



## **AT-3500**

### **Underground Cable/Pipe Locator System**

#### **Users Manual**

- Mode d'emploi
- Bedienungshandbuch
- Manuale d'Uso
- Manual de uso
- Användarhandbok





# AT-3500

## Underground Cable/Pipe Locator System

Users Manual

## **Limited Warranty and Limitation of Liability**

Your Amprobe product will be free from defects in material and workmanship for 1 year from the date of purchase. This warranty does not cover fuses, disposable batteries or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Amprobe's warranty obligation is limited, at Amprobe's option, to refund of the purchase price, free of charge repair, or replacement of a defective product. Resellers are not authorized to extend any other warranty on Amprobe's behalf. To obtain service during the warranty period, return the product with proof of purchase to an authorized Amprobe Test Tools Service Center or to an Amprobe dealer or distributor. See Repair Section for details. This warranty is your only remedy. All other warranties - whether express, implied or statutory - including implied warranties of fitness for a particular purpose or merchantability, are hereby excluded. Neither Amprobe nor its parent company or affiliates shall be liable for any special, indirect, incidental or consequential damages or losses, arising from any cause or theory. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

### **Repair**

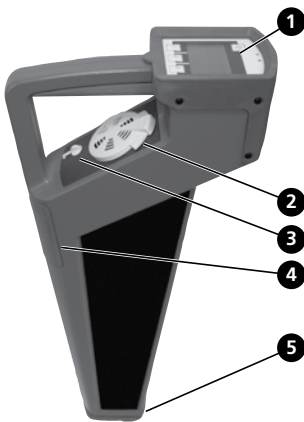
All test tools returned for warranty or non-warranty repair or for calibration should be accompanied by the following: your name, company's name, address, telephone number, and proof of purchase. Additionally, please include a brief description of the problem or the service requested and include the test leads with the meter. Non-warranty repair or replacement charges should be remitted in the form of a check, a money order, credit card with expiration date, or a purchase order made payable to Amprobe® Test Tools.

### **In-Warranty Repairs and Replacement – All Countries**

Please read the warranty statement and check your battery before requesting repair. During the warranty period any defective test tool can be returned to your Amprobe® Test Tools distributor for an exchange for the same or like product. Please check the "Where to Buy" section on [www.amprobe.com](http://www.amprobe.com) for a list of distributors near you. Additionally, in the United States and Canada In-Warranty repair and replacement units can also be sent to a Amprobe® Test Tools Service Center (see below for address).

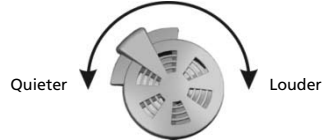
### **Non-Warranty Repairs and Replacement – US and Canada**

Non-warranty repairs in the United States and Canada should be sent to a Amprobe® Test Tools Service Center. Call Amprobe® Test Tools or inquire at your point of purchase for current repair and replacement rates.

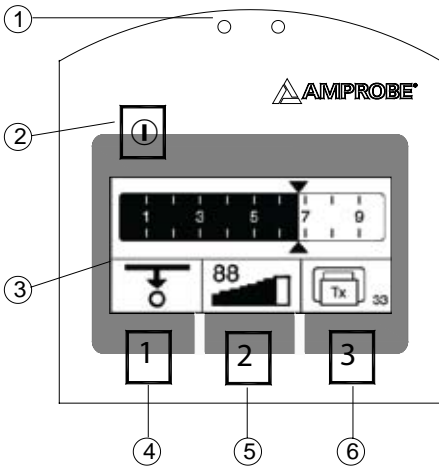


R-3500 Receiver

- ❶ Control Panel with display
- ❷ Speaker with Volume control

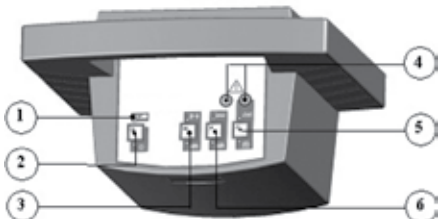


- ❸ Headphone jack (3.5 mm headphone not included)
- ❹ Battery Compartment
- ❺ Floor Cap (Removable)



