use.
- Use the NORMAL operating mode whenever possible.

**RECEIVER.** Under normal service conditions, receiver battery life is longer than 100 hours.

**Note:** For maximum Receiver battery life, always turn off the Receiver when not in use.



Section IV  
FACTORY SERVICE INFORMATION

SECTION IV FACTORY SERVICE INFORMATION

4-1. FACTORY SERVICE

Dynatel instruments are designed for dependable operation without periodic adjustment and calibration. However, if your instrument is not working properly, return it to the factory for repair. Send it to:

**Dynatel Department**

**TelComm Products Division/3M**

380 N. Pastoria Avenue  
Post Office Box 60549  
Sunnyvale, California 94088 USA  
Telephone: 408/733-4300  
TWX: 910-339-9202

If you need information call:

the Dynatel Customer Service Department at (408) 733-4300. If you return an instrument for service or repair, be sure to include the following information:

- (a) Name and address of owner.
- (b) Brief discussion of symptoms or trouble.

- (c) If possible, send the name and telephone number of someone familiar with the problem, and who may be contacted if more information is necessary.
- (d) Special shipping instructions, if any. Include your return shipping address and department mail address, if necessary.

4-2. PACKING INSTRUCTIONS

4-2. PACKING INSTRUCTIONS

- (a) Wrap the entire unit in plastic.
- (b) Place the unit in a sturdy container. Add packing material around all sides of the unit.
- (c) Seal the shipping container with strong tape.
- (d) Mark the shipping container to indicate that it contains fragile electronic equipment.

