West Test Set Type 36 100-736

WEST TEST SET TYPE 36

Technical bulletin 100-736

AUTOMATIC ELECTRIC

GENERAL SYSTEM

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

Factory, development laboratories, and general office at Northlake, Illinois, U.S.A.

AUTOMATIC ELECTRIC COMPANY is an organization of designing, engineering, and manufacturing specialists in the fields of communication, electrical control, and allied arts. For more than sixty years the company has been known throughout the world as the originator and parent manufacturer of the Strowger Automatic Telephone System. Today Strowger-type equipment serves over 75% of the world's automatic telephones. The same experience and technique that have grown out of the work of Automatic Electric engineers in the field of telephone communication are also being successfully applied on an ever-increasing scale to the solution of electrical control problems in business and industry.

PRINCIPAL PRODUCTS

Strowger Automatic Telephone Systems—Complete automatic central-office equipment for exchange areas of any size, from small towns to the largest metropolitan networks.

Community Automatic Exchanges—Unattended automatic units for small rural or suburban areas, with facilities for switching into attended exchanges.

Automatic Toll Boards—An adaptation of Strowger principles to toll switching, resulting in simplification of operators' equipment and greater economy of operating and toll-circuit time.

Private Automatic Exchanges—Available in various capacities, with or without central-office connections, and with facilities for special control services to meet the needs of the user.

P.B.X. Switchboards—A complete range of cordless and cord types for the modern business.

Telephone Instruments—Modern designs for automatic or manual exchanges, including the Monophone—the world's most attractive and efficient handset telephone.

Exchange Accessory Equipment—Auxiliary exchange and substation equipment, including manual desks, testing apparatus, transmission equipment, and all accessories needed for the operation and maintenance of the modern telephone exchange.

Makers also of electrical control apparatus for industrial, engineering, and public utility companies, telephone apparatus for railroads and pipe-line companies, private telephone systems of all types, electrical and communication devices for aircraft and airways control, and special communication apparatus for military and naval departments.

Part I

WEST TEST SET TYPE 36

1. GENERAL

The West Test Set, Type 36 (figure 1) is a portable test set used by linemen to locate line faults (short-circuits, crosses, leaks, grounds, opens, etc.) in open-wire telephone lines. It comes as a self-contained unit complete with test leads, finder coil, and handset. Central-office testing equipment or power is not required for its operation. Power required to operate the test set is supplied by a hand-operated magneto-type tone generator, which is an integral part, and three flashlight cells.

With the test set, linemen can determine the type, direction, and approximate location of a fault. Tests can be made without opening the lines or interfering with busy circuits.

In addition to its use as a test set, the unit is well adapted for use as a portable telephone. High-efficiency transmitter and receiver circuits, comparable to those of a local-battery (magneto) telephone, are used. Quality of transmission is excellent. Ringing signals supplied by the tone generator are capable of carrying distinctly over long and heavily-loaded lines.

In conjunction with the West Ground Tester, the test set can be used to measure resistance of ground connections.

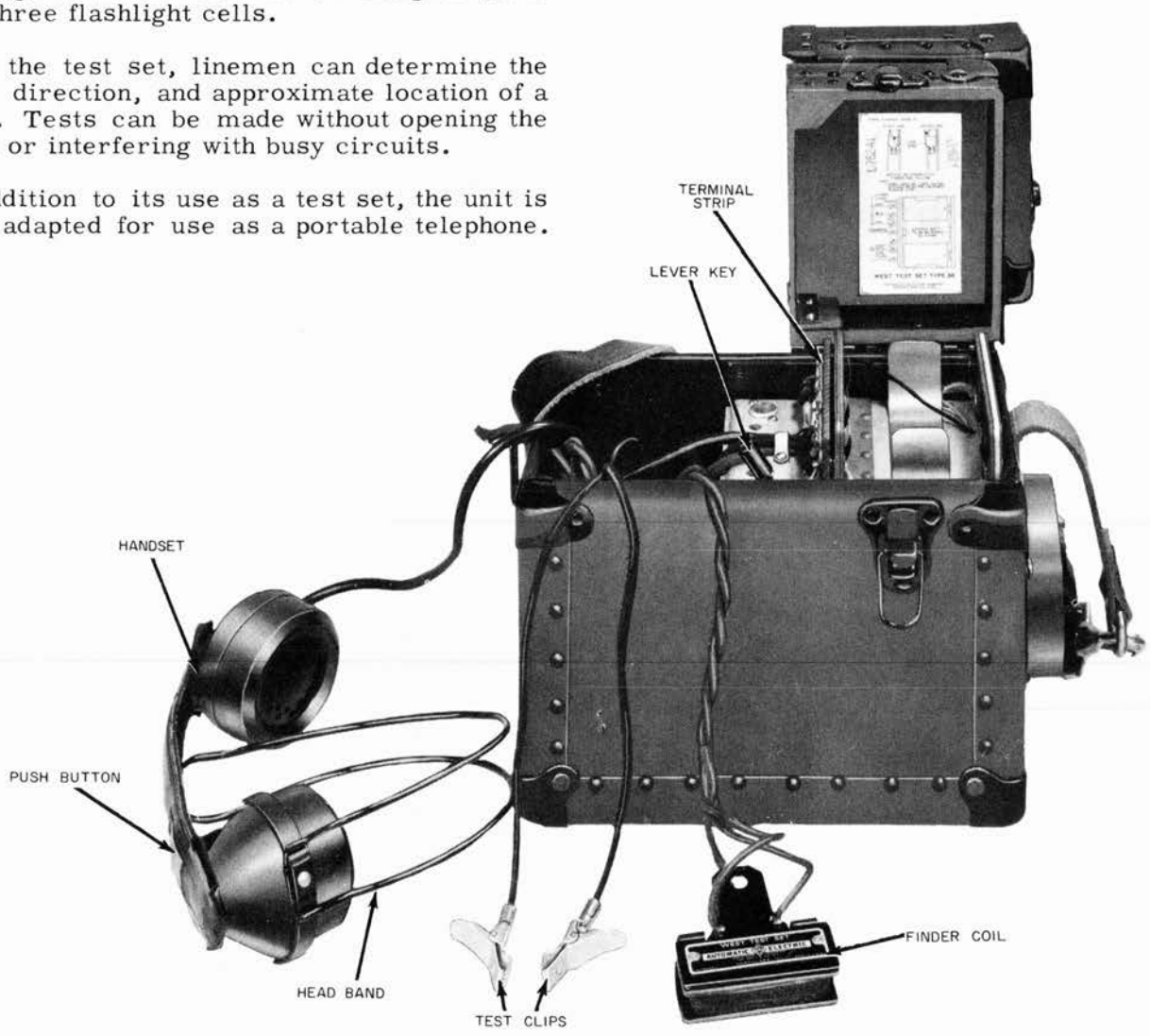

Figure 1. West Test Set, Type 36.

