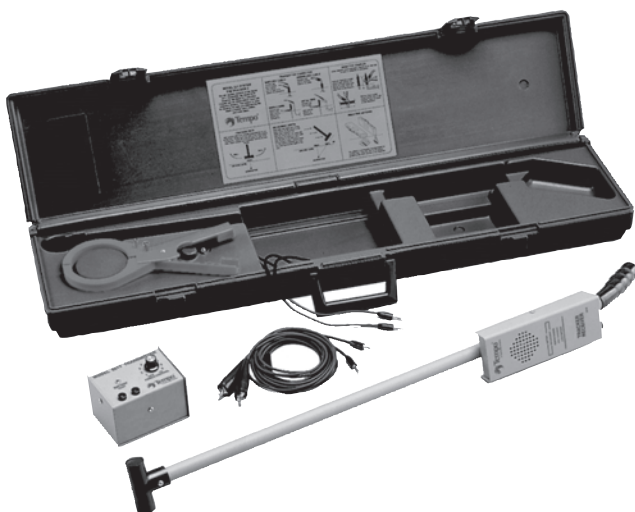


# INSTRUCTION MANUAL



**GREENLEE®**

A Textron Company



Español..... 13  
Français..... 25

## Model 501 Tracker™ II Cable Locator System



**Read and understand** all of the instructions and safety information in this manual before operating or servicing this tool.

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## Description

The Model 501 is designed to locate the path and depth of buried cable, service wires, metallic pipe or conduit and locate the end of a cut cable.

The Model 501 consists of:

- 501T Transmitter
- 501R Receiver
- 500CA Carrying Case with Inductive Antenna
- CS16 Cord Set
- IC-1 Inductive Coupler

## Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

## Purpose of This Manual

This instruction manual is intended to familiarize all personnel with the safe operation and maintenance procedures for the Greenlee Model 501.

Keep this manual available to all personnel. Replacement manuals are available upon request at no charge at [www.greenlee.com](http://www.greenlee.com).

All specifications are nominal and may change as design improvements occur. Greenlee Textron Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Tracker is a trademark of Greenlee Textron Inc.

***KEEP THIS MANUAL***

## Important Safety Information



### SAFETY ALERT SYMBOL

This symbol is used to call your attention to hazards or unsafe practices which could result in an injury or property damage. The signal word, defined below, indicates the severity of the hazard. The message after the signal word provides information for preventing or avoiding the hazard.

#### **⚠ DANGER**

Immediate hazards which, if not avoided, **WILL** result in severe injury or death.

#### **⚠ WARNING**

Hazards which, if not avoided, **COULD** result in severe injury or death.

#### **⚠ CAUTION**

Hazards or unsafe practices which, if not avoided, **MAY** result in injury or property damage.



#### **⚠ WARNING**

**Read and understand** this material before operating or servicing this equipment. Failure to understand how to safely operate this tool could result in an accident causing serious injury or death.



#### **⚠ WARNING**

Electric shock hazard:  
Contact with live circuits could result in severe injury or death.

## Important Safety Information

### **WARNING**

Electric shock hazard:

- Do not expose this unit to rain or moisture.
- Use this unit for the manufacturer's intended purpose only, as described in this manual. Any other use can impair the protection provided by the unit.
- Use test leads or accessories that are appropriate for the application. Refer to the category and voltage rating of the test lead or accessory.
- Inspect the test leads or accessory before use. They must be clean and dry, and the insulation must be in good condition.
- Before opening the case, remove the test leads from the circuit and shut off the unit.

Failure to observe these warnings could result in severe injury or death.

### **CAUTION**

Electric shock hazard:

- Do not attempt to repair this unit. It contains no user-serviceable parts.
- Do not expose the unit to extreme temperatures or high humidity. Refer to "Specifications".

Failure to observe these precautions may result in injury and can damage the instrument.

## Identification

The Model 501 is designed to locate the path and depth of buried cable, service wires, metallic pipe or conduit and locate the end of a cut cable.

### Transmitter

The transmitter is housed in an aluminum case and is powered by eight (8) 1.5V AA batteries. The transmitter has an on/off control knob which is also used to adjust the output level and a light emitting diode (LED) indicating the battery condition. In addition, the transmitter has an automatic shut-off feature after 1.5 hours of non-use. Effective range is greater than 4000 feet in length and for depths up to 7 feet.

### Receiver

The receiver is encased in an aluminum housing, mounted with an antenna and is powered by one (1) 9V battery. Like the transmitter, the receiver will automatically shut itself off after 1.5 hours of non-use. The receiver has a speaker for listening to the signal, a meter for monitoring the signal level, a headset jack, an on/off volume control knob and an antenna for detecting the tone over the cable.

