FISHER® RESEARCH LABS

TW-82

DIGITAL LINE TRACER

Operating Manual

Revision Level 1

CONTENTS

INTRODUCTION

The TW-82 Digital Line Tracer components include a Transmitter, Receiver, ground-rod assembly, carrying case (soft or optional hard case) and an operator's manual.

The TW-82 is an active single-frequency line tracer that is used to locate and trace buried utilities using any of the following three tracing methods:

1. **Conductive Method** (preferred). In this method, the accompanying transmitter energizes the buried utility by making a direct electrical connection to it with conductive tracing cables. In most cases, this method sets up the strongest magnetic field for the receiver to sense above ground.
2. **Inductive Method**. When a direct physical connection to the utility is unavailable, the utility may be energized indirectly by magnetically coupling an energizing current from the accompanying transmitter. Some prior knowledge of the utility's location is required so that the transmitter can be placed and oriented near it in the most effective manner.
3. **Coupling Clamp**. In some cases a utility may be exposed, but does not provide a direct connection for the conductive tracing cables. The accessory coupling clamp can be clamped around the exposed utility to magnetically couple an energizing current from the accompanying transmitter into the utility.

   Never make direct contact with electrical or communication lines that are in service. To trace such lines in service, perform an inductive trace, either with or without the coupling clamp.

TW-82 TRANSMITTER

The Transmitter has two controls: ⏻ & POWER MODE.
The POWER MODE Button has a dual function:

1. When the Transmitter is powered on, POWER MODE switches the device between normal (1/4 watt) and high (1.0 watt) output.

2. With the Transmitter powered off:

   A. Press-and-hold POWER MODE to program the **Auto Power-Down** feature.

   Successive presses of ⏻ will show a flashing battery indicator, followed by a blank screen or the illuminated battery indicator.
   - An illuminated battery indicator means that **Auto Power-Down** is activated.
   - A blank screen means that **Auto Power-Down** is deactivated.

   B. After you release POWER MODE, the transmitter power will turn on.

   With the **Auto Power-Down** feature activated, the Transmitter will automatically turn off 60 minutes after the last key-pad press by the user. This is a battery saving feature. The Transmitter will warn of power-down by switching ON and OFF as described on the top of the following page.

Low Battery Power-Down Warning

When the Transmitter batteries are near the end of their useful life, the Transmitter will warn the operator before shutting down.

Five minutes before shutting down, the Transmitter will alternately stop and start transmitting at approximately one-second intervals. The operator using the Receiver, even at a distance from the Transmitter, will notice the signal turning on and off before the power turns off completely.

Accessory Output

1. Flip up the black protective cover to expose the Accessory Output Jack.
2. Connect the conductive tracing cable plug for conductive tracing.

When the conductive tracing cable is connected, Signal Current will be displayed. The Signal Current Bar Graph shows the quality of the connection.

Vertical Bars will illuminate to indicate the current as follows:

mA indication	1	2	4	8	15	25	50	100	200
Actual Range (mA)	0.5-1.4	1.5-2.9	3.0-5.9	6.0-12.9	13.0-18.9	20.0-39.9	40.0-74.9	74-149	150+

Automatic Load Impedance Matching adjusts output to provide full rated power over a wide range of loads (e.g. utility types and conditions). It is tolerant of both dry (high resistance) and shunted (low resistance) ground connections.

The Transmitter has a built-in antenna for inductive locating. When the Cable Jack is not connected, the inductive antenna automatically engages and begins transmitting. When locating inductively, the Signal Current Bar Graph will not be displayed, as there is no conductive trace load to be measured.

WARNING: Do not handle output leads unless power is off. **ELECTRIC SHOCK HAZARD:** Servicing to be performed by qualified personnel only.

NEVER connect conductive cables to an energized power line.

INDUCTIVE LOCATING

Inductive locating is most effective with the Transmitter straddling the utility as illustrated, with the utility perpendicular to the Transmitter's batteries.