2. DESCRIPTION

The tone generator, lever key, and test lamp are mounted on an aluminum frame, which fits snugly into a carrying case. The lever key and test lamp protrude through the top of the aluminum frame. They can be operated and viewed without removing the frame from the case. The battery compartment and terminal strip are also mounted on the top of the aluminum frame. Test, finder coil, and handset leads furnished with the test set, are connected to the terminal strip.

2.1 Test Leads

Test leads are terminated with spring clips equipped with needle points and saw-tooth edges. Needle points facilitate the testing of insulated conductors without damaging the insulation. Saw-tooth edges are used to test insulation-resistance.

2.2 Finder Coil

The finder coil is comprised of an oblong 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 wire being tested. At the rear of the coil is a terminal block to which are connected the finder coil flexible leads.

2.3 Flexible Handset

A flexible handset with a push button built into the handgrip, and spring-type head band (figure 1) is furnished complete with handset cord.

2.4 Carrying Cases

Either a brown leather or black fiber carrying case is provided to house the frame of the test set, test leads, finder coil, and handset. Both cases have adjustable leather straps. The test set fits snugly into a portion of the carrying case, the other portion being used as a storage compartment for the handset, test leads, and finder coil. Approximate dimensions of the test set housed in a carrying case are: 10'' long, 8-1/2'' high, and 5-1/2'' wide. Weight of the test set is approximately 16 pounds.

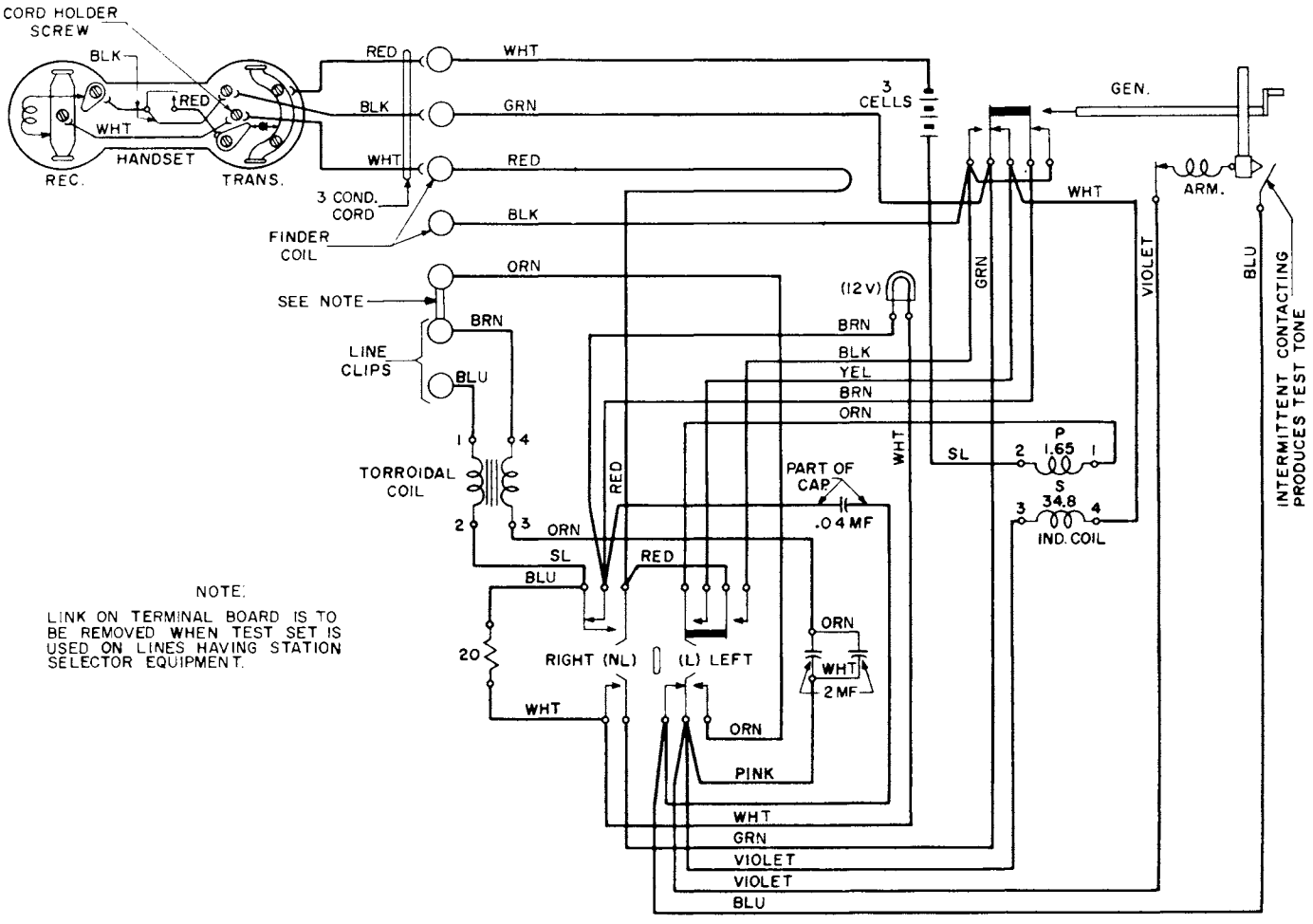

Figure 2. Schematic diagram, West Test Set.

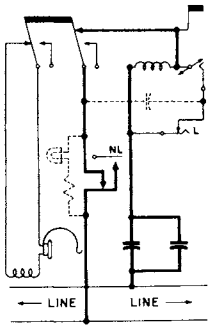

Figure 3. Circuit with key normal.

