

**STROWGER AUTOMATIC SYSTEMS**  
COMMUNICATING ..... SIGNALING

# The WEST TEST SET

A Portable Line-Testing Device  
and Telephone for Maintenance  
of Communication and Signaling  
Systems.

CATALOGUE 1505

For telephone systems, relays or  
signalling equipment not described  
in this catalog call  
NEW YORK OFFICE  
Lexington 2-6226  
21 East 40th St.

*Mr. L. D. Lee  
R. A. and help!*

**Automatic Electric Inc.**

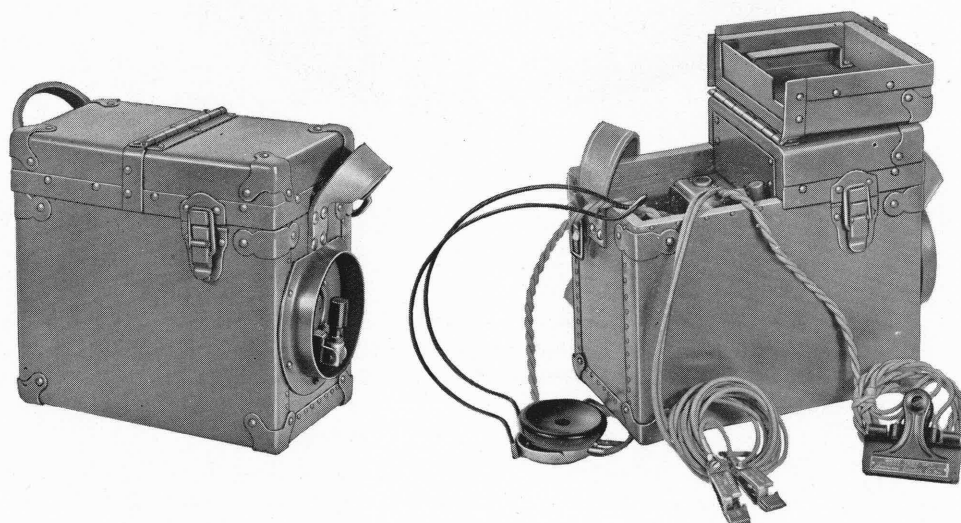
1033 W. Van Buren Street  
CHICAGO, U. S. A.

## The West Test Set

**E**FFICIENT operation of telephone, telegraph, fire-alarm, or other communication or signaling systems demands a policy of constant testing and repair. Faults must be located and remedied as fast as they appear—before they have progressed far enough to noticeably affect the quality of the service. Continual testing, coupled with thorough repair work, is the only real safeguard of dependable service.

ruggedly built, to withstand the use and abuse to which it is subjected, and is simple and reliable in operation, securing perfect results even in the hands of an inexperienced operator.

The West Test Set is a complete and independent unit, requiring no central testing equipment for its operation. By its use, the direction and location of any line fault can be positively determined without opening any lines or interfering with busy circuits, and with-



*The West Test Set—(Left) Closed for Carrying—(Right) Open Ready for Use*

The testing of such communication lines may be handled either by using testing equipment located at some central point, or by placing a portable test set in the hands of the lineman. However, instruments of the type used in centralizing testing are usually of a delicate nature, difficult to handle, and so costly as to preclude their use in the average small installation.

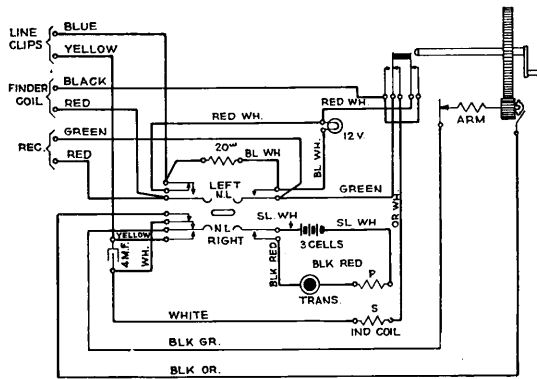
In such cases, the West Test Set fills a real need. It provides a complete portable line-testing unit for the man out on the job. It is

out regard to the presence of bridged inductive windings of comparatively low resistance, such as ringer, repeating, or relay coils.