R-3500 Display

- ❶ Light Sensor: Automatically regulates the brightness of the display
- ❷ ON/OFF Switch
- ❸ Display: Provides visual indication of the signal strength, depth measurement, and mode of operation, Battery Status, and menu items.
- ❹ Control1
- ❺ Control2
- ❻ Control3



T-3500 Transmitter

- ❶ Battery status indicator: Battery status LED blinks in red when near empty
- ❷ ON/OFF Button
- ❸ Signal Type: To switch between continuous and pulsed signal output
- ❹ Input Jacks
- ❺ Mode: To switch between inductive and direct signal coupling
- ❻ Signal Strength: To select one of two signal strength levels (0.1W or 0.5W)

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## UNPACKING AND INSPECTION

Your shipping carton should include:

- 1 R-3500 Receiver
- 1 T-3500 Transmitter
- 2 Measurement Cables
- 2 Alligator Clips
- 1 Grounding Rod
- 10 Battery IEC R6/AA Cell /Migon
- 6 IEC R20/ D Cell/ Mono
- 1 Nylon Bag

## INTRODUCTION

The AT-3500 underground cable/pipe locator system is designed for the uncomplicated and user-friendly determination of the location, orientation and depth of metallic lines (e.g. cable and pipe lines).



It can be used to probe areas for unknown lines or for locating specific lines.

The AT-3500 is distinguished by the following features:





- Robust construction for use in poor weather and in harsh environments
- Simple, user-friendly operation concept with a minimum number of controls
- Reliable battery status indicator

## OPERATION



1. Decide which mode of operation to use for your application

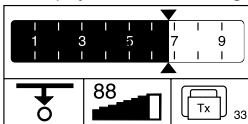
- **Induction:**  Transmitter's signal is emitted through the integrated antenna and is thereby inductively coupled with any metallic lines located within a certain radius.
  - i. Place the T-3500 transmitter on the site to be searched. Refer to Figs. 1, 2, 3&4.
- **Direct Connection:**  Transmitter's signal is directly coupled with a metallic line via the measurement cable which is connected to the jacks on the front panel of the transmitter. Transmitter clamps, alligator clips or power socket adapters (for example) may be used to connect the measurement cable to the lines.
  - i. Connect the T-3500 transmitter to the line to be located using the desired method. Refer to Figs 1, 2, 3, & 4





### T-3500 Transmitter

2. Push and Hold **ON/OFF** button to switch on the T-4000
3. Push **Mode: C** to select direct coupling or inductive coupling
  - Direct coupling    
Green LED blinking: good (low-resistance) connection   
Alternating red and green LED blinking: sufficient connection   
Red LED blinking: poor/no (high-resistance) connection
  - Inductive Coupling:    
Green LED blinking: induction mode is active
4. Push **Signal Type: M** to select Pulsed or Continuous signal
  - Pulsed Signal  is helpful when there is interference. Easier to distinguish from other signals.
  - Continuous Signal  is better to be used when taking a depth measurement   
Green LED blinking indicates respective signal is on
5. Push **Signal Strength: P** to select low (0.1W) or High(0.5W) output signal strength
  - **Low output (0.1W)** for normal tracing. Battery saving
  - **High output(0.5W)** for long tracing   
Green LED blinking indicates respective signal is on

### R-3500 Receiver

6. Push and Hold the Control1 button 
7. Push briefly the ON/OFF button  while holding control1
  - Listen for the audible signal before releasing control1
  - The display shows the following:






8. Push control3 to select the unit of measurement (meter  or ft )
9. Push Control1 to select normal depth measurement  or depth measurement using the mouse 

10. Push **[OK]** button to save the setting.

- An audible sound is heard
- The display shows the main menu:

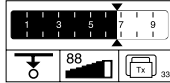


11. Push Control3 to select the mode of operation

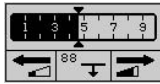
- **Radio**  for locating cables carrying VLF re-radiated radio signals (No need for T-3500)
- **Power Grid**  for locating main power cables that carry electrical current (No need for T-3500)
- **Transmitter**  for locating cables or pipes carrying the signal of the T-3500 transmitter.