If the utility direction is unknown, place Transmitter on the ground, power on, and sweep the Receiver a complete 360º around the Transmitter, keeping at least a 25-foot (8-meter) distance between the Transmitter and Receiver. If unsuccessful, move the Transmitter to another location. When located, the Receiver's azimuth indicator will show the direction of the utility.

In inductive mode, the Transmitter's LCD will not display Signal Current. When the conductive tracing cables are plugged in, the Signal Current display will illuminate.

CONDUCTIVE LOCATING

1. Turn Transmitter Off.
2. Connect the Conductive Tracing Cables to the Transmitter.
3. Push the Ground Rod into the earth at a 90º angle to the direction of the utility.
4. Connect the red clamp to the non-energized utility.
5. Connect the black clamp to the Ground Rod.
   Be sure not to place the wires over any other utility.
6. Turn Transmitter On.
7. Move at least 25 feet (8 meters) away from the connection point.
8. Sweep the Receiver in a circle around the connection point.
9. Using information provided on the display, find the areas that need to be traced and analyze the situation in more detail to find the buried utility.

TW-82 RECEIVER

TW-82 Receiver

2-BUTTON OPERATION

VOL TAP OFF HOLD **BUTTON**

- Power-Up: Press Button to turn ON
- Volume Control: Tap the Button to adjust volume
  1. Mute
  2. Low
  3. Medium
  4. High

  Continued presses of the button cycles back to setting #1.
- Power-Down: Press-and-Hold Button to turn OFF

2-Button Operation - *Continued*

LATERAL BUTTON

- Press LATERAL to enter Lateral-Tracing Mode.
- Press LATERAL again to exit Lateral-Tracing Mode.

While in LATERAL Mode, press-and-hold LATERAL to program:

- To exit Lateral programming, press-and-hold LATERAL again.
- To set the upper limit of the signal range, press LATERAL.

  Each press of LATERAL toggles through the program choices: 50, 100, 150, 200, 250 or 300

  Set this upper limit just above the maximum SIGNAL number that appears during your lateral trace.

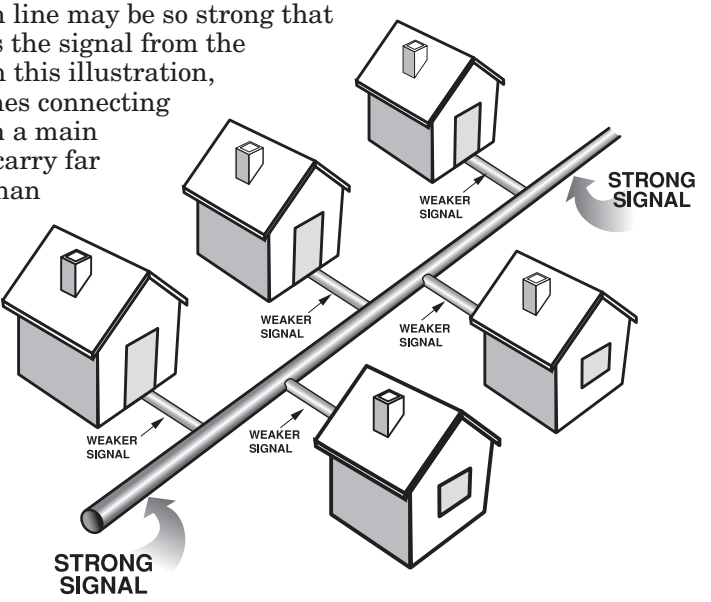
  The correct setting will make it easier to hear the peak in the signal as you pass over the lateral line.

  Set the number just above the highest SIGNAL number.
  Examples:

If the highest lateral SIGNAL number is:	Set to:
137	150
159	200
310	300

(300 is the maximum possible)

At some sites, utility lines branching off from a main line may be difficult to trace using the Normal Mode of operation. The signal from the main line may be so strong that it overwhelms the signal from the lateral line. In this illustration, gas service lines connecting to homes from a main gas line may carry far less current than the main line. This weaker current could be the result of a lateral line that is shorter than the main line, or a lateral that is not well grounded.