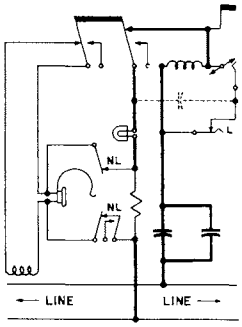

Figure 4. Circuit with key up.

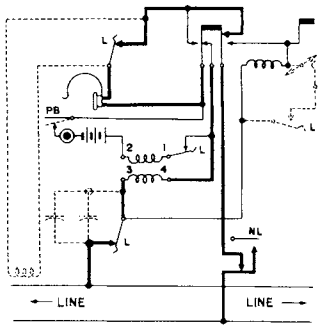

Figure 5. Circuit with key down.

3. OPERATION

Power required to perform the various functions of the test set is furnished by the hand operated tone generator. A three-position lever key is used to condition the test set circuitry for the various test functions.

Turning the generator crank actuates the tone generator which charges, through the line wires being tested, the two 2-mf capacitors (figure 2). When the generator voltage is at its peak, a cam contact short circuits the charged circuit, discharging the capacitors through the line. These short-circuits occur approximately 32 times-per-second. Assuming that the circuit is a completed loop, the finder coil clipped around a wire will detect the discharge currents and transmit them to the handset receiver. Resulting clicks heard in the receiver, constitute the test tone. Loud clicks will be heard when the loop resistance is low or no clicks when high. The generator crank should be turned briskly, although the speed of rotation is not critical.

3.1 Lever Key Positions

Use of lever key positions are described below:

a. Normal (slanting 45°): For tone tests including identity, direction, and estimated distance of fault. Finder coil is usually used with the lever key in this position. Figure 3 is a partial schematic of this circuit.

b. Up (nonlocking): To determine distance to low resistance faults and also for high-resistance and insulation tone tests. Finder coil is not used with the lever key in this position. Figure 4 is a partial schematic of this circuit.

c. Down (locking): When key is operated to this position the test set may be used as a portable telephone. Finder coil is not required. Figure 5 is a schematic illustration of this circuit.

4. PREPARATIONS FOR USE

Before starting test procedures select a test site somewhere along the line wires to be tested. Location of the test site is not critical, as the fault-directional test will determine the direction of the fault with respect to the test set. After the direction of the fault has been determined the test site can be relocated to a location in the direction of the fault. At the testing location attach the test-set leads and finder coil to the line wires, see section 6.

4.1 Attachment of Test Leads

Test leads are required for all tests and also when using the unit as a portable telephone. To attach the test lead to an insulated conductor, spread the clip and position needle point so it will pierce the insulation when clip is closed. For testing insulation resistance the saw-tooth portion of the test clip is used. To attach, spread clip and clamp the wire between the saw-tooth edges. Placement of the test clips on the line wire with respect to each other is shown in the illustrations that accompany the test procedures.

4.2 Placement of Finder Coil

To place the finder coil over the line wire spread the spring clip and place the coil so the wire is in the hollow space inside the spring clip (figure 6). Do not pinch the wire with the coil. Placement of the finder coil with respect to the fault and test clips is shown in the illustrations that accompany the test procedures.

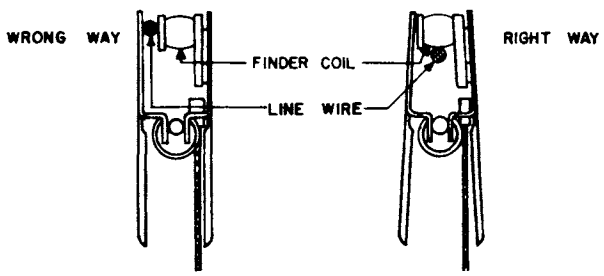

Figure 6. Finder coil placement.

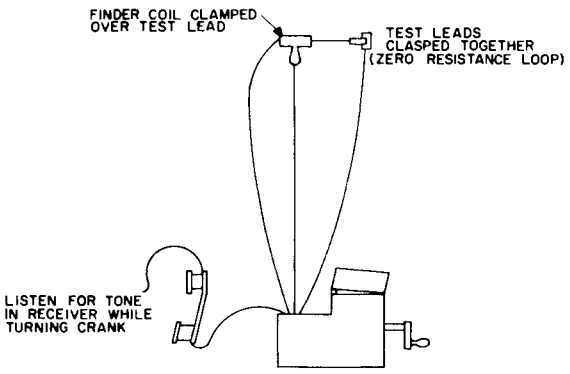

Figure 7. Test for maximum tone.

5. TESTING THE WEST TEST SET

Prior to using the test set use the following test procedures:

a. Snap the test clips together and attach the finder coil around one of the test leads (figure 7).

b. With the lever key in the normal position turn the generator crank and listen for test tone in the receiver. A loud test tone should be heard if the test set is working properly.

c. Remove the finder coil, hold the lever key up, and turn the generator crank. The lamp should light brightly.

d. Insert three flashlight cells into the battery compartment (see section 7) and push the lever key down. Press the handset push-to-talk button and blow into the transmitter. This sound should be heard in the receiver. Turn the generator crank; it should be difficult to turn. Separate the test clips and turn the generator crank again. Crank should turn freely.

6. TEST PROCEDURES

Important factors in locating a line fault are its identity, direction, and approximate distance of the trouble with respect to the test location. With these facts known, the linemen can often detect the fault visually.

6.1 Location of Crossed Line Wires

To locate a cross between two of a number of line wires use the following procedures:

a. Attach one test clip to each of the two wires believed to be crossed (figure 8). The finder coil need not be attached at this time.

b. Hold the lever key up, turn the generator crank, listen for test tone in the receiver, and observe the lamp. If weak or no tone is heard and the lamp is dark move one or both test clips to other lines.

c. Repeat steps a. and b. until tone is heard or the lamp lights, indicating the two wires that are crossed.

d. To find the direction and approximate location of the cross follow the procedures in paragraphs 6.5.1 and 6.5.2.

6.2 Location of a Grounded Line Wire

To locate a grounded line wire use the following procedures:

a. Attach one test clip to the line wire and the other to a known earth ground, such as a grounded guy-wire etc., (figure 9). If an earth ground is not readily available, drive a metal pipe or stake into the ground.

b. Place the finder coil over the line wire to the right and approximately 6 inches away from the clip.