12. Push Control2 twice rapidly to select automatic or manual sensitivity adjustment

- Automatic sensitivity adjustment:



- Manual Sensitivity adjustment:



- Push control1 to decrease sensitivity adjustment
- Push control3 to increase sensitivity adjustment
- Push Control2 to start a depth measurement.

13. Hold the R-3500 receiver in an upright position in front of you as close to the ground as possible. Refer to Fig. 1.

- Receiver in line with the conductor → Maximum signal strength
- Receiver perpendicular to the conductor → minimum signal strength

#### APPLICATIONS AND PRINCIPLES OF DIRECT COUPLING

1. Single-wire cables or pipes (with or without insulation against ground)

The distance between the grounding rod and the ends of the connected lines should be as great as possible because return current tends to flow through the earth into adjacent lines, which could result in their path being followed.



2. Single-wire cable with metallic screen and ground insulation

Short circuit between internal conductor and screen at the end of the cable with ground at the beginning and end of the cable as well.

Failure to make the connection as shown will result in current cancellation from the internal conductor and the return current in the screen. Under certain circumstances this can prevent the cable from being detected.



3. Multiple-wire cable (internal conductor connected or disconnected) with metallic screen and grounding insulation  
Same application as in example 1

4. Metallic conduit (with or without insulation)

the grounding rod and the conduit should be spaced as far apart as possible. Under certain circumstances, optimum positioning of the grounding rod may require several attempts.

5. If a return wire is available

the spacing of the return wire should correspond to at least 10 times the depth of the line being located.

6. Pair of wires (with or without screen) with short circuit at the end of the cable

For twisted cable pair (with a length of lay of the twist greater or equal to the laying depth), the orientation of the cable can be easily determined.


Adjacent lines which are horizontal to each other ➔ Minimum of the reception signal

Lines situated on top of each other vertically ➔ Maximum of the reception signal

#### **Direct Coupling** (Refer to Fig. 2.)

1. Connect the red test lead of the T-3500 transmitter with the conductor to be traced
2. Connect the black test lead of the T-3500 transmitter to ground using the grounding rod. Alternatively the black test lead may be clipped to the rim of a valve box or manhole cover.
3. Switch the T-3500 on
4. Select pulse or continuous signal transmission
5. Switch the R-3500 Receiver on
6. Begin to trace the cable from the point of application about 50-FT (15m) away
7. Move slowly over the cable. Decrease or increase the sensitivity as needed

#### **Direct Coupling using the A-3500 Clamp** (Refer to Fig. 3.)

1. Plug the SC-3500 clamp into the T-3500 transmitter connection socket
2. Place the clamp around the pipe or cable
3. Switch the T-3500 transmitter on
4. Set the T-3500 transmitter to pulse or continuous signal transmission
5. Switch the R-3500 Receiver on
6. Select transmitter 
7. Begin to trace the cable from the point of application about 15m away

#### **Inductive Coupling** (Refer to Fig. 4.)

1. Position the T-3500 transmitter above the presumed cable
2. Switch on the T-3500 transmitter
3. Switch on the R-3500 receiver
4. Select the appropriate mode. Refer to section: Operation:R-3500
5. Begin to trace the line from the transmitter at least 15m away.
6. Make sure that a distance of at least 50-FT (15m) is always maintained between the receiver and transmitter in order to prevent the coupling of the transmitter's signal through the air.

