



3M

Dynatel™ 2210E
Cable Locator

Operators Manual

September 1999
78-8097-6519-7-Revision B





TABLE OF CONTENTS

Introduction	2
Installing or Replacing the Batteries	2
Initial Receiver Configuration	3
Receiver Battery Test	3
Transmitter Battery Test	4
Locating a Buried Cable	4
Transmitter Setup	4
Direct Connect Method	5
Dyna-Coupler Method	6
Induction Method	7
Receiver Setup	8
About Trace Modes	9
Selecting Passive Power Frequencies	9
Determining Cable Depth and Current	10
Locating an Active Duct Probe (ADP)	10
Determining ADP Depth	10
Locating EMS Markers	11
Cable or Pair Identification	12
Transmitter Setup	12
Receiver Setup	12
Pair Identification Receiver Setup	13
Optional Accessories	13
Technical Information	14

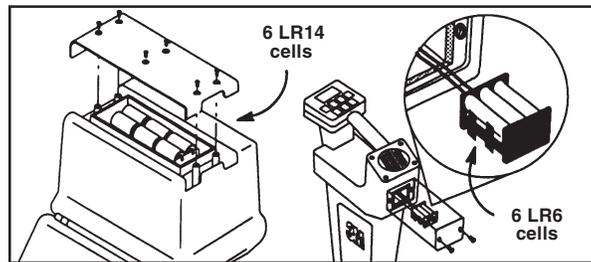


INTRODUCTION

The 3M™ Dynatel™ 2210E Cable Locator consists of a Transmitter and a Receiver for locating buried cables or Active Duct Probes (sondes). It also can be used to identify cables or pairs using a Dyna-Coupler plugged into the Receiver jack. The Transmitter provides two frequencies to accommodate varying factors such as distance, cable type, or soil conditions. The Receiver detects 50 or 60 Hz AC Power signals and low frequency (LF) radio signals re-radiated from local broadcast transmitters. It also measures the signal current in a cable and displays its magnitude. The depth of buried cables or sondes may also be displayed.

Note: For more detailed locating instructions and advanced locating techniques, ask your 3M sales representative for a free publication called *Cable and Pipe Locating Techniques*.

INSTALLING OR REPLACING THE BATTERIES



CAUTION!

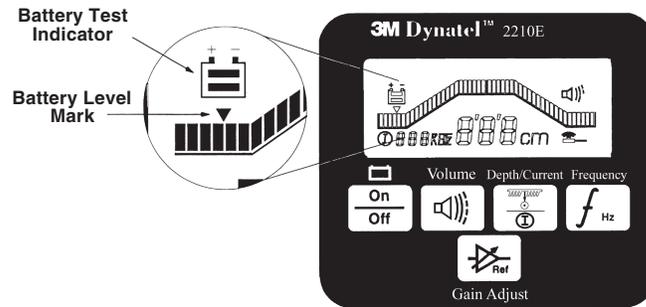
Do not connect batteries improperly, charge or dispose of in fire. Batteries may leak or explode and cause personal injury. Always remove batteries when storing the units.

Battery Disposal: Since regulations vary, consult applicable regulations or authorities before disposal.

INITIAL RECEIVER CONFIGURATION

Display depth units (inches, feet and inches, or centimeters) may be changed while holding  and pressing . For each press, one of three units will display. To change the passive Power frequency, press and hold  then press  to toggle between 50 or 60 Hz as displayed in the lower left corner of the display.

RECEIVER BATTERY TEST



To test the batteries, turn the Receiver on by pressing and holding . The bar graph should extend to the right of the battery level mark, otherwise replace the batteries.

Note: When batteries are low, the battery test indicator  will flash.

TRANSMITTER BATTERY TEST



To test the Batteries, hold down  and listen to the tone (solid tone=good; beeping tone=low; no tone=replace batteries).

Note: *The battery test indicates battery condition for normal output levels. If the unit resets when the high output level is selected, use the normal output level or replace the batteries.*

LOCATING A BURIED CABLE

Transmitter Setup

Note: *Key descriptions can be found inside the Transmitter lid.*

Perform a battery test and then connect the Transmitter using one of the three methods below to put tracing signal on a cable.

