

SUBSCRIBER LINE INSULATION TEST SET
ELECTRONIC TYPE - WITH SLEEVE SUPERVISION PER DRAWING SEK-10938

1. GENERAL

1.01 This test circuit is designed to test the quality of insulation of subscriber lines, particularly during and immediately following wet weather. It is intended primarily for use during rains to detect and indicate the magnitude of insulation defects in the outside plant, especially in drop wire and cable. It consists of an electronic type testing circuit, and relay type supervisory and signaling circuits mounted in a convenient size box, which also contains the necessary block batteries to power the electronic circuit (Exhibit A).

1.02 It is possible with this set to test all working lines in a central office unit (10,000 lines) within an hour and thus it is feasible to test all lines during nearly every ordinary rain.

1.03 By measuring the magnitude of the defects, this test set segregates those defects which most nearly approach service failure and hence require immediate attention (Test "A" range).

1.04 This test set is also intended for use after a rain when drop wire and terminal face plate leakage have cleared. In this instance the set is used to detect low insulation caused by cable sheath or similar defects which by their nature are slow to dry out (Test "B" or "C" ranges).

1.05 With Test "B" or "C" ranges the set may be used at any time for the detection of leaks of much lower magnitude than is possible with the Test "A" range.

1.06 The test set is connected to the tip, ring and sleeve terminals of the subscribers line by means of a test shoe which is moved manually from top to bottom of the terminal blocks of either the V.I.D.F. or line finder frames in panel offices and V.I.D.F. blocks in other types of offices. The test shoe may also be operated from left to right over H.I.D.F. terminal blocks.

1.07 The test shoe used with this set for the purpose of presenting the test circuit to the line terminals, consists of a small box-like device attached to a cord and plug for plugging into the test set. The contact portion of the shoe consists of a vulcanized fiber guide which is grooved to correspond to the three rows of terminals ("T", "R" & "S") on the I.D.F. or line finder frame blocks. Near the middle

of the length of the guide, three flexible phosphor bronze contact springs ("T", "R" & "S") protrude from the bottom of the grooves. The center contact spring ("R") protrudes about 1/32" farther than the two outside springs in order to provide a reliable contact on the ring terminal lugs when testing at the line finder frames. A second set of "T", "R" and "S" contact springs project from the trailing edge of the guide. These are verification springs used to identify a line terminal which has caused a trouble indication signal to be locked in, without reversing the direction of travel of the test shoe. When a trouble indication is observed, the movement of the test shoe is slowed or stopped and the (RLS) key is held operated to release the signal. The leading edge of the test shoe is tilted away from the block sufficiently to cause the contact springs to break from the terminal lugs and to cause the verification springs to make contact with them. The movement of the shoe is then continued. When the trouble signal again appears the verification springs will be found in contact with the line terminals in trouble. Two push-button type keys are provided. One, the "release" key (RLS) is non-locking, the other the "tip open" key (TO) is locking. The latter key has a scribe mark on the button to indicate the normal position. To lock this key the button must be depressed and turned slightly. When the (TO) key is operated only ring leaks to ground are detected. This key is also operated when testing open tip lines. When the (TO) key is operated the test set key (RG) should be operated to the (SHG) position. For satisfactory operation the end of the contact springs of the test shoe should bear against their respective stops. This may be measured by means of a gram gauge No.70-H or equivalent applied against the contact point of the springs with sufficient pressure to just lift the end of the spring from its stop. The gauge under this condition should show a tension of 15 grams plus or minus 1 gram.

1.08 This circuit is designed to test subscriber lines of battery and ground cut off panel offices, step-by-step offices, both line finder and line switch type, and No. 1 or No. 11 manual offices, over cable loops not exceeding 1500 ohms.

1.09 It will detect leakage resistances as high as 4 megohms (low current leakage).

1.10 The figures and wiring of SEK-10938, used in the various types of offices are as indicated in the following table:

Type of Office	Figures	Wiring
Manual #1 or #11 with flat rate and prepay coin lines	1, 2 & 2-B	W
Manual #1 or #11 with flat rate and without prepay coin lines	1, 2 & 2-A	W
Step-by-step, Line Sw. or Line Finder Type	1 & 3	Y
Panel, Battery Cut-off	1 & 5	Y
Panel, Ground Cut-off	1 & 4	Y
Panel with both Battery Cut-Off and Ground Cut-Off	1 & 6	Y

2. CIRCUIT AND EQUIPMENT FEATURES

2.01 Makes a test on the sleeve of the line to which it is connected to determine if the line is busy (Figs. 2, 3, 4, 5, and 6).