### Carrying Case with Inductive Antenna

The case is used for storing and transporting the Tracker II system and is constructed of vacuum formed polyethylene. The case also includes an easy, quick reference operation guide on the inside of the lid.

### Cord Set

An 8 foot pair of leads with plugs and clips is included for connecting the transmitter to the cable or pipe.

### Inductive Coupler

The inductive coupler induces a tracing tone on a cable, wire or pipe by clamping around it.

### Optional Headset

The headset can be used to monitor the received signal in high noise level areas and is plugged into the receiver jack provided.

## Operation

### Testing Transmitter Batteries

Plug cord set leads into transmitter and clip leads together. Turn transmitter control on and rotate fully clockwise. A bright LED indicates enough battery power. Refer to the "Maintenance" section for battery replacement.

### Connecting Transmitter Leads

**IMPORTANT:** The transmitter is protected against damage from inadvertent direct connection to voltages up to 250 VAC. However, direct connection to energized cable is not recommended. The inductive coupler Model IC-1 is included for such applications.

**Shielded Cable (Coaxial):** Connect one lead to the shield and the other lead to one wire within the cable.

**Unshielded Cable:** Connect each lead to separate conductors within the cable.

**Single Conductor:** Connect one lead to the conductor and the other lead to earth ground via screwdriver.

**Metallic Pipe or Conduit:** Connect one lead to the pipe or conduit and the other lead to earth ground via screwdriver.

**Gas Pipes:** Connect one lead to the “IN” line of the gas meter and the other lead to the “OUT” line.

**PVC Plastic or Non-Metallic Pipes:** A fish tape or plumber’s snake must be inserted into the pipe first. Connect one lead to the fish tape or snake and the other lead to earth ground via screwdriver.

Connecting the transmitter leads to conductors or shield within the cable will minimize the bleeding effect or the tracking signal into adjacent utilities in congested areas.

Connecting one lead to a conductor or shield and the other to earth ground via screwdriver will insure maximum distance. This method can be used in all applications. However, it may increase the chances of the bleeding effect.

### Testing Receiver Batteries

Turn receiver control on and rotate clockwise to the 12:00 position. Turn the transmitter on to #3 position and pass receiver antenna close to the transmitter. Any indication from the receiver indicates acceptable battery condition. Refer to the “Maintenance” section for battery replacement.

### Operating Receiver

Turn receiver control knob on and rotate clockwise to the 12:00 position. If optional head set is to be used, plug headset into receiver jack provided. A peak meter indication will be seen and a strong tone will be heard when the receiver/antenna is directly over the cable or pipe. The antenna or T-end should be oriented perpendicular to the path of the subject utility. (See Fig. 1)

### Locating Path

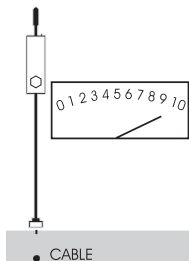
*Note: The transmitter control knob should initially be set as low as possible to minimize the bleeding effect in congested areas.*

Connect transmitter properly and set output level to #3. Radius the area approximately 10 to 15 feet from the transmitter location with the receiver. Proceed down the path following the peak meter indication and the tone from the speaker or the headset.

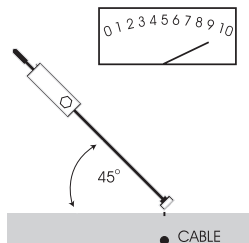
As progress is made down the cable path, gradual increases in the receiver gain control will be necessary to maintain reception.

The receiver control knob should be adjusted so that the meter needle is at approximately 1/2 scale to insure that any increase or decrease in signal can be detected and accuracy maintained.

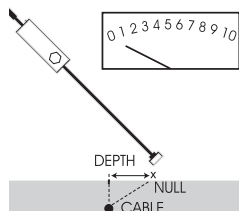
Return to the transmitter and increase the output level as needed for the distance and depth required.



**Fig. 1. Locating Cable Path**



**Fig. 2. Determining Depth**



**Fig. 3. Determining Depth**

## Determining Depth

Mark the ground directly over the path. (See Fig. 1) Hold the receiver at a 45-degree angle close to the ground. (See Fig. 2) Maintain this angle and slowly move the receiver away from the path opposite the handle. (See Fig. 3) The tone will decrease to a minimum and then increase again. Mark the spot where the signal is at its minimum. The depth of the cable will be the distance between the two points marked.