#### **Locating Passive Lines (Radio and Power Modes)** (Refer to Fig. 5.)


The R-3500 Receiver can locate passive cables that carry radio signals in the frequency range between 15 kHz and 23 kHz as well as power signals between the range of 50 Hz and 60 Hz without the help of the T-3500 Transmitter.

1. Turn the R-3500 Receiver on
2. Select radio mode or power mode. Refer to section 8 OPERATION.
3. Set the sensitivity to maximum
4. Sweep the area using a grid pattern as shown below
5. Adjust the sensitivity to pinpoint the conductor
6. Rotate the R-3500 to find the maximum response

#### **Locating unknown cables** (Refer to Fig. 6.)

1. Use the T-3500 Transmitter using the inductive mode.
2. Use the R-3500 Receiver to sweep the area. Keep the receiver 50-FT (15m) apart from the transmitter.
3. Select the desired mode of operation.
4. Adjust the sensitivity of the R-3500 as needed
5. When a conductor is located, pinpoint the strongest signal and mark the location
6. Repeat steps 1 and 2. Move the transmitter at least 3.3-FT (1m) and 90-degree from the initial position.
7. Repeat the process until the right cable is detected.

#### **Depth Measurement** (Refer to Fig. 7.)

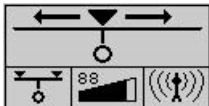
1. Connect the T-3500 transmitter with the cable or the metallic pipe
2. Turn the T-3500 transmitter on. Use continuous signal mode for better result
3. Turn the R-3500 receiver on and move at least 50-FT (15m) away from the transmitter
4. Rotate the R-3500 receiver until the maximum signal strength is detected
5. Push control 1  to take an automatic depth measurement
6. The measurement will display as follow:



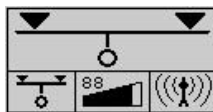
7. To change the unit of measure, refer to R-3500 mode of operation (section 8).
8. For non-metallic pipe, use the M-3000 mouse. Refer to R-3500 receiver mode of operation section 9 to set the receiver accordingly.

9. For Power and Radio signals, an estimated depth measurement can be taken as follow:

a. Push control 3 to select Power or Radio mode



b. Move to one side of the suspected cable until the following symbol appears:



- c. Mark the spot
- d. Move to the other side until the symbol appears again
- e. Mark the spot
- f. Measure the distance between the two spots
- g. Divide the measurement by 2 to find the depth of the cable.

**ERROR MESSAGES DURING A DEPTH MEASUREMENT**

Symbol	Meaning
	For one of the following reasons, the depth could not be measured: <ul style="list-style-type: none"> <li>• The signal received was too weak or too irregular.</li> <li>• The receiver was not held steady enough during the measuring process.</li> </ul> The receiver was not positioned directly above the line at the beginning of the process.
	The depth of the metallic conductor amounts to more than 5 m (16 ft).
	The depth of the metallic conductor amounts to less than 30 cm (1 ft). Such conductors must be specially marked in order to prevent damage during construction.
	The receiver was moved too far to the left or right while making a rough estimate. Move in the opposite direction until the following symbol appears:

**TECHNICAL SPECIFICATIONS**

**R-3500**

The following parameters are specified for the R-3500 receiver:

**Frequency ranges**

- Range 1: radio 15 kHz to 23 kHz
- Range 2: power network 50 Hz / 60 Hz; optionally 100 Hz (can be adjusted by Amprobe service personnel)
- Range 3: transmitter 32.768 kHz

**Sensitivity at a depth of 1m**

- Range 1: radio >20 µA
- Range 2: power network >7 mA
- Range 3: transmitter >5 µA

**Dynamic response range**

- Range 1: radio 120 dB
- Range 2: power network 135 dB
- Range 3: transmitter 120 dB

**Depth determination**

- Depth range 0.1 m ... 5 m (4 in ... 16 ft)

• Resolution	0.1 m
• Accuracy	
- Range 1: radio	±20 %
- Range 2: power network	±20 %
- Range 3: transmitter	±5 % (>5m (6-FT)), ±20 % (<5m (15-FT))
Power supply	10 x IEC R6 / AA cell / Mignon
Operating time	40 hours (for intermittent use with alkaline batteries, 20 °C)