In addition to its use in testing, the West Test Set is well adapted for use as a portable telephone. High-efficiency transmitter and receiver circuits, the same as employed in standard magneto telephones, are used. The quality of transmission is excellent, and the ringing signals from the magneto-generator are capable of carrying distinctly over long and heavily-loaded lines.

## General Description

The West Test Set is contained in a carrying case made of laminated wood, with an outer covering of aluminum alloy finished in olive drab Duco. It is weatherproof at all times,



*The Circuit of the West Test Set*

whether packed for carrying or in actual use, and as it has no exposed circuit contacts it is groundproof, except by intention during use. The case is heavily reinforced on the bottom and corners, and the cover is attached by piano-type hinges and secured, when closed, by toggle trunk fasteners. An adjustable carrying strap is provided, and the set may be conveniently carried in the hand or slung over the shoulder.

The working parts of the set consist of a transmitter, magneto-generator, test lamp and lever key. These parts are mounted on a separate aluminum frame which fits snugly into the carrying case without bolts or screws. Three flashlight batteries, for telephone transmission, are also mounted on the frame, and held in place by spring clips which provide circuit connections and make it easy to replace batteries when necessary.

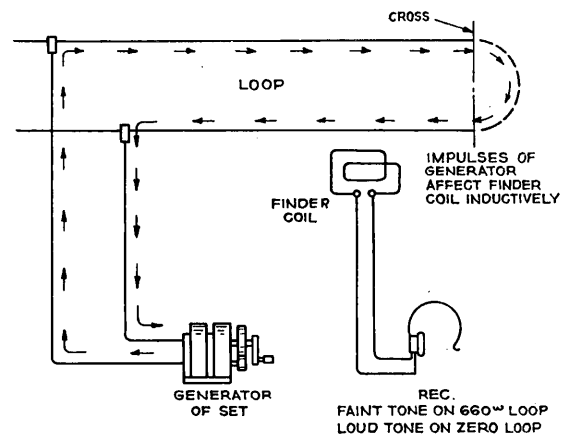
To detach this working unit from the case for inspection, or for replacing the case, it is merely necessary to remove the generator crank. This crank is insulated, and folds

against the end of the case when not in use. When in this position, it is protected from damage by a heavy metal collar.

The only apparatus which is removed from the case when making a test is a pair of test clips, a finder coil, and a head receiver. The finder coil consists of a small oblong coil having a core with top and bottom pole pieces forming the spool heads. This coil is fastened to a spring clip which is easily clamped over the line being tested. On the rear of the coil is a terminal block to receive the flexible cord connecting it to the terminals on the test set.

To permit testing on insulated wire, the test clips are provided with needle points which will make contact with the conductors without damaging the insulation. It is, therefore, not necessary to remove the insulation from the wire.

No buzzer, vibrator, or battery is used for supplying the test tone. The tone is produced

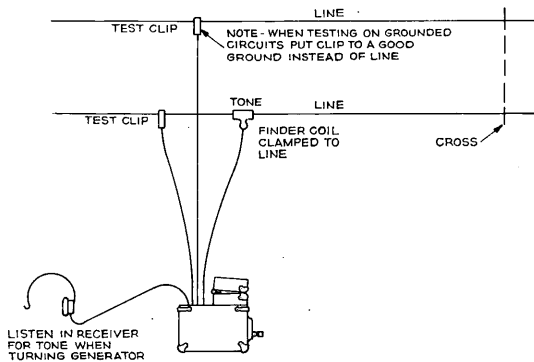


*The Theoretical Operating Principle*

by the generator and taken off by a commutator spring which is timed to discharge the capacity peaks from a telephone condenser at regular intervals.

## How It Is Used

To test for a short-circuit—The method of testing for a “short” with the West Test Set is typical of its simplicity and ease of operation in all tests. The test clips are snapped on the lines to be tested, and the finder coil hung over one of the lines, parallel to it and about six inches on either side of the clip. The receiver is then placed to the ear and the generator crank turned briskly. The test tone from the generator travels over one side of the line to the cross, thence back to complete the circuit. The finder coil clamped over the line picks up the tone, and it is heard in the receiver. The volume of the tone is an indication of the distance to the fault, being greatest when the trouble is near.