## Locating the End of an Open Cable

Follow the peak receiver indications as outlined in the “Operating Receiver” section. Reception of the signal will diminish rapidly and be lost once past the end of the cable. (See Fig. 4)

*Note: These results may not be achieved if the faulted cable occupies a common trench that is congested with other wires or cables.*

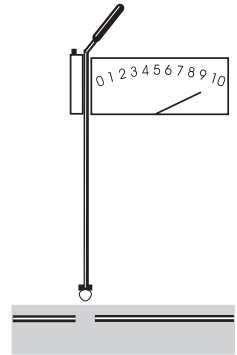


Fig. 4. Locating the End of Open Cable

## Locating Underground Cable Splices

Locate and mark cable path as described in the “Locating Path” section of this practice. Place 501 receiver antenna parallel to cable path. (See Fig. 5)

Keeping the receiver antenna parallel with the cable, proceed down the cable path. Watch and listen for increases in signal (peaks). (See Fig. 6)

When the increase in signal is seen, check to see if it continues to the left or right of the cable path. A signal that continues out to either side of the cable path is a drop wire or branch cable. Mark these paths. (See Figures 7 & 8)

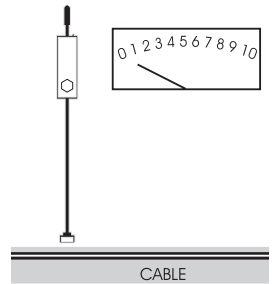


Fig. 5. Signal Over Cable with No Splice

A peak in signal without a continued path indicates the presence of a splice. Mark this point. (See Fig. 6)

A branch splice will peak over the cable path, and then a peak can be followed over the path of the branch cable. (See Fig. 7)

*Note: The same signal can be produced by a drop wire running parallel to the cable from a splice at the point it turns 90° from the cable path.*

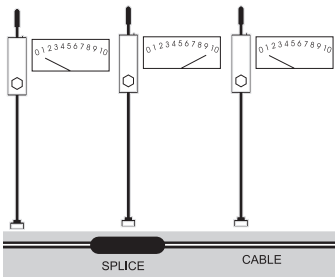


Fig. 6. Signal Changes Over Splice

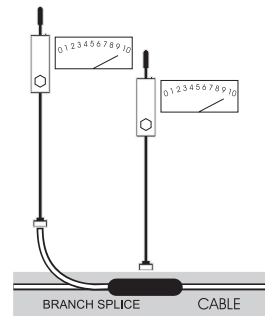
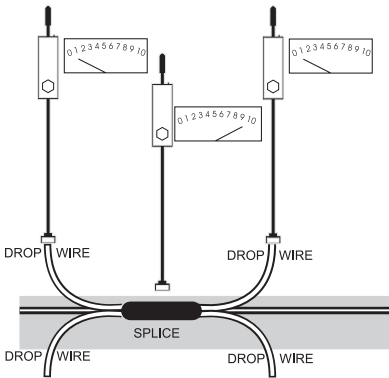


Fig. 7. Signal Over Branch Splice



**Fig. 8. Signal Over Dropwire Splice**

## Inductive Coupler Description

The inductive coupler is designed to induce a tracking tone into a subject cable or wire without establishing metallic contact or removing bonds. (See Fig. 9)

The inductive coupler is constructed of plastic and iron and can accommodate up to a 3 inch cable.

### Operation

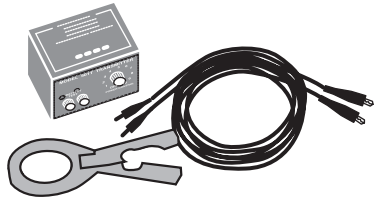
Clamp the inductive coupler around the insulation of the buried cable to be tracked. The coupler must be completely closed to transmit the maximum signal. Connect both transmitter leads to the two terminals on the face of the coupler. Turn transmitter on to approximately a #5 output setting and radius the immediate area with the Tracker II receiver to determine path. The power output may be increased for greater distance.

### Positioning of Coupler

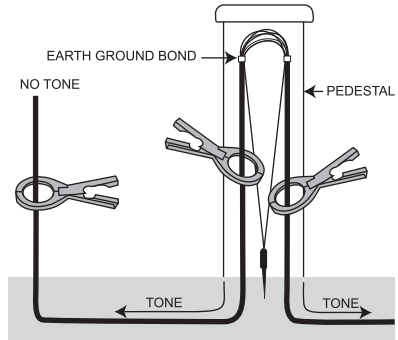
1. **Coupling Points:** The bond is one aspect which enables the inductive coupling method to work. For proper placement of the clamp at a pedestal, place it between the bonding point and the point where the cable goes into the ground. In CATV applications, these positioning points would be at the end of the main line or at the subscriber's house.