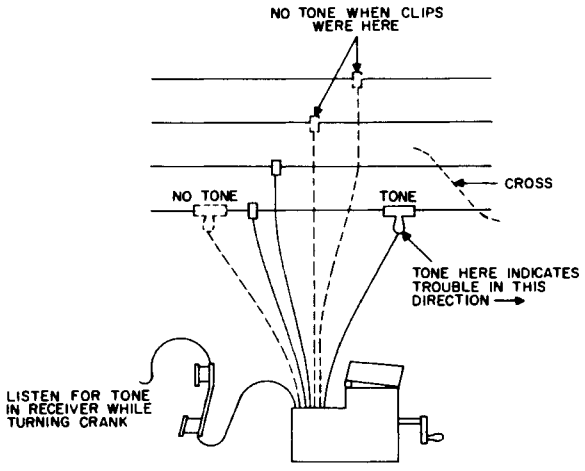

Figure 8. Connection diagram for cross.

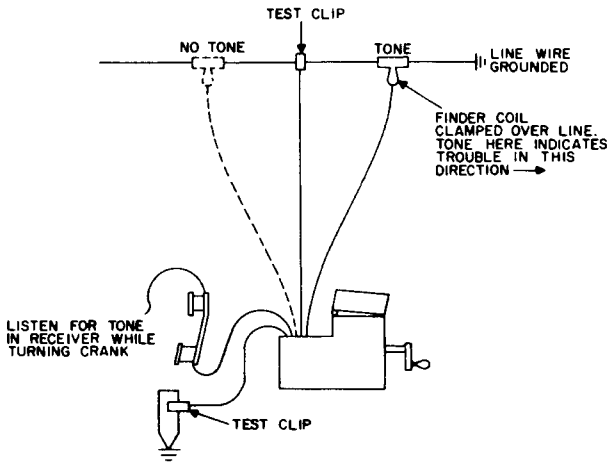

Figure 9. Connection diagram for grounded line wire.

c. With the lever key in the normal position, turn the generator crank and listen for test tone in the receiver. Repeat this procedure with the finder coil placed to the left of the test clip. A loud test tone will be heard with the finder coil toward the location of the wire ground. Because the resistance of both the fault and test ground is negligible, it is impracticable to estimate the distance to the fault.

6.3 Location of Open

To locate an open in a wire use the following procedures:

a. Ground the central office end of the wire.

b. Attach one test clip to the wire being tested and the other end to an earth ground (figure 10).

c. Place the finder coil over the wire to one side of the test clip.

d. With the lever key in the normal position, turn the generator crank and listen for test tone in the receiver. Repeat this procedure with the finder coil placed on the other side of the test clip. Test tone will not be heard when the finder coil is on the side of the test clip toward the open.

e. Proceed in the direction of the open and repeat the test at other points along the wire.

When test tone cannot be heard with the finder coil on either side of the test clip, the open has been passed. The open is somewhere between the last test point where test tone was heard and the first test point of no tone in either direction.

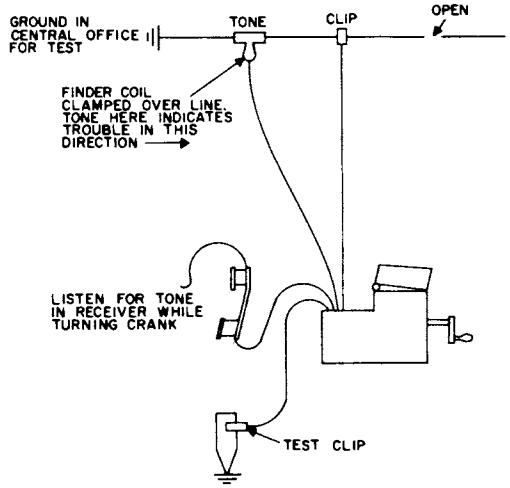

Figure 10. Connection for open.

6.4 Direction and Location of Fault

After the fault has been identified, its direction and approximate location should be determined.

6.4.1 To determine the direction of the fault, use the following procedures:

a. Place the lever key in the normal position.

b. Attach test clips to the line wires, with the needle points piercing the insulation, as shown in figure 11. Distance between the clips is not critical, however, they should not touch each other.

c. Place the finder coil over the wire to the right of the test clips (approximately 6 inches away from the nearest clip). Turn generator crank.

d. Listen for test tone in the handset receiver, noticing particularly loudness of the tone.

e. Repeat steps c. and d. with the finder coil attached to the left of the test clips.

Little or no tone will be heard when the finder coil is on the side of the line wire, with respect to the test clip, that is either open or clear. Louder tone will be heard when the coil is on the side of the line wire that forms a low resistance ground, such as a short circuit, cross, ground fault, etc. If loud tone is heard in both directions, locate and repair the fault of the loudest tone first.

6.4.2. After the direction of the fault has been determined, the distance of the fault from the test location can be estimated. This is done by determining the approximate loop resistance from the test set location to the fault. Use the following procedures to estimate the loop resistance.

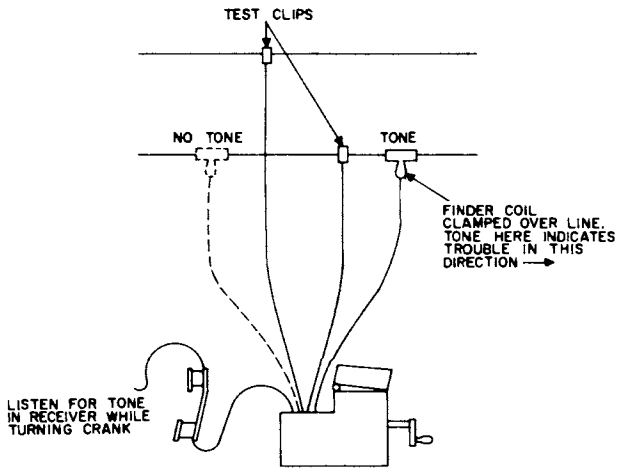

Figure 11. Connection for direction and estimate of distance.