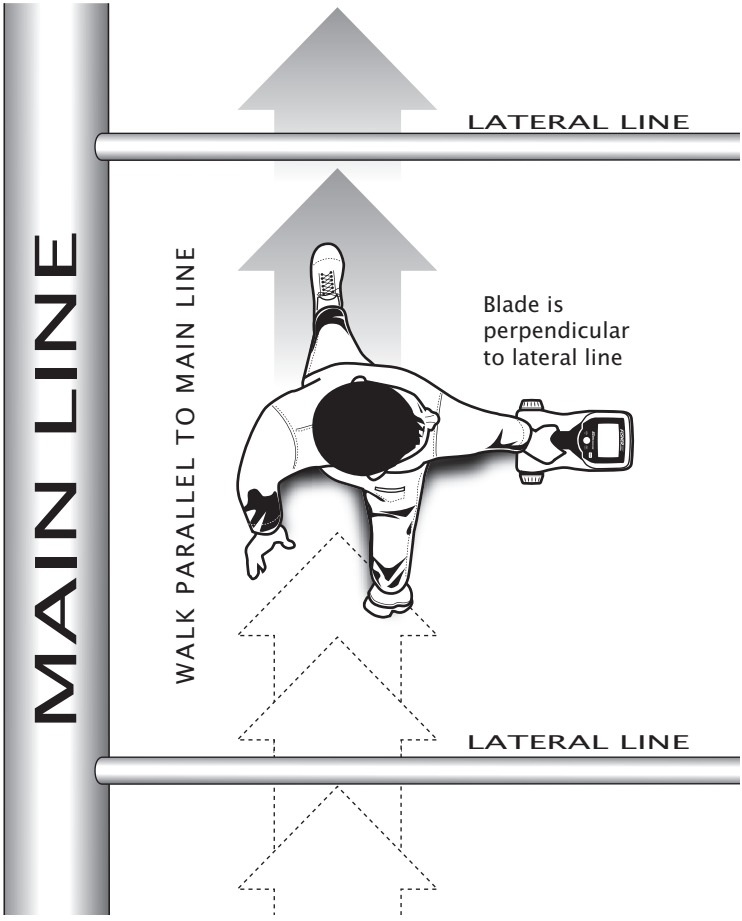


LATERAL Button - *Continued*

When conducting a trace of the Lateral line, select LATERAL Mode and walk parallel to the main line (as in the illustration below). You must use Lateral Mode in this situation because in the Regular Mode, you may detect the signal from the main line all of the way up to the house, even with the blade of the Receiver parallel to the main line.

Using the Lateral Mode, you can ignore the signal coming from the parallel main line and detect signals coming from the perpendicular lateral lines. The Lateral Mode will detect the main line in very close proximity, even though the blade is parallel to it. So maintain a distance of 6 to 12 feet from the main line when tracing lateral lines.

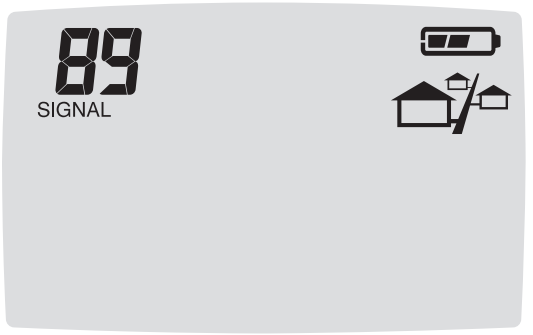
Walk parallel to the main line, holding the blade of the Receiver perpendicular to the lateral lines.