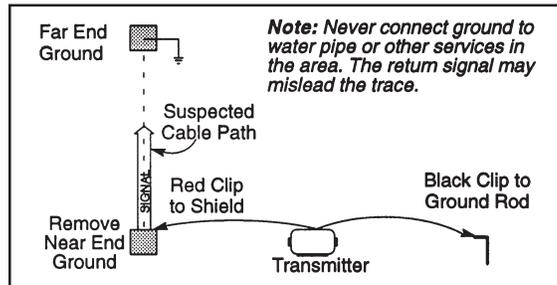
DANGER!

Check for stray voltage before attaching Transmitter. Voltage greater than 240 volts will damage equipment and cause personal injury and death. Follow standard procedures for reducing the voltage.

WARNING!

Potential for electrical shock exists when handling connecting cables while the Transmitter is in the TRACE, FAULT or TONE modes. Turn the Transmitter off before handling connecting cables.

Direct Connect Method



Make sure the Transmitter is off. Plug the direct connect cable into the front panel jack. Connect the Black clip to the ground rod. Place the ground rod in the earth perpendicular to the suspected cable path. If necessary, extend the black lead with the Ground Extension Cable. Remove the ground bonding and attach the Red clip to the shield.

Note: Never attach or remove the direct connect cable from the Transmitter front panel jack while the red and black clips are connected to a cable.

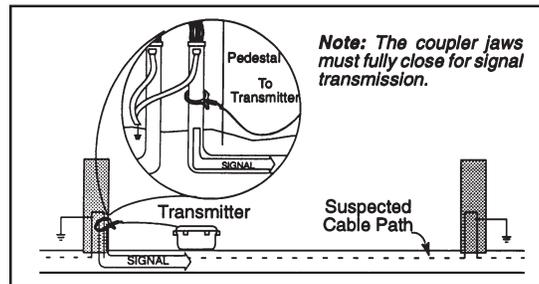
Press Ω to turn the unit on and select Continuity Test (solid tone=good ground; beeping tone=usable ground; no tone=poor ground or no far-end ground). Both LEDs light continuously during the continuity test.

Press f_{Hz} to apply Tracing signal and select the desired frequency: 577 Hz for direct connect with far-end ground; or 33 kHz for direct connect with no far-end ground. LED indicates frequency selection. (This key can also turn the unit on.)

Press \square to change output level. Choose **Normal** output (flashing LED) for locating short to moderate distances using direct connect method. Use **High** output (solid LED) for long distances and deep cables.

Transmitter setup is finished, now go to **LOCATING A BURIED CABLE - Receiver Setup** (Page 8).

Dyna Coupler Method



Connect the Dyna-Coupler to the Transmitter front panel jack using the coupler cable.

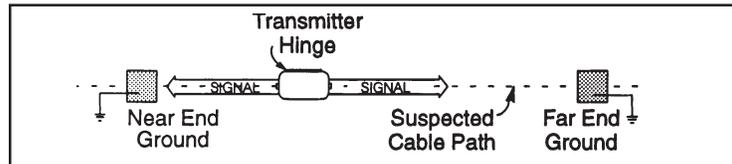
Clamp the Dyna-Coupler around the cable below any bonds just before the cable enters the earth. The jaws of the coupler must fully close.

Press f_{Hz} to apply Tracing signal and select the 33 kHz frequency. LED indicates frequency selection. (This key can also turn the unit on.)

Select high output level by pressing .

Transmitter setup is finished, now go to **LOCATING A BURIED CABLE - Receiver Setup** (Page 8).

Induction Method



Place the transmitter on the ground over the target cable with the lid hinge in line with the cable path.

Press  to turn the transmitter on and select the 33 kHz frequency. LED indicates the frequency selection.

For greater tracing range, select high output level by pressing .

Transmitter setup is finished, now go to **LOCATING A BURIED CABLE - Receiver Setup** (PAGE 8).

LOCATING A BURIED CABLE

Receiver Setup

Note: Key descriptions can be found on the side of the Receiver.

Press  to turn the Receiver on.

Press  to select the 50/60 Hz power frequency (see section on *Selecting Passive Power Frequencies Page 9*) or LF for passive locating; otherwise, select the same frequency as the Transmitter.

Note: The Receiver is automatically set to Special Peak mode when LF is selected. No other modes are allowed in LF frequency.