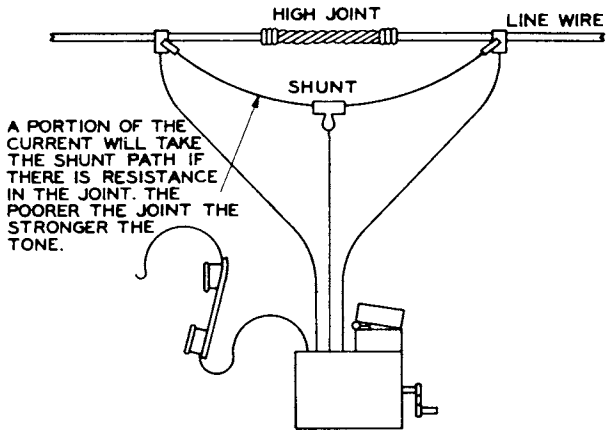

Figure 12. Connection for testing quality of splice.

a. Place the finder coil over the wire and at least 6 inches away from the test clip toward the direction of the fault (figure 11).

b. Place the lever key in the normal position.

c. Listen for test tone in the handset receiver while turning the generator crank. A loud tone indicates low resistance to the fault location.

d. If loud tone was heard in c. above, remove the finder coil from the wire.

e. Hold the lever key up, rotate the generator crank, and observe the test lamp. If the loop resistance is 600 ohms or less the lamp will light.

f. If little or no tone was heard when performing the test in c. above, remove the finder coil from the wire.

g. Hold the lever key up, turn the generator crank, and listen for test tone in the handset receiver. If no tone or weak tone is heard the loop resistance is over one megohm.

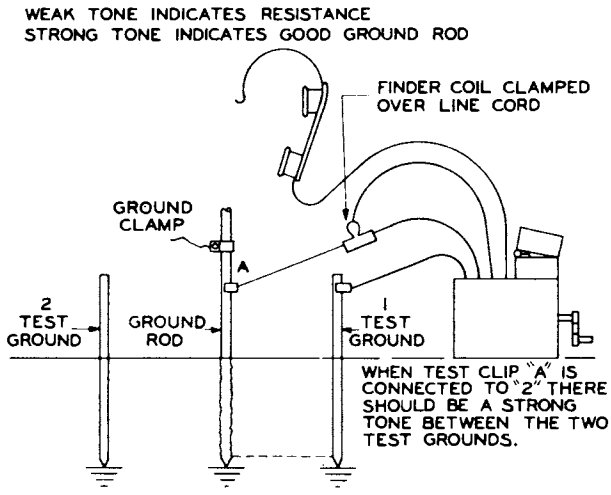

Figure 13. Connection for quality of ground connection.

6.4.3. Distance of the fault from the test site is indicated by the loudness of the test tone or the lamp being lit. Knowing the resistance-per-foot of the line wire, the distance can be calculated easily. With a little practice the lineman can calculate the distance with a high degree of accuracy.

6.4.4. In the direction indicated in paragraph 6.4.1, check the wires and pole connections of the loop within the distance estimated in paragraph 6.6. If the fault is not readily found, repeat the test at other points along the line wire.

6.5 Quality Test

The test set can be used to determine the quality of a splice, ground connection, or insulation.

6.5.1. To test the quality of a splice, use the following procedure:

a. Attach a test clip to each side of the splice (figure 12).

b. Shunt the splice with a piece of wire attached to the test clips (figure 12).

c. Place the finder coil around the shunt.

d. With the lever key in the normal position, turn the generator crank and listen to the test tone in the receiver, noticing particularly the loudness of the tone. If the splice is good, no tone or a weak tone will be heard.

6.5.2. To test for insufficient ground (earth connections), use the following procedures:

a. Drive two test-ground rods into the ground approximately 20 feet apart and 20 feet away from the working ground to be tested (figure 13).

b. Connect a test clip to each of the test ground rods.

c. With the lever key in the normal position, turn the generator crank and listen to the test tone in the receiver, noticing particularly the loudness of the tone.

d. Transfer the test clip from one of the test grounds to the working ground and repeat c. above.

The test tone heard in d. should be as loud as that heard in c. A weak tone in d. indicates high resistance between the ground rod and earth.

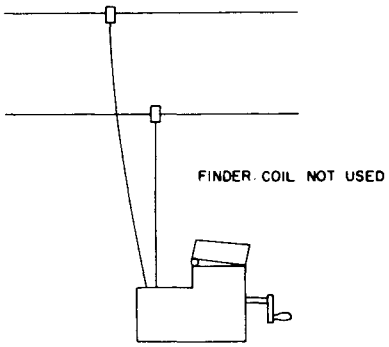

Figure 14. Connection for insulation - resistance test.

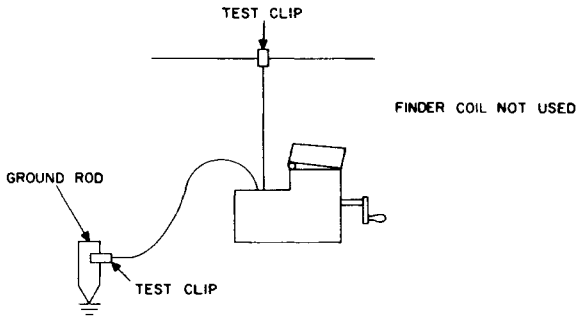

Figure 15. Connection for insulation - resistance between line wire and earth.

6.6 Insulation Resistance Test

To test insulation resistance between two wires proceed as follows:

a. Connect the test clips to the two wires being tested (figure 14). Attach only the saw-tooth portion of the test clip to the wire. DO NOT pierce the insulation with the needle point.

b. With the lever key held up, turn the generator crank and listen for test tone in the receiver. No tone or weak tone indicates good insulation.

6.6.1. To test insulation resistance of a wire with respect to earth ground, attach one test clip to the wire being tested. DO NOT pierce the insulation with the needle point. Attach the other test clip to a ground rod (figure 15). Proceed as in b. of pargaraph 6.6.

7. USED AS PORTABLE TELEPHONE

To use the West Test Set as a portable telephone, insert three size D flashlight cells in the battery compartment of the test set. Place one flashlight cell with its polarity opposite to that of the other two as shown in figure 16. Attach one of the test clips to each of the telephone line wires with the needle point of the clip piercing the insulation. Push the lever key down. Line-ringing current is supplied by turning the generator crank. The flexible handset is equipped with a push-to-talk button in the handgrip. Depress this button to talk.