2-Button Operation - *Continued*

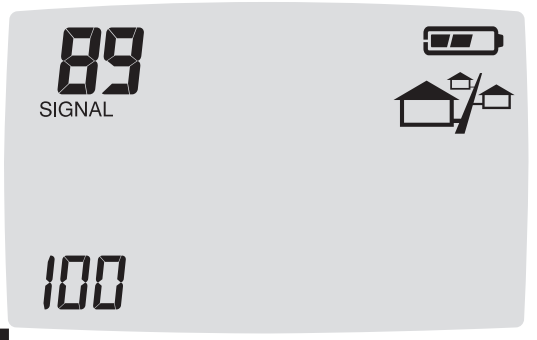
LATERAL TRACING OPERATION

While tracing a line using the Lateral Mode, the display will appear as illustrated below.
The SIGNAL number indicates the strength of the field emitted by the buried line.
The buried line is located at the spot when the maximum SIGNAL number is indicated. If you move left or right of the spot where the maximum SIGNAL is found, the value displayed will fall.
Walk across the location of the lateral line with the blade perpendicular to the lateral line.



LATERAL MODE PROGRAMMING

While in the Lateral Mode, press-and-hold LATERAL to set the upper limit of the SIGNAL RANGE.
The upper limit of the SIGNAL RANGE appears at the bottom-left of the display. The default value is 150.
Press LATERAL to change the number. Press-and-hold LATERAL to exit programming mode. Changes to this upper limit of the SIGNAL RANGE are saved to memory.
Changing this upper limit is similar to the gain adjustment on other line tracers which use a peak mode of operation. Set the number just above the highest SIGNAL number, as described on the previous page.



METRIC / IMPERIAL UNIT OF MEASURE

To change the Receiver unit of measure, follow this procedure:

1. Start with the Receiver OFF.
2. Press and Hold the Button for 10 seconds.
   The device will turn on; continue to hold Button the full 10 seconds.
3. Release the Button after 10 seconds.

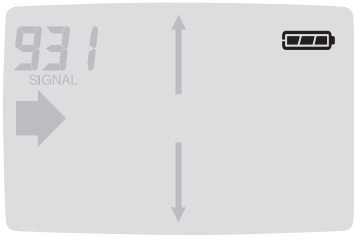
DISPLAY

1. Signal Strength: Indicates your proximity to the center of the electromagnetic field emitted by the utility.

999: maximum value
0: minimum value

You may find different locations where the Signal Strength value is high. Use this reading as a relative indicator as to where the utility is located. Signal Strength is strongly influenced by the depth of the utility.

2. Battery Strength: When battery life declines to less than 1 hour (estimated) of operation the battery indicator outline will be illuminated with no segments. When the batteries reach the end of their useful life, the screen will go blank and the battery icon will flash before the Receiver shuts off. Expect about 60 hours of battery life from a set of two D-cell alkaline batteries.