Press  to adjust the speaker volume as needed: off, normal, high, or high-expanded. The high-expanded setting causes the audio to cut off as the antenna moves away from the cable.

Note: While tracing cables, keep the Receiver handle in line with the suspected cable path.

To select Special Peak mode, press and hold  the press . While in this mode, the peak flag will flash.

Note: Peak or Special Peak mode may require re-setting the Receiver gain. Press  when the bar graph remains either fully open or fully closed.

About Trace Modes

Peak: In this mode, as the antenna crosses the cable, the Receiver speaker volume increases to a maximum and the bar graph fills from both sides toward the middle. As the antenna moves off the cable path, the speaker volume decreases and the bar graph opens.

Peak with High-Expanded: While in Peak mode, press  to select High-Expanded (the highest setting). Speaker response is cut off as the antenna moves away from the cable.

Special Peak Mode: This mode will increase the signal sensitivity of the Receiver when the signal is too weak for normal tracing. Use special attention when using this mode because it is more susceptible to congestion than the normal peak mode. To select Special Peak mode, press and hold  then press . While in this mode the Peak flag will flash.

Note: While tracing cables in any mode, keep the Receiver handle in line with the suspected cable path.

See section *Initial Receiver Configuration (Page 3)* to set the power frequency to 50 Hz or 60 Hz. The Receiver can be tuned to locate 3 different harmonics of the chosen power frequency.

H50 Hz or H60 Hz (high harmonic): Best for general locating of passive power.

L50 Hz or L60 Hz (low harmonic): Works best on primary power cables. May be used when high harmonic is weak or erratic.

100 Hz or 120 Hz: For locating rectified AC power signals, often found on pipelines using impressed current cathodic protection.

When a Power frequency is selected, the Hz symbol will flash, indicating that alternate frequencies are available. To change the selected power frequency, press and hold  then press  to select the next Power frequency.

DETERMINING CABLE DEPTH AND CURRENT

Place the Receiver Antenna on the ground directly above the cable with the handle parallel to the path. Press  and the display will indicate the cable depth and relative current . Current is displayed in the lower left corner of the display. Press  twice to continue tracing. You may also press  to return to Trace mode.

LOCATING AN ACTIVE DUCT PROBE (ADP)

Press  to turn the Receiver on.

Press  to select the 33 kHz frequency.

With the Receiver handle *perpendicular* to the conduit path, locate the ADP position by moving along the path until a peak is found.

Press  when the bar graph remains either fully open or fully closed. Refer to the ADP operating instructions for further information.

Determining ADP Depth

Place the Receiver Antenna on the ground directly above the located ADP position maintaining the handle orientation *perpendicular* to the path. Press  twice to display ADP depth . To return to trace mode, press  or .

LOCATING EMS MARKERS

EMS markers may be detected and located using either the 3M Dynatel™ 2205 or 2206 EMS Marker Locating Accessory. To attach the accessory, slide the Receiver horizontally into the EMS Marker Locating Accessory mounting slot. Make sure the locking button holds the Receiver securely in the slot. To separate the units, press the locking button down and slide the Receiver out of the EMS Marker Locating Accessory mounting slot.

Locating Markers while Tracing Cable Path

To detect markers while tracing the cable path, set the 2205 or 2206 accessory mode switch to the *Alert* position, and trace the cable path normally. The internal buzzer in the accessory will alert you to the proximity of a detected marker.

Locating Markers using the Receiver

If the buzzer response is too broad, the exact marker position may be pinpointed by using the Receiver.

Select 577 Hz or 33 kHz on the Accessory. Use a different frequency from the tracing signal.
Turn the Receiver ON and set the frequency to match the Accessory setting.

Note: *The initial Receiver gain in Peak mode is optimized for interfacing with the 2205 or 2206 Accessory while searching for a marker. Press  only when a marker is detected and the signal is too strong. To search for a new marker, reset the Receiver gain to the initial setting by turning its power OFF and back ON.*

Refer to the EMS Marker Locating Accessory operating instructions for further information.

CABLE OR PAIR IDENTIFICATION

Transmitter Setup

Transmitter setup is the same to identify cables or pairs. However, Receiver setups are different.