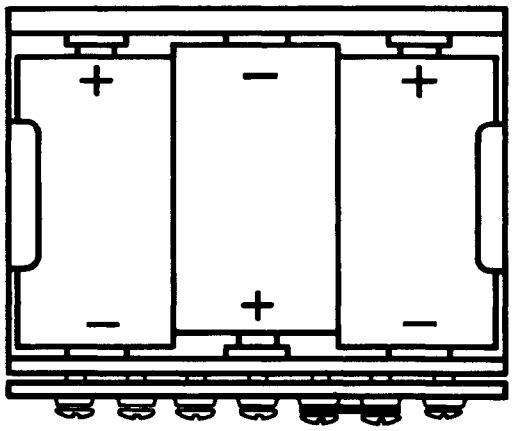

Figure 16. Battery placement.

ORDERING INFORMATION

COMPLETE TEST SET	ORDER NUMBER
West Test Set in Leather Case	L-760-AO
West Test Set in Fibre Case	L-760-A2
REPLACEMENT PARTS	
Capacitor, .04 Microfarad	D-68636-A
Capacitor, 2 Microfarad (2 Required)	D-68730-A
Coil (Toroidal)	D-284247-A
Dry Cells (3 Required)*	Eveready #950 or Burgess #2 or Size D
Fibre Case Only (With Strap)	H-69948-1
Finder Coil and Clip	D-283727-A
2-Conductor Cord and Clips for Finder Coil	MP-3864-A
Generator	AC-90117-A
Crank	MP-4312-A

* Purchase dry cells locally.

REPLACEMENT PARTS (continued)	ORDER NUMBER
Headset With Head Band and Cord	L-9004-AO
3-Conductor Handset Cord	D-543017-A
Head Band	D-65420-A
Receiver Capsule	D-51021-A
Receiver Ear Cap	D-67304-A
Transmitter Capsule	D-38363-A
Transmitter Mouthpiece	D-38306-A
Induction Coil	D-284113-A
Key	D-322387-A
Key Handle	MP-4195-A
Lamp (12 Volt)	D-9490-A
Lamp Cap	MP-4330-A
Leather Case Only (With Strap)	M-6725-A
Line Cord and Clip (2 Required)	MP-3863-A
Clip for Line Cord	D-15909-A
Resistor (20 Ohms)	D-281114-A

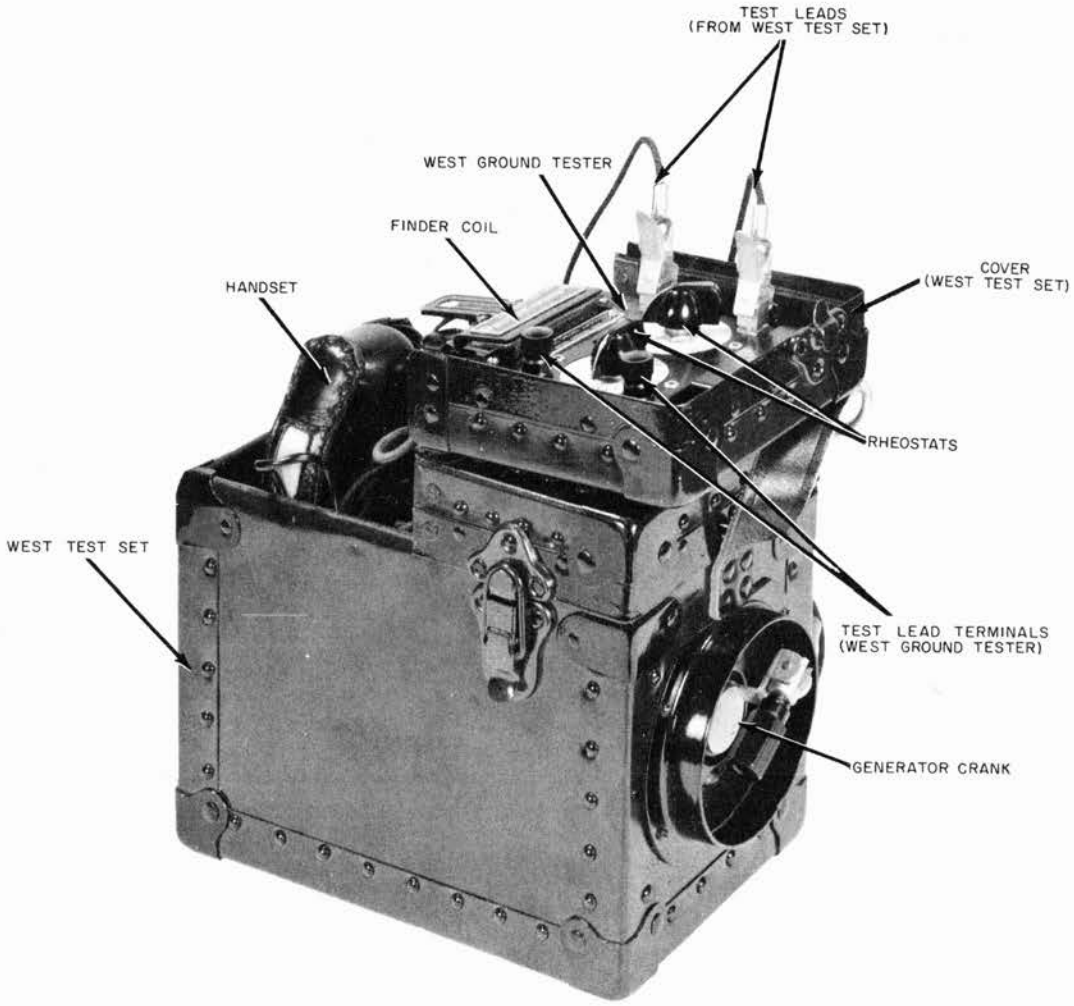

Figure 1. West Ground Tester attached to the cover of the West Test Set.

Part II

WEST GROUND TESTER

1. GENERAL

Ground connection tests made with a West Test Set give an indication of the presence and/or quality of a ground connection. When the resistance of a ground connection measured in ohms must be determined, a West Ground Tester is used in combination with the West Test Set. The resistance of the ground connection can be determined easily without the use of complicated mathematical formulas.

2. DESCRIPTION

The West Ground Tester consists of a molded bakelite case approximately 3-7/8'' long, 3-3/4'' wide, and 1'' high. The West Ground Tester contains two rheostats, two square terminals for interconnecting the West Ground Tester to the West Test Set, and two binding posts for connecting the West Ground Tester to the ground connection to be tested.