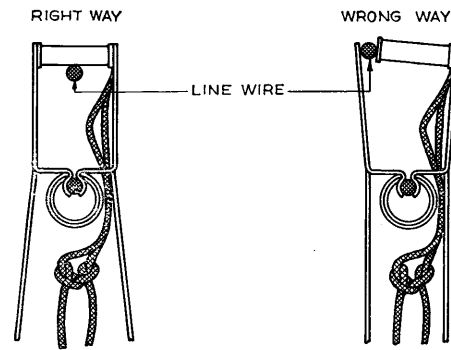


Method of Testing for a Short-Circuit

If the test tone is not heard, the finder coil is placed on the other side of the test clip and the test repeated. A tone heard here indicates that the fault is in the direction indicated by the position of the finder coil.

If the tone is noticeable on both sides of the test clip, there is trouble in both directions. In this case the tester should go in the direction of the louder tone, and clear that trouble first. The volume of the tone is dependent on the distance to the fault, and with a little experience the tester learns to estimate the distance with a surprising degree of accuracy.

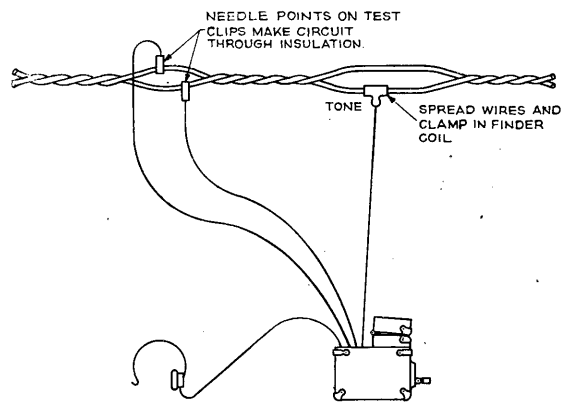
When testing on twisted pairs, the two wires are spread and the test clips inserted, with



The Right and Wrong Ways of Attaching Finder Coil to Line Wire

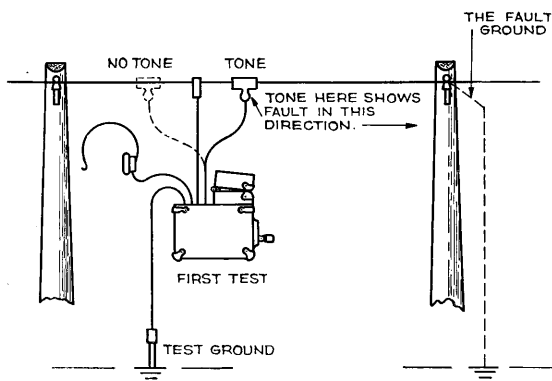
their needle points penetrating the insulation. The wires are also spread to permit clamping the finder coil over one of them.

If the resistance of the circuit loop through the fault does not exceed 600 ohms the tone test may be supplemented by a lamp test. For this test, the lever key is operated, closing the circuit to the test lamp. The lamp will then glow when the generator is operated, and its brilliance will indicate the distance to the fault. This test may be used to locate even momentary shorts, such as are caused by swinging lines.



Method of Testing on Twisted Pairs

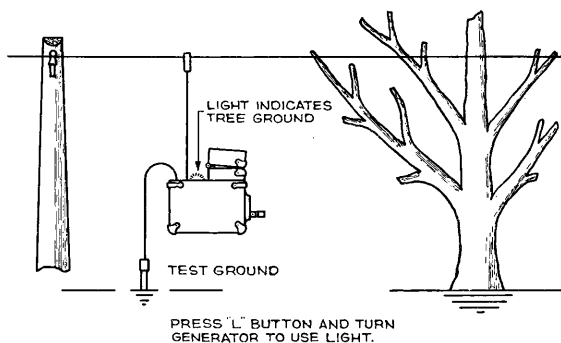
To locate a “ground” (earth), one test clip is attached to the line wire and the other to ground (earth). A test ground for this purpose may be obtained either by driving a rod into



Method of Locating a "Ground" (Earth)

the earth or by attaching the clip to a grounded (earthed) guy wire. The same procedure is followed in locating a fault in a ground- (earth-) return circuit.