Temperature range in accordance with DIN EN 60068-1

• Operation	-20 °C to +55 °C
• Storage	-30 °C to +70 °C

Weight	2.5 kg, 5.51 lbs.
Dimensions (W x H x D)	99 x 660 x 252 mm, .390 x 25.98x 9.92 in

Type of protection in accordance with EN 60529

Dust and water protected	IP 67 from the lower edge of the receiver up to the lower edge of the battery compartment, and IP 56 for all parts above this delineation
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### T-3500

The following parameters are specified for the T-3500 transmitter:

Transmitted power	0.1 W / 0.5 W (switchable)
Frequency	32.768 kHz
Power supply	6 x IEC R20 / D cell / Mono
Operating time	40 hours (for intermittent use with alkaline batteries, 20 °C)

Temperature range in accordance with DIN EN 60068-1

• Operation	-20 °C to +55 °C
• Storage	-30 °C to +70 °C

Weight	1.7 kg, 3.75 lbs.
Dimensions (W x H x D)	260 x 255 x 140 mm,

Type of protection in accordance with EN 60529

Dust and water protected	IP 56
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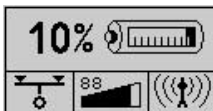
### MAINTENANCE

#### Changing the battery in the R-3500 receiver

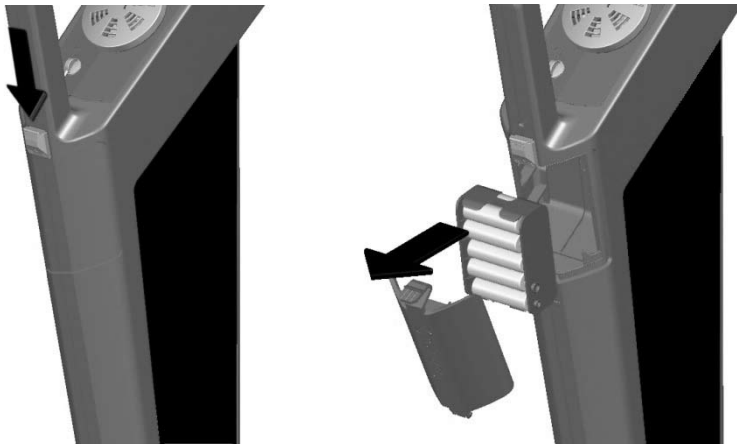
The status of the receiver's batteries is checked upon start-up and indicated in the display.



The system regularly checks the battery strength as well. If battery capacity falls below 10 % of the threshold value, an audible warning signal is given and the current status of the batteries is shown in the upper part of the display.



In order to replace the ten 1.5 V mignon (AA) batteries, the battery housing must be removed as described in the following illustrations:



### Changing the batteries in the T-3500 transmitter

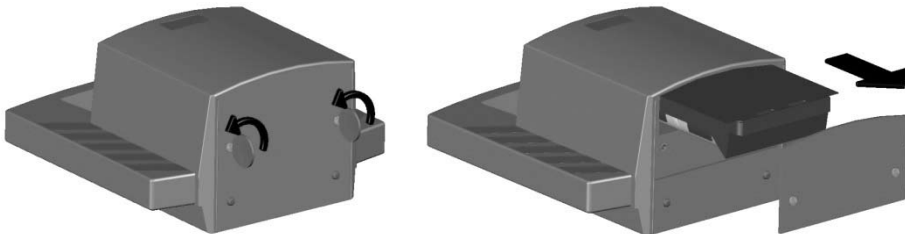
The batteries in the transmitter have to be replaced as soon as the red LED battery indicator starts to blink.