Applying the coupler above the bond will effectively "block" the tone from transmitting past the grounding point. (See Fig. 10) By strategically placing the clamp in the direction of the transmitter, tone may be controlled.

2. **Mid Run Coupling:** If the subject cable is relatively long, current is permitted to flow back through earth as tone is transmitted in both directions. (See Fig. 11)
3. **Near End Coupling:** To supply tone from the end of a cable, the end of the cable must be bonded or grounded. (See Fig. 10)
4. **Reduced Tone At Branch:** When tone is applied to a cable which has a branch, the tone will be split and be effectively decreased relative to each conductor's length and size. (See Fig. 12)

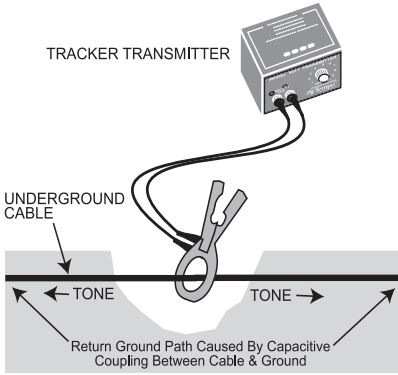


**Fig. 9. The Inductive Coupler**

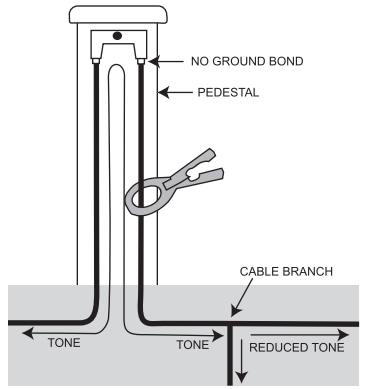


**Fig. 10. Coupling Points**

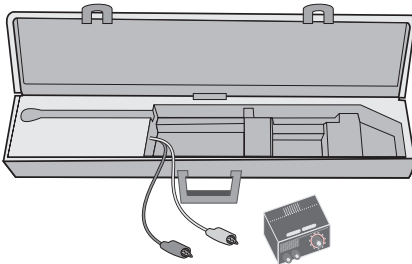




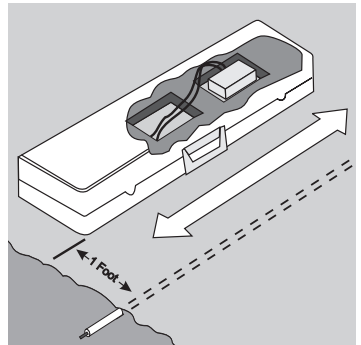
**Fig. 11. Mid Run Coupling**



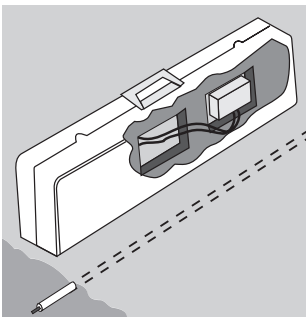
**Fig. 12. Reduced Tone at Cable Branch**



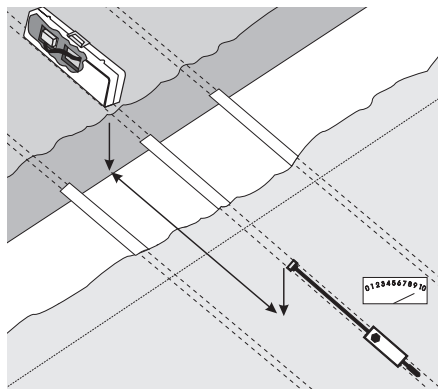
**Fig. 13. The Inductive Antenna**



**Fig. 14. Placement of Antenna**



**Fig. 15. Antenna Placement for Long Distances**



**Fig. 16. Placement of Antenna Directly Over a Utility**

## Inductive Antenna Description

The inductive antenna (See Fig. 13) is used to apply a tracking tone into a cable, wire or metallic pipe by radiating a signal from the ground surface. This method is used when there is no accessible way to make a direct connection.

The inductive antenna or transmitter loop is fitted inside the carrying case of the 501 System and is powered by the Model 501T transmitter.

### Operation

Plug the two antenna leads into the 501T transmitter. Turn transmitter to full power; place the transmitter in its compartment with the leads facing to the rear of the case. Close the carrying case. (See Fig. 14) Place activated antenna on the ground parallel with and approximately one foot to either side of the utility to be tracked. (See Fig. 14) Radius the area approximately 20 feet away from the inductive antenna with the Tracker II receiver to determine the path. Proceed down the cable path following the peak signal.