2.02 Makes a subscriber line busy while it is connected to the test set.

2.03 In panel offices, makes a test on the line to which it is connected to determine if the line is of the hunting type (Figs. 4, 5, and 6).

2.04 Operates the (CT) relay if the line is not busy or is not of the hunting type, connecting the tip and ring of the line to the electronic circuit and closing the cathode circuit of the amplifying tube.

2.05 The (TEST) jack is provided for connecting the set to the test shoe tip, ring, sleeve and release leads.

2.06 With the (TO) key in the test shoe operated, the tip lead is opened and the test set will detect only ring leaks to ground.

2.07 With the (TO) key in the test shoe normal both tip and ring leads are closed through to the test set.

2.08 The test set will detect leakage resistance faults from zero to approximately 4.0 megohms with the (B) and (C) test keys operated as indicated in the following table:

Leak Res. Value	Test Keys Operated	
	B	C
150,000 ohms	-	-
1.3 Megohm	x	-
3.5 Megohms	-	x
4.0 Megohms	x	x

2.09 By operating the calibrate keys (G) and (CT) and adjusting the potentiometer (G), the set may be so adjusted that a leak equivalent to approximately 40 volts on a 100,000 ohm 100 volt voltmeter will just light the (G) lamp.

2.10 By operating the calibrate keys (Y) and (CT) and adjusting the potentiometer (Y), the set may be so adjusted that a leak equivalent to approximately 60 volts on a 100,000 ohm 100 volt voltmeter will just light the (Y) lamp.

2.11 By operating the calibrate keys (R) and (CT) and adjusting the potentiometer (R), the set may be so adjusted that a leak equivalent to approximately 70 volts on a 100,000 ohm 100 volt voltmeter will just light the (R) lamp.

2.12 Provides for "locking in" only one trouble signal, although on a 70 volt or greater leak, all three indicating relays will be operated.

2.13 Provides the (RLS) key in the test shoe for releasing the set from a trouble indication.

2.14 Provides for changing the testing range of the set by changing the values of resistances R-2, R-3, and R-4.

2.15 Provides for checking the output of the detector or amplifier tube with the milliammeter provided in the test set, by operation of the (OUTPUT) keys (DET) or (AMP), respectively.

2.16 Provides for adjusting the amplifier plate current by means of the (AMP-BIAS) potentiometer.

2.17 Provides an audible and visual trouble signal consisting of three buzzers and associated lamps. Each buzzer is adjusted so that its pitch corresponds to the magnitude of the leak as indicated by the visual signal that is operated, i.e., low, corresponding to green lamp (G), medium, corresponding to yellow lamp (Y) and high, corresponding to red lamp (R).

2.18 Provides for eliminating the audible signal by operating the (BUZZ) key to its (OFF) position.

2.19 Provides a test key (RG) which in its (SH) position removes ground from the biasing network, making the test set sensitive only to tip and ring shorts. With the key in its (SHG) position it connects ground to the grid lead of the detector tube which is also the tip test lead; it also closes an electrolytic condenser (C3), across the grid and cathode of the detector tube. In this position of the key the set is sensitive to both tip and ring shorts and grounded ring conditions on the line

under test. The purpose of condenser (C3) is to absorb differences in ground potential and to bypass induced A.C. potentials.

2.20 Provides the (TR) key for transposing the tip and ring leads, and opening the ring lead, when testing manual prepay coin lines (Fig. 2B). When the (TR) is operated the (RG) must also be operated to its (SHG) position. Under this condition tests are made for grounds on the tip only.

2.21 Provides the transfer key (TR) for adapting the test set to a (BCO) or (GCO) type of panel office (Fig. 6).

2.22 Provides space inside the test box for accommodation of all block batteries necessary for operation and control of the electronic circuit.

2.23 Provides a (BAT and GRD) power supply jack for supplying 48 volt battery and ground to the test set for Figs. 1-2-3-4-5 and 6, 24 volt battery is also provided when Fig. 2 is used ("W" wiring).