To test for "tree grounds," operate the lever key and use the lamp test. A faint light is an indication of a tree ground. The direction can then be ascertained by using the finder coil, the same as for locating a ground.



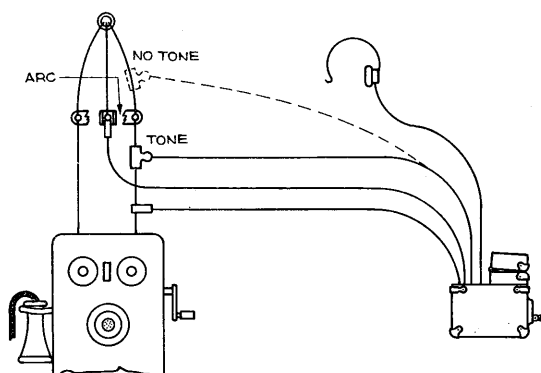
Method of Locating "Tree Ground"

To locate a cross between two of a number of line wires, one of the test clips is shifted from line to line to determine which wires are crossed. The location of the trouble can then be found in the same way as in locating a short-circuit.

To locate an open line, a short-circuit is placed across the line. The tester then works away from this, and when the trouble is passed the tone ceases.

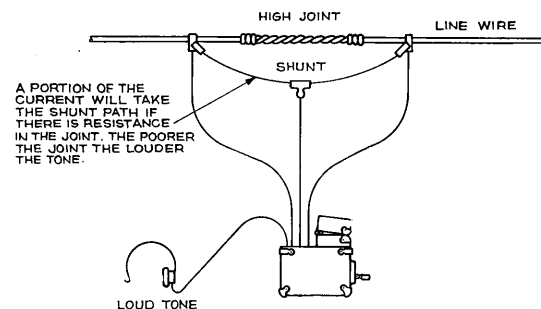
To locate grounds (earths) and faults in lightning arresters, one of the test clips is connected to the "ground" (earth) terminal of the arrester block, and the other clip to the binding post of the telephone. If the fault is at the arrester, the test tone will be heard when the finder coil is between the binding post and the arrester. The other line wire may then be tested in the same way.

The advantage in testing for carbon faults with a West Test Set is that any trouble will come in on the test, even if the trouble is intermittent when the line is ordinarily used.



Locating Faults in Lightning Arresters

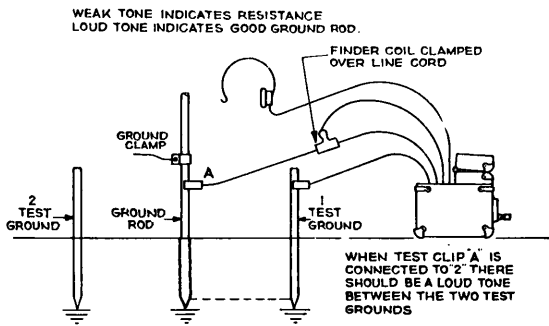
To locate high-resistance joints, the clips are placed on the wire at opposite ends of the joint, and a 1-10th ohm shunt (consisting of a piece of copper cordage with clips attached) is placed around the joint by clipping it into the test clips. The finder coil is then put over the joint and the generator crank is turned. If the joint is good, a tone will be heard in the receiver, but if its resistance is as much as ten



Method of Locating High-Resistance Joints

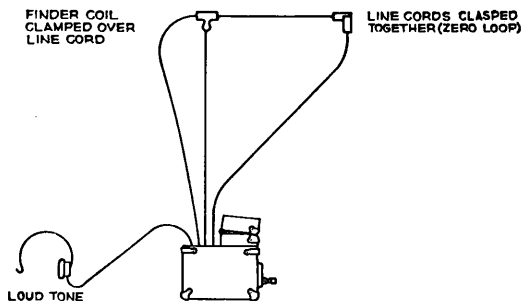
ohms, no tone will be heard. A tone will then be heard on the shunt if the finder coil is changed to this position.