Perform a battery test; then, connect the Dyna-Coupler to the Transmitter front panel jack using the coupler cable.

Note: *Cable Identification requires two Dyna-Couplers: one at the Transmitter and one at the Receiver.*

Clamp the Dyna-Coupler around either the cable or both tip and ring of a pair and make sure the jaws fully close.

Press  to turn the Transmitter on and select the 33 kHz frequency.

LED indicates the frequency selection.

Press  to change the high output level.

Receiver Setup

Connect a second Dyna-Coupler to the Receiver accessory jack another coupler cable.

Note: *Cable Identification requires two Dyna-Couplers: one at the Transmitter and one at the Receiver.*

Press  to turn the Receiver on.

Press  to select the highest toning frequency.

Check the first cable in the group by clamping the Dyna-Coupler around the cable. Press  and observe the numeric display, which is relative signal strength. Remember the number and continue by clamping the Dyna-Coupler around the next cable in the group. If the signal strength is greater than the previous observation, press . If the signal strength is less than before, ignore it. After checking all the cables in the group, the cable with the highest reading is the one being identified.

PAIR IDENTIFICATION

Receiver Setup

Connect the inductive probe to the Receiver accessory jack using the probe cable.

Press  to turn the Receiver on.

Press  to select the 33 kHz frequency.

Insert the Probe into the bundle of pairs (or the group, if known) and press . Next, divide the pairs into two bundles and insert the Probe into each of the bundles and observe the numeric display. The bundle with the highest reading will contain the target pair. Continue by dividing the bundle with the target pair into two parts and checking each part for the highest signal. In this way the pair to be identified will be isolated.

OPTIONAL ACCESSORIES

- 1196 6- inch Dyna-Coupler (includes Pouch)
- 2205 EMS Marker Locating Accessory (single frequencies)
- 2206 EMS Marker Locating Accessory (all frequencies)
- 3005 1 inch Dyna-Coupler
- 3011 Inductive Probe
- 3019 3 inch Dyna-Coupler Kit (includes 9011 Coupler Cable and Pouch)
- 3229 Active Duct Probe (sonde)
- 9011 Coupler Cable
- 9023 Probe Cable
- 9043 Ground Extension Cable

TECHNICAL INFORMATION

Transmitter

Frequencies:	
Trace mode:	577 Hz, 33 kHz
Output Power:	3 watts maximum
Battery Life:	50 hours, typical (Normal output level) 10 hours, typical (High output level)
Recommended Batteries:	Six Duracell™ Alkaline LR14 "C" (MN1400)

Receiver

Frequencies:	
Active Trace/Tone:	577 Hz, 33 kHz
Passive VLF:	15 - 30 kHz
Passive Power:	50 Hz or 60 Hz (user selectable) L50/60 (5th harmonic) H50/60 (9th harmonic) 100/120 (for rectified power frequencies)
Depth Range:	0 to 914 cm (0 to 360 inches)
Depth Accuracy:	±10% ± 1 digit for 0 to 150 cm (0 to 60 inches) ±15% for 150 cm to 450 cm (60 to 180 inches) ±20% for 450 cm to 914 cm (180 to 360 inches)
Battery Life:	50 hours, typical
Recommended Batteries:	Six Duracell™ Alkaline LR6 "AA" (MN1500)

Environmental

Temperature Range:	Operating : -20° to 50° C (-4° to 122° F) Storage: -40° to 70° C (-40° to 158° F)
--------------------	--

Physical

Receiver Weight:	1.9 kg (4.11 lbs)
Transmitter Weight:	2.4 kg (5.29 lbs)

Dynatel is a registered trademark of 3M.
Duracell is a registered trademark of Duracell Inc.



This product is in accordance with the requirements of the European directive 89/336/EEC

Important Notice

All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in 3M's current publications, or any contrary statements contained on your purchase order shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.

Warranty; Limited Remedy; Limited Liability.

This product will be free from defects in material and manufacture for a period of one year from the date of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the shelf life period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any loss or damage arising from this 3M product, whether direct, indirect, special, incidental or consequential regardless of the legal theory asserted.**



Telecom Systems Division
6801 River Place Blvd.
Austin, Texas 78726-9000

Printed on Weather Proof
and Tear Resistant Paper

Printed in the U.S.A
©3M 1999