The two rheostats provide the ground tester with a maximum measuring capacity of 1000 ohms. One rheostat has a total resistance of 900 ohms, divided into nine steps of 100 ohms each. The calibration card for this rheostat is graduated from 0 to 900 in steps of 100 ohms each. The second rheostat has a total resistance of 100 ohms, with its calibration card graduated in 25 divisions of 1 to 5 ohms each.

Two test leads, each terminated with a spade lug and test clip are provided with the ground tester. Two round-head wood screws and washers are provided for securing the tester to the cover of the test set. Figure 1 shows the tester connected to the West Test Set.

3. INTERCONNECTIONS

Use the following procedures to interconnect the West Ground Tester to the West Test Set.

NOTE: The West Ground Tester can only be mounted in West Test Set equipped with fibre case.

a. Place ground tester in cover of test set as shown in figure 1. Secure with the screws and washers provided.

b. Attach the test leads of the West Test Set to the square terminals of the West Ground Tester.

c. Clamp the finder coil of the test set to the recess located in the lower end of the ground tester.

d. Connect the spade lugs of the ground tester test leads to the round terminals of the ground tester.

4. THEORY OF OPERATION

The schematic diagram (figure 2) shows the wiring of the ground tester and associated test set components. The operation of the ground tester is based on the induction balance principle. The binding posts are the connecting points to the unknown resistance Xr (resistance to be measured).

Test tone current produced by the magneto-type tone generator of the test set flows through a parallel circuit. One path of the parallel circuit consists of coil winding A, two rheostats, and 30-ohm resistance. The other path consists of coil winding B, unknown resistance, and 30-ohm resistance. Coils A and B are wound in electrical opposition to each other, therefore, current flowing through one of the coils will oppose the current flowing through the other coil. Current will be induced in coil C whenever unequal amounts of current flow through coil windings A and B. A tone will be heard in the receiver when current is induced in coil C. The loudness of the tone is dependent upon the amount of current unbalance existing between coils A and B.

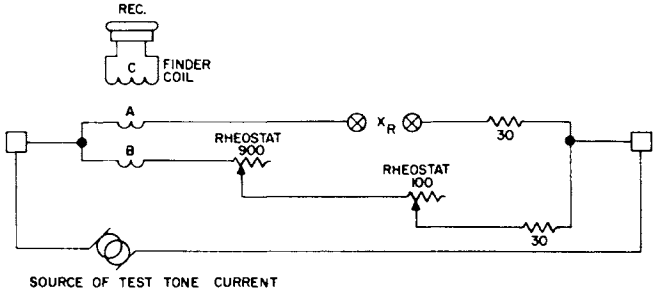

Figure 2. Schematic diagram, West Ground Tester.

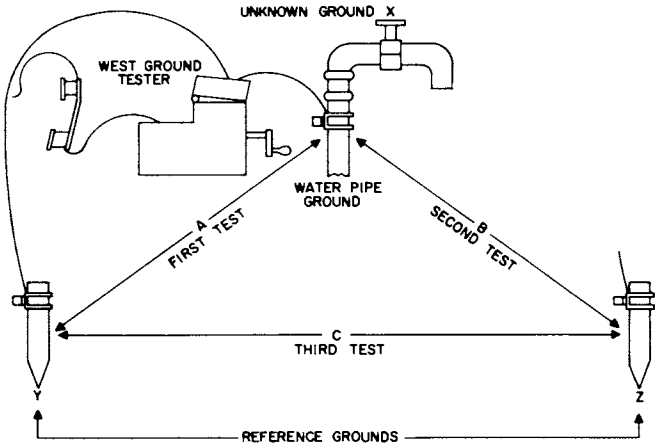

Figure 3. Triangulation method.

Since the circuit path through coil A includes the two rheostats in series and the circuit path through coil B, the unknown resistance Xr, it is a simple matter to balance the two paths of the parallel circuit. This is accomplished by adjusting the rheostats so their combined resistance equals that of the unknown resistance. As the point of balance is approached, the tone in the receiver becomes correspondingly weaker until no tone or minimum tone is heard. At this point the magnetic effect of winding A will cancel the magnetic effect of winding B and the sum of the rheostat settings will be the value of the unknown resistance in ohms. Coils A and B are integral parts of the finder coil holder. Coil C with its iron core comprises the finder coil.

5. GROUND CONNECTION MEASUREMENTS

5.1 General

A ground connection consists of, the ground wire and its connection to the ground electrode, the ground electrode, and the contact between the ground electrode and surrounding soil. The resistance of the ground wire and its connection to the electrode, is practically negligible in comparison with the total resistance of the ground connection. The resistances to be measured are the contacts of the ground electrodes with the surrounding soil. The following paragraphs describe the various methods of measuring the resistance between the ground electrode and surrounding soil.

5.2 Triangulation or Three-Point Test

In addition to the ground connection being tested, two auxiliary ground connections are used. Two metal rods approximately 18 inches long are used for auxiliary ground connections.

Drive these rods into the earth, twenty feet apart and twenty feet from the ground connection being tested, forming a triangle (figure 3). The resistance of the earth between the electrodes is negligible and the resistances to be measured are the contacts of the ground electrodes with the earth. Figure 3 illustrates the testing arrangement. Assume X, Y, and Z represent the three ground connections with X as the ground connection to be measured, and Y and Z as the two auxiliary ground connections. Connect the ground tester leads between X and Y and measure the resistance. Tests are also made between X and Z, and Y and Z.

To determine the resistance of ground connection X, use the following formula:

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

in which

A = ohms measured between X and Y

B = ohms measured between X and Z

C = ohms measured between Y and Z

example

Assume the readings to be

A = 25 ohms

B = 30 ohms

C = 50 ohms

then

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

5.3 Simple Resistance Test

A simple method of measuring the resistance of a ground connection can be used when an auxiliary ground connection of known resistance is available. Connect one test lead to the ground connection of known resistance and the other lead to the unknown resistance (figure 4). The combined resistance is then measured. Deduct the resistance of the test leads and the known resistance from the measured combined resistance. The remainder is the resistance of the ground connection being tested. When the test leads are short and of negligible resistance it is unnecessary to deduct their resistance.