As the shunt is of very low resistance, the joint is protected against breakdown on this test.



Testing Ground (Earth) Connection

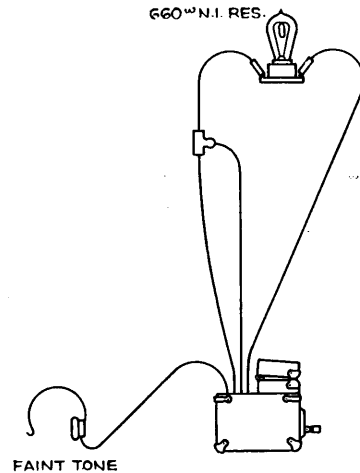
To test for insufficient or bad ground (earth) connection—Very frequently, ground (earth) rods will give trouble due to the formation of rust, or drying out or freezing of the ground causing high resistance to earth. This form of trouble is located by using two temporary test rods, preferably located not less than twenty feet from each other, and from the rod under test. One of the test clips is snapped on each of these test rods, the crank is turned and the strength of the tone noted. Then the clip is removed from one rod and connected to the permanent ground (earth) being tested. The volume of the tone should be equal to the volume secured between the two test rods. A weak tone indicates high resistance to earth, while no tone at all indicates an “open.”



The Test for Maximum Trouble-Tone

To use the West Test Set as a portable telephone, the lever key is operated, closing the battery circuit through the transmitter, and preparing the generator circuit.

To test the trouble tone of the West Test Set, the line clips are snapped together, and the finder coil clamped over one of the line cords. The generator crank is then turned, and if the maximum tone is heard in the receiver it indicates that the set is working properly. To make a test for minimum tone conditions, a 660-ohm non-inductive resistance can be used and in this case a tone of much less strength will be heard.



The Test for Minimum Trouble-Tone

### Use of the Lever Key

Purpose	Position of Key
Finder Coil Tests	Neutral
Megger and Lamp Tests	Away from battery compartment
Listening, talking, heavy-duty ringing	Toward battery compartment

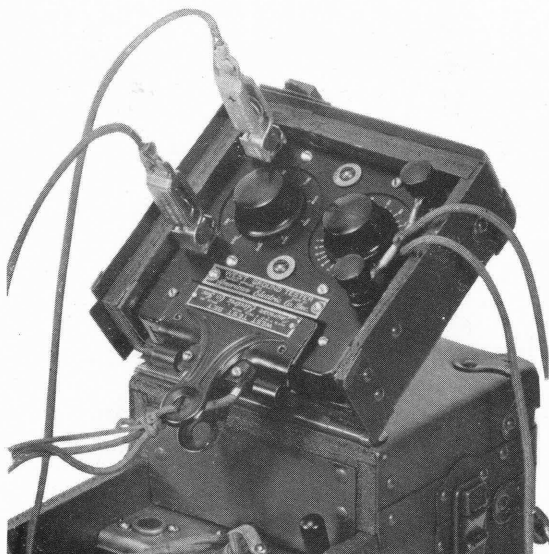
To talk, throw the lever key toward the battery compartment and hold in this position.

For heavy-duty ringing, throw the lever key toward the battery compartment and hold in this position while ringing.

To make insulation tests, throw the lever key away from the battery compartment and hold in this position while turning the generator crank.

## The West Ground Tester

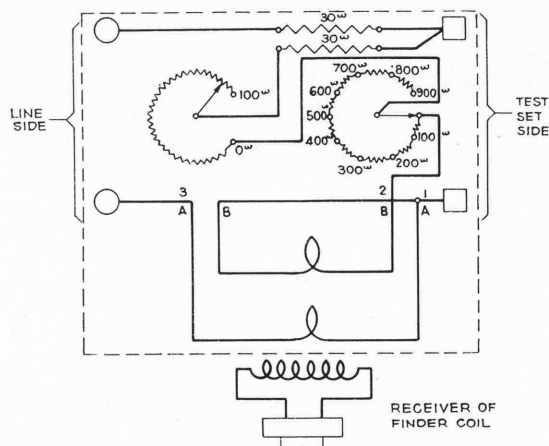
Ground (earth) tests with the West Test Set give an indication of the ground, but no measurement of its actual resistance. To provide such a measurement, the West Ground Tester may be used in combination with the West Test Set. This tester is designed to mount in the cover of the set by means of two screws, and may be readily installed or removed. Connections between the two units are made by means of cords.