3. DETAILED CIRCUIT DESCRIPTION

Patching the Test Set

3.01 The power supply for operating the relays is connected by plugging one end of a power supply patching cord into the jack (BAT-GRD) of the test set and the other into the 48V (BAT-GRD) power supply jack on the frame. This patching cord is of the low resistance type and no other should be used. (In manual offices a special jack, or equivalent arrangement may be provided to supply both 48V and 24V battery and ground.) The test shoe is connected to the test set by plugging the test cord into the test set jacks (TEST), with the strain cord fastener facing the edge of the box.

3.02 After about 30 seconds, to allow for heating of the tubes, the set will be ready for operation.

Supervisory Circuit

3.03 With the plug of the test shoe cord inserted into the (TEST) jacks, the test shoe is passed manually over the line circuit terminal lugs at a speed of about 10 per second. The shoe is so constructed as to pass from one terminal block to another without varying the speed when used on the V.I.D.F., or H.I.D.F. The "T", "R" and "S" contact springs of the test shoe make contact with the tip, ring and sleeve terminal lugs of each line circuit as the shoe is moved over the terminal blocks. It is important that the shoe is not operated too fast or leaks of low magnitude may not be indicated. Experience will determine the speed at which the test shoe may be operated in a particular office.

3.04 When the sleeve spring of the test shoe makes contact with an idle sleeve terminal, it causes the (CT) relay to operate.

3.05 In a manual office, the (S) relay is operated from ground on the sleeve terminal through the 34 (or 37) ohm winding of the (CO) relay of an idle line circuit. The (S) relay is marginal and will not operate if a busy line condition is present. The operation of the (S) relay closes contacts which operates relay (CT). The above applies also to a panel G.C.O. office except that the resistance of the line circuit (CO) relay is 1100 ohms for an idle non-hunting line.

3.06 In a step-by-step office, either line switch or line finder type, the operation is the same as above, with the exception that battery is furnished through the winding of the (CO) relay instead of ground. The sleeve resistances varies from 1200 ohms to 700 ohms depending upon the type of line circuit.

3.07 In a B.C.O. panel office, the (CT) relay serves the purpose of both cut-through and supervision. It is marginal in operation and will cut through only on an idle line.

3.08 The operation of the (CT) relay closes the tip and ring leads to the biasing network. (The tip side of this network is connected to ground through the contacts of the (RG) key when operated.) The cathode of the amplifying tube is also closed through the operated contacts of the (CT) relay. This prevents a drain on the (B2) battery which supplies operating current to the (G), (Y) and (R) indicating relays, except when the test circuit is cut through.

3.09 In B.C.O. panel offices, when the test shoe sleeve spring makes contact with a busy line, the marginal (CT) relay does not operate due to the 112 ohm ground condition placed on the sleeve by either a district or final selector, limiting the current available to the (CT) relay.

3.10 In step-by-step offices, the (S) relay is marginal and will not operate on a busy line due to a make-busy ground being placed on the sleeve terminal by the busy-ing condition.

3.11 In manual offices, the busy condition is placed on the sleeve terminal from battery on the sleeve of the cord or trunk circuit plug through a supervisory network in the "A" Board cord or "B" Board trunk signal circuit, preventing operation of the (S) relay.

3.12 In G.C.O. panel offices, this busy condition acts in the same manner on the marginal (S) relay and is furnished by 220 ohm battery from the sleeve circuit of the district or final selector.

3.13 In B.C.O. and G.C.O. panel offices, the first and intermediate P.B.X. and auxiliary service trunks are not tested due to a permanent sleeve condition wired into the (CO) relay circuit.

3.14 In B.C.O. panel offices, this resistance in the (CO) relay circuit is 2600 ohms which will not pass sufficient current to allow the (CT) relay to operate.

3.15 In G.C.O. panel offices, the test set is equipped with an extra relay (P.B.X.) (Fig. 4 & 6) which operates when the sleeve of the test shoe encounters a "hunting" type line. The (PBX) and (S) relays are wired in series and they both operate on this circuit. The operating circuit of the (CT) relay is through the make contacts of the (S) relay and the break contacts of the (PBX) relay; therefore, when the (PBX) relay operates, the operating path of the (CT) relay is open. To prevent possible interference on a "hunting" line, the (S) and (PBX) relays are adjusted so that the (PBX) opens its contacts before the (S) relay closes its contacts. The "hunting" condition is placed on a (CO) relay by reducing its resistance from 1100 to 100 ohms.