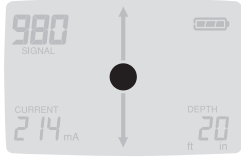


3. Left/Right & Over-Target: These indicators show your position relative to the center of the electromagnetic field.

Move to the left

Move to the right

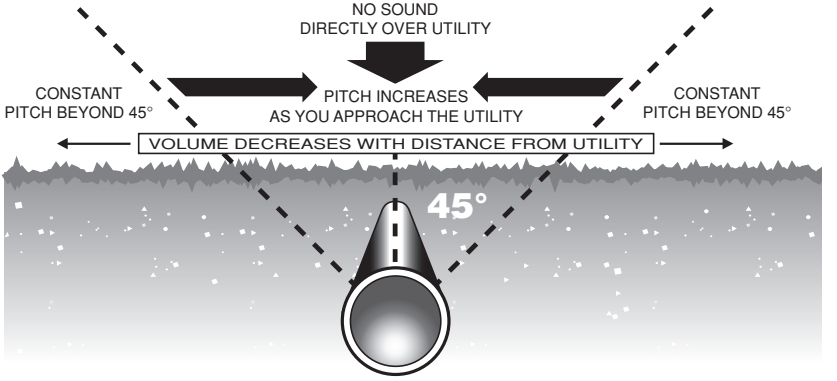
You are over the target



Left/right & over-target - *Continued*

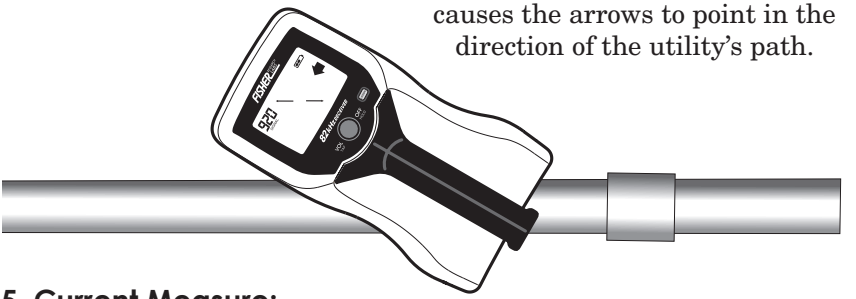
Audio: When you move within a 45º angle of the center of the electromagnetic field, the audio pitch will change; the pitch increases as you approach the utility. Outside the 45º zone, the pitch does not change.

When the Receiver is directly over the utility, it goes silent. The over-target indicator, ●, also appears when the Receiver is silent.



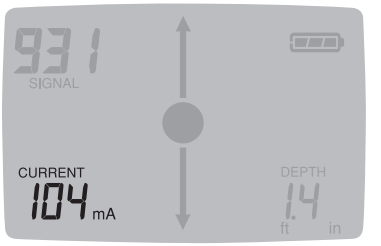
When you are standing to the right of the utility, you will hear a constant tone, and to the left, a pulsating sound.

4. Azimuth: These rotational arrows indicate the utility's path relative to your position. Rotating the device near a buried utility causes the arrows to point in the direction of the utility's path.



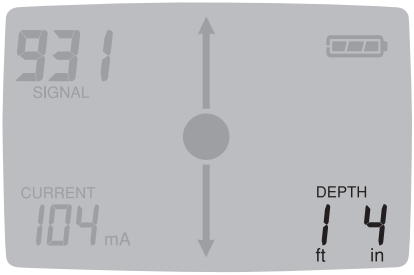
5. Current Measure:
mA (milliamperes) of current flowing on the conductor.

Use Current Measure as an aid for distinguishing utilities in close proximity. The Current Measure will generally be the highest on the utility you are connected directly to, regardless of the utility's depth.



6. Depth:

Depth reading is only accurate if the electromagnetic field is perfectly round.



The electromagnetic field must have enough energy for the device to accurately calculate the depth. The weaker the signal strength, the less reliable the depth indicator. For this reason, depth readings for inductively located utilities will tend to be less accurate than conductively located ones.

The depth reading is a measure of the distance between the tip of the Receiver blade and the *center* of the buried utility. When the device is directly over a buried utility, as indicated by the Over-Target indicator, depth will automatically be displayed in feet and inches (meters if metric). In general, the accuracy of any depth measurement will be influenced by factors such as proper azimuth orientation of the device, field strength and the *roundness* of the field. The only 100% reliable method for determining the depth of any buried utility is to hand-excavate.

7. Overhead Power Line Interference: When the Receiver encounters an interfering overhead field greater than the field from an energized buried line, the Receiver will display zeroes, "000", for the Depth and Current measurements.

In this case, the field from the overhead power line is interfering with the buried line you are trying to trace. You may still be able to trace the buried line, but the accuracy of your trace will be impaired by this interference.

AUTO POWER-DOWN, RECEIVER

When 90 minutes have passed without the operator pressing the control button, the Receiver will automatically power down.

- Lower left of the display will indicate "OFF".
- Lower right of the display will count down from 10 to 0.
- The Receiver will then turn off.

To stop Auto Power-Down, press the button once.