*The West Ground Tester, as Installed in West Test Set*

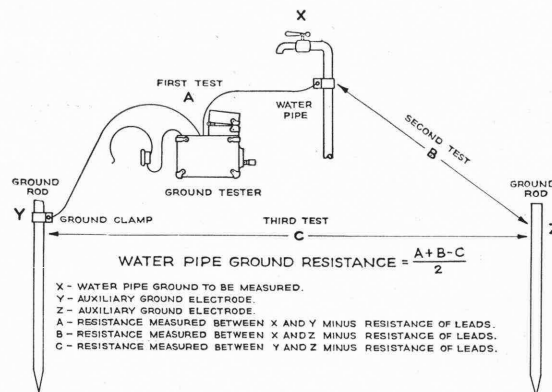
The tester consists of a small bakelite case  $3\frac{7}{8}$  in. long,  $3\frac{3}{4}$  in. wide, and 1 in. thick. The face equipment consists of two round terminals, two square terminals, and two rheostats. The rheostats are controlled by dials calibrated to indicate directly the resistance being tested. Maximum measuring capacity is 1000 ohms, which is more than ample for ground-testing purposes.

The operation of the West Ground Tester is based on the well-known induction-balance principle. A coil is mounted in a recess in the ground tester, and the finder coil of the test set is clamped into this recess, to form the inductive balance. The unknown resistance is



*The Circuit of the West Ground Tester*

then connected to the round terminals, and the test clips of the West Test Set are snapped on the square terminals. The receiver is placed to the ear, and while the generator crank is being turned, the rheostats are adjusted until no tone, or a minimum of tone, is heard in the receiver. When this point is reached the sum of the readings on the dials will give the resistance of the circuit being measured.



*The Triangulation, or 3-point, Test*

If a ground connection of known resistance is available, one of the round terminals is connected to the ground to be tested, and the other to the known resistance. The resistance of the connection is then measured. Deducting

from this the resistance of the connecting leads and of the known ground will give the value of the ground connection under test.

If a convenient ground of known resistance is not available, two temporary test rods may be used. Measurements are taken of the series resistance between these three grounds (the permanent ground X and the two temporary grounds Y and Z.) Then, the following formula is used.

$$X = \frac{A + B - C}{2}$$

in which A is resistance between X and Y, B is resistance between X and Z, and C is resistance between Y and Z.

For example, assume the reading to be 25, 30, and 50 ohms, respectively. Then

$$X = \frac{25 + 30 - 50}{2} = 2.5 \text{ ohms}$$

## Code Numbers of West Test Set Apparatus

	Code No.
West Test Set.....	MC-4023
West Ground Tester.....	MC-4025
West Test Set, complete with West Ground Tester.....	MC-4028
Test Lamp.....	D-9448
Case.....	M-2361, Assm. 5
Resistance Coil.....	D-281117
Crank.....	MP-4312
Condenser.....	MC-68618
Generator.....	AC-90117
Induction Coil.....	AC-28841
Transmitter.....	D-38192-A
Receiver.....	MC-5131
Key.....	MC-320306
Head Band.....	MC-6504
Finder Coil.....	MP-4124
Clips.....	Mueller, 10-Amp.
Cords	
Receiver.....	MP-3907
Finder Coil.....	MP-3864
Test Clip.....	MP-3863

## Summary of Features

A study of the features listed below will soon convince any experienced line-maintenance man of the great practical usefulness of the West Test Set, as well as the care and thought which have been put into its design and manufacture.

### The West Test Set—

1. Is a *combined* portable telephone and test set.
2. Provides for heavy-duty ringing.
3. Has an insulated crank.
4. Has an insulated case.
5. Provides for insulation tests to one megohm.
6. Uses standard flashlight batteries.
7. Is weatherproof at all times.
8. Has enclosed protected transmitter.
9. Can be quickly dismantled without tools.