Should this occur while the user is busy locating a line with the receiver, he/she will be informed of the weak batteries via the reception signal:

Ty pe of signal	Normal signal	Signal when batteries are weak

In order to change the six 1.5 V mono (D cell) batteries, both screws on the back of the transmitter must be (e.g. with the aid of a coin) turned through ¼ turn (1) and the battery tray must be pulled (2). Please note that all the batteries are fitted in the same direction.



### Changing the floor cap on the R-3500 receiver

The plastic floor cap, which prevents the tip of the receiver from being damaged, can be easily replaced with the aid of a pointed object (e.g. screw driver). Replacements can be ordered through the SEBA KMT sales team.



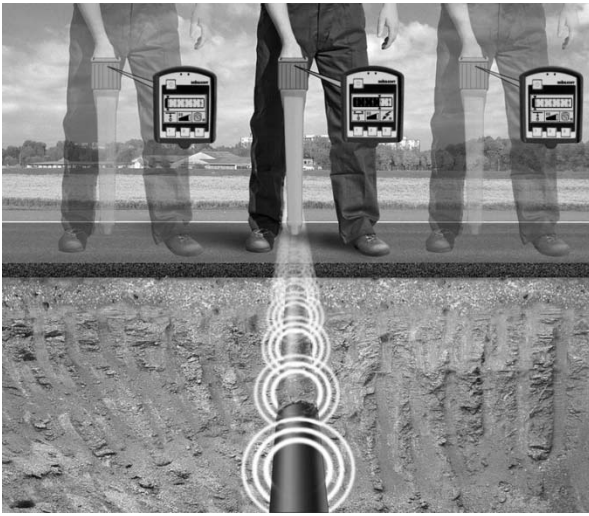


Fig. 1



Fig. 2

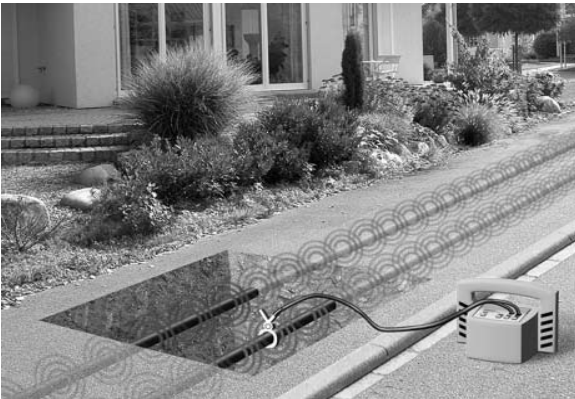


Fig. 3



Fig. 4



Fig. 5



Fig. 6

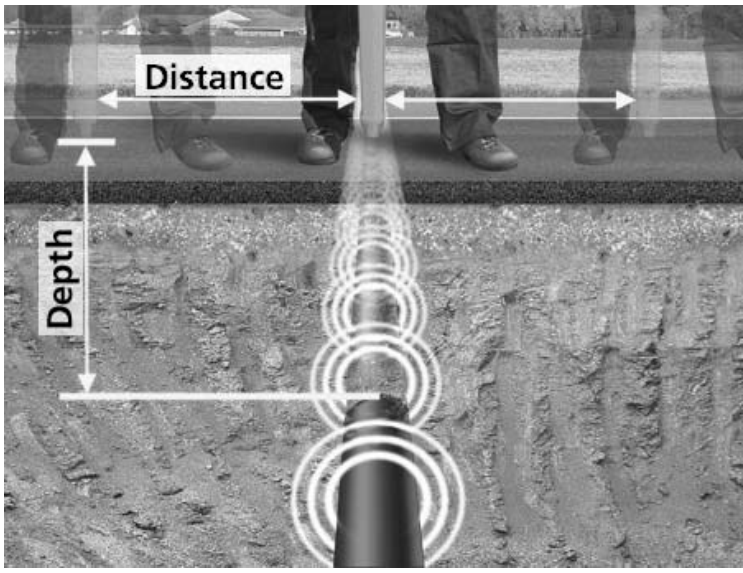


Fig. 7