5.4 Multiple or Two-Point Test

Two similar ground connections connected in multiple are often used when a single connection is not adequate. The testing procedures under these conditions consist of measuring the resistance of the two ground connections in

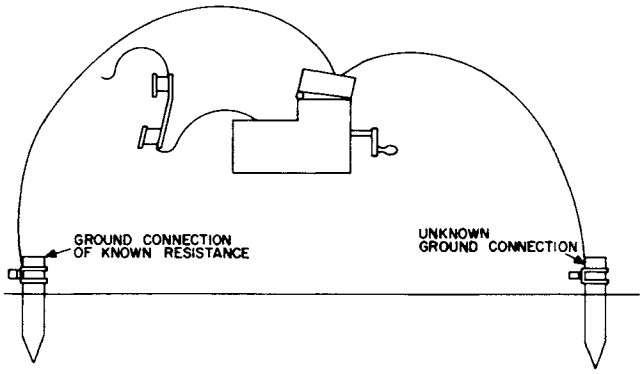

Figure 4. Simple resistance test.

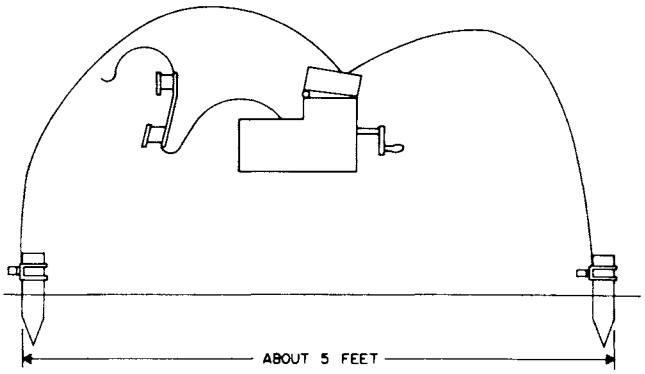

Figure 5. Multiple or two-point test.

series and taking a certain percentage of the series resistance as the parallel resistance of the two connections (figure 5). The percentage to be used is dependent upon the spacing between the connections. For example, when the spacing is five feet, the percentage is approximately 30. The percentage decreases as the spacing increases. This method is based on the theory that a definite relationship exists between the parallel and series resistance of two ground connections of like resistance when located in uniform soil.

5.5 Measuring Live Grounds

A feature of the West Ground Tester is that it can be used to measure the resistance of a ground connection regardless of stray currents flowing through the electrode. This makes it possible to measure the resistance of a ground connection by the triangulation or three-point test without disconnecting the ground wire or correcting for foreign current flow.

When measuring ground electrode resistance without disconnecting the ground wire, care should be taken that foreign potentials, which may cause injury to personnel or damage to testing equipment, are not present. This precaution should be observed especially where there is exposure to high tension lines. Before connecting the testing equipment, any dangerous source of high potential should be removed.

NOTE: When dangerous potential is apparent, the local power company should be contacted to remove this potential.

6. METHOD OF OPERATION

Use the following procedures to operate the ground tester:

a. Check installation of ground tester, section 3.

b. Determine the type of test to be performed, see section 5, and attach the ground tester test leads accordingly.

c. Place receiver of headset to the ear.

d. Place lever key of the West Test Set in the normal position.

e. Rotate the tone generator crank, and simultaneously adjust the rheostat until no or minimum tone is heard in the receiver.

NOTE: Hold the test set firmly with one hand while turning the generator crank with the other. The hand that is holding the test set should be so positioned to permit movement of the rheostat knobs with the fingers. The 900-ohm rheostat should be adjusted first and fine adjustment made with the 100-ohm rheostat.

Printed in U.S.A. by Gunthorp-Warren Printing Company

AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

Makers of Telephone, Signaling, and Communication Apparatus . . . Electrical Engineers, Designers, and Consultants

Factory and General Offices: Northlake, Illinois, U.S.A.

•

ASSOCIATED RESEARCH AND MANUFACTURING COMPANIES

Automatic Electric Laboratories, Incorporated - - - - - - - Northlake, Illinois, U. S. A.
Automatic Electric (Canada) Limited - - - - - - - - - - Brockville, Ontario, Canada
Automatic Electric, S.A. - Antwerp, Belgium
Automatic Electric, S.p.A. - Milan, Italy

•

DISTRIBUTOR IN U.S. AND POSSESSIONS

AUTOMATIC ELECTRIC SALES CORPORATION
Northlake, Illinois, U.S.A.
Sales Offices in All Principal Cities

•

GENERAL EXPORT DISTRIBUTOR

General Telephone & Electronics International Inc.
Northlake, Illinois, U.S.A.

•

REGIONAL DISTRIBUTING COMPANIES

Automatic Electric, S.A.
Boomgaardstraat—22
Antwerp, BELGIUM

General Telephone & Electronics
International Incorporated
Caixa Postal 9212
São Paulo, BRAZIL

Automatic Electric Sales (Canada) Ltd.
185 Bartley Drive
Toronto 16, Ontario, CANADA

GENERAL TELEPHONE & ELECTRONICS
INTERNATIONAL, S.A.
Apartado Aéreo 3968
Bogotá, COLOMBIA

GENERAL TELEPHONE & ELECTRONICS
INTERNATIONAL, S.A.
Casilla Postal 1388
Quito, ECUADOR

General Telephone & Electronics
International, Inc.
Apartado Postal 313
San Salvador, EL SALVADOR

General Telephone & Electronics
International, Inc.
1103 Central Building
HONG KONG

Automatic Electric, S.p.A.
Via Bernina 12
Milan, ITALY

General Telephone & Electronics
International, S.A. de C.V.
Apartado Postal 26010
México 12, D.F., MEXICO

Cia. General de Telefonía y Electrónica, S.A.
Apartado 1896
Panamá, REPUBLICA DE PANAMA

General Telephone & Electronics
International, Inc.
P.O. Box 12251
Santurce, PUERTO RICO

General Telephone & Electronics
International, S.A.
40, Rue du Rhone
Geneva, SWITZERLAND

General Telephone & Electronics
International, Inc.
730 Third Avenue
New York 17, New York, U.S.A.

Automatic Electric de Venezuela, C.A.
Apartado 9361
Caracas, VENEZUELA

Sales Representatives and Agents Throughout the World

West Test Set Type 36 100-736
ISSUE 1