SPECIFICATIONS

RECEIVER

Frequency	82.175 kHz
Standard Mode	Automatic response
Lateral Mode	Programmable
Left/Right Guidance	Audible and visual
Azimuth Indicator	Visual
Over-Target Indicator	Visual and audible
Battery Status	Visual
Signal Strength Indicator	Numeric display & audible
Signal Current Measurement	Numeric display, automatic
Depth Measurement	Numeric display, automatic
Battery Type	Two D-cell batteries (included)
Battery Life	From 80 to 130 hours, depending on the volume setting
Weight, with batteries	3.60 lbs

TRANSMITTER

Output Frequency	82.175 kHz
Output Power (nominal)	Normal Setting = 0.25 watt High Setting = 1.0 watt
Conductive Tracing Impedance Matching Range	Normal Power: 2 to 8,000 ohms -6dB High Power: 2 to 3,000 ohms -6dB
Inductive Tracing Magnetic Strength	Normal Power: 15 Vm^2 High Power: 25 Vm^2
Battery Type	Four D-cell batteries (included)
Battery Life	Typically 130 hours with high quality alkalines
Weight, with batteries	4 lbs

ENVIRONMENTAL

Ingress Protection Rating	IP65 (stands up to water jets)
Operating Temperature Range	-4ºF to 140ºF (-20ºC to +60ºC)
Relative Humidity	0 to 95% noncondensing
Shipping Weight (packaged)	17.5 lbs
Field Carry Weight, w/accessories	15.5 lbs*

**Includes Carry Case, Batteries, Ground Rod and Conductive Tracing Cables*

Fisher Research Laboratory does not warrant suitability to specific use. Fisher Research Laboratory shall in no event be liable for any direct, incidental, consequential or indirect damages.

FISHER® RESEARCH LABS

QUALITY

Fisher detectors are renowned for their quality.
Each detector is handcrafted in the USA with pride.

PERFORMANCE

The worldwide underground utility industry relies on Fisher.
Our instruments are durable, dependable and locate deeper.

REPUTATION

Fisher produced the first patented metal detector in 1931. For over 80 years, the Fisher logo has been a mark of excellence.

2 - YEAR LIMITED WARRANTY

Proof of purchase is required to make a claim under this warranty.

NOTE TO CUSTOMERS OUTSIDE THE U.S.A.

This warranty may vary in other countries; check with your distributor for details.
Warranty does not cover shipping costs.

SERVICE

Should you have any questions or problems, contact:

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1465 Henry Brennan Dr., El Paso, Texas 79936
Tel 1-800-685-5050 Fax 915-225-0336
www.fisherlab.com email: info@fisherlab.com

According to FCC part 15.21, changes or modifications made to this device, not expressly approved by the party responsible for compliance, could void the user's authority to operate this equipment.
This device complies with FCC Part 15 Subpart B Section 15.109 Class B.

Not to be used with conductive tracing cables longer than 6.5' (1.98 m)

TW-82 ACCESSORIES

3-Inch Coupling Clamp – CCLAMP-3

Useful for in-service and electrical power line tracing when a metal-to-metal hookup is not possible

5-Inch Coupling Clamp – CCLAMP-5

Useful for in-service and electrical power line tracing when a metal-to-metal hookup is not possible

Hard Carry Case – 1802050000

Shock absorbent protective hard carrying case with contoured foam insert custom made to house the TW-82.
35” x 7” x 16”

Fisher Sonde Signal Transmitter 82kHz – SONDE-82.175

Small transmitter used to trace the path of non-metallic pipes and locate blockage in lines. Sonde is inserted into a pipe or duct by means of a push rod and located using a Fisher receiver.

- Rugged Design
- Long Battery Life
- Outstanding Distance & Depth
  Locate up to 15’ deep
- Operating Frequency: 82.175 kHz
- Weight 6.4 oz
- Length 6”
- Diameter 2”
- Battery Life: 70 hrs
- Operating Temperature
  -20 to +60 C (4° to 140°F)
- End Cap Thread 3/8”-16 x 3/4”