*Note: As progress is made down the cable path, gradual increases in the gain control of the receiver will be necessary to maintain reception.*

Eventually reception will be effectively lost, even at the maximum transmitter setting. Retrieve the antenna and place it at the point where the signal was last effectively received.

Resume tracking the line and repeat the relocation of the inductive antenna as necessary.

### Searching for Underground Utilities

The activated inductive antenna will radiate the tracking signal through the ground surface and the target utility will receive the signal and effectively transmit it down the path.

One craftsman will carry the antenna case close to the ground and move in a specified direction.

Another craftsman will hold the receiver (501R) at a distance of at least 20 ft. away and simultaneously move parallel with the first person.

When the receiver is directly over a utility, strong signal will be detected. (See Fig. 16)

Keep in mind that even though this is the easiest and most convenient way to locate, caution should be used because the radiated signal may be induced into the other utilities.

### Application Tips

Remember that any conductive line in the immediate area can collect the radiated signal. In locations such as trailer parks or other areas with congested facilities, minor reductions in the transmitter output level may eliminate unnecessary signal bleed.

The very nature of the inductive antenna may be a problem to the operator if he is not prepared to pick up the tone from the antenna itself. Begin using the receiver 20 feet or more away from the antenna to avoid receiving signal on a direct basis.

Fig. 14 applies to situations involving shorter runs or work relatively close to the antenna.

To achieve maximum distance, orient the activated antenna parallel to the suspect path and set the Tracker II case up on its back, as shown in Fig. 15.

The inductive antenna is permanently installed and is weather sealed; no attempt should be made to field repair the unit.

Provisions have been made to retrofit existing carrying case with the inductive antenna.

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## Specifications

### Electrical

#### 501T:

Output Voltage: 40 Vp-p (140 mW) maximum

Output Frequency (nominal):

Carrier: 447.5 kHz

Audio Modulation: 1 kHz

Voltage Protection: 250 VAC

#### Battery:

501T: (8) AA 1.5V

501R: 9 VDC (NEDA 1604, JIS 006P or IEC 6LR61)

#### Battery Life (nominal):

501T: 30 hours

501R: 10 hours

### Physical

#### Dimensions:

501T: 108 x 76 x 89 mm (4.25 x 3 x 3.5")

501R: 70 x 102 x 813 mm (2.75 x 4 x 32")

IC-1: 105 x 241 x 25 mm (4.13 x 9.5 x 1")

Kit: 851 x 216 x 102 mm (33.5 x 8 x 4")

#### Weight:

501T: 422 g (15 oz)

501R: 533 g (19 oz)

IC-1: 138 g (5 oz)

Kit: 3.1 kg (6.7 lb)

### Operating/Storage Conditions

Operating Temperature: 0 °C to 50 °C (32 °F to 122 °F)

Storage Temperature: -17 °C to 75 °C (0 °F to 167 °F)

## Maintenance

The only service required for maintaining proper operation is the periodic replacement of the batteries in the transmitter and receiver units.

### **WARNING**

Electric shock hazard:

Before opening the case, remove the test leads from the circuit and shut off the unit.

Failure to observe this warning could result in severe injury or death.

### Battery Replacement

To replace the 501R battery:

1. Remove (2) screws and separate case.
2. Replace the 9V battery. Observe polarity.
3. Re-assemble case and tighten screws. **DO NOT OVERTIGHTEN SCREWS.**

To replace the 501T battery:

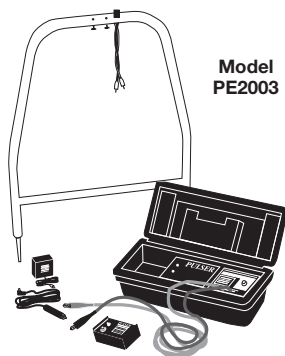
1. Remove (2) screws (indicated by arrows) and separate case.
2. Replace (8) AA 1.5V batteries. Observe polarity.
3. Re-assemble case and tighten screws. **DO NOT OVERTIGHTEN SCREWS.**

### Cleaning

Periodically wipe with a damp cloth and mild detergent; do not use abrasives or solvents.

## Compatible Products

- Model PE2003 Ground Fault Locator
- Model 701K Tone & Probe Kit
- Model 77HP Tone Generator
- Model 200EP Inductive Amplifier
- Model 700C Cordura Case
- Model 200FP Filter Probe



**One-Year Limited Warranty**