Note: A transfer key (TR), is furnished on test sets equipped for both G.C.O. and B.C.O. offices, (Fig. 6). It transfers certain leads to arrange the set for testing in either type of office.

3.16 In manual and step-by-step offices, P.B.X. and auxiliary trunks are tested because no sleeve condition is imposed on an idle line of this type.

3.17 When the test shoe sleeve contact spring and the line terminal lug break contact, relays (CT), (S) and (PBX) release, if operated. Condenser (C1) is furnished to absorb the surge induced by the opening of the sleeve circuit.

Electronic Circuit

3.18 The electronic circuit consists of two resistance coupled vacuum tubes, one a detector and the other an amplifier. In the control grid circuit of the detector tube is a balanced biasing network consisting of a 49½ volt battery (C-1) feeding resistances (R-5), (R-6), (R-7), potentiometers (P-6), (P-5) and resistance (A-6), all in series. The control grid tap is made between (R-7) and (P-6). The positive side of the (C-1) battery connects to the (A-6) resistance and the cathode of the detector tube. The negative side connects to (R-5), (R-7) and (P-6), and (R-6) and (P-5) are shunted by the test keys (C) and (B) respectively. This network places a 1 volt negative bias on the grid of the detector tube. Keys (B) and (C) may be operated to remove the shunt without affecting the balance of

the network; they increase the resistance in the network and make it more sensitive.

3.19 The tip test lead is connected to the grid of the detector tube. The ring lead is connected to the negative side of battery (C-1).

Note: The transposition key (TR), (Fig. 2B) is provided on test sets for manual offices which have pre-pay coin lines, to transpose the "T" and "R" leads, so that pre-pay coin lines may be tested.

3.20 The 45 volt battery (B-1), connected to the plate of the detector tube, furnishes the potential for the plate circuit current. The voltage drop across the coupling resistance (R-1), in series with the detector plate and positive terminal of the battery (B-1), is used to furnish the potential required to operate the amplifying tube.

3.21 The 45 volt battery (C-2), together with the (AMP-BIAS) potentiometer in the control grid circuit of the amplifying tube, opposes the voltage drop across resistance (R-1) so as to place the proper negative potential on the grid lead of the amplifying tube.

3.22 The 45 volt battery (B-2) provides the potential for current flow in the plate circuit of the amplifying tube. The negative sides of batteries (B-1) and (B-2) are strapped to the positive side of battery (C-1).

3.23 When the tip and ring test leads are connected to the biasing network in the electronic circuit by operation of the (CT) relay, the resistance (R-5) is shunted by the leakage from the "Ring" side of the line to the "Tip," or to ground. By this shunting of one arm of the network the current flow in this circuit is increased. The increase in current flow causes an increase in the voltage drop across resistance (A-6) and thereby increases the negative potential on the control grid lead of the detector tube. This change in bias lowers the current flow in the plate circuit of the detector tube. In turn, this decreased current flow through (R-1) resistance, lowers the negative bias potential of the amplifying tube and allows the plate current of that tube to increase. Consequently, the effect produced on the amplifier plate current is to increase it in proportion to the magnitude of the leaks detected. Also, when the (B) or (C) test keys are operated, removing the shunt from (R-6) and (P-5) or (R-7) and (P-6), respectively, the line leakage will have a greater effect in increasing the amplifier plate current. Potentiometers (P-5) and (P-6) are provided so that (R-6) and (R-7) resistance variations due to temperature changes may be readily corrected.

3.24 The (C2) and (C3) condensers are provided to prevent conditions of foreign ground potential and induced A.C. currents from affecting the balance of the network. (C2) is connected across the "T" and "R" test leads and will bypass ordinary A.C. disturbances. (C3) is an electrolytic type condenser and is connected from the cathode to the grid of the detector tube when the (RG) key is operated to the (SHG) position. Under this test condition the set is more susceptible to the effects of foreign ground potential or induced A.C. currents and requires a condenser of larger capacity to drain off these disturbances. The set is originally equipped with a 6 MF condenser, which may be changed locally to care for existing conditions. (Increasing the capacity of this condenser will materially decrease the speed at which tests "B" or "C" may be made.)

Signal Circuit

3.25 When the (CT) relay operates, the amplifier cathode circuit is closed through the P-1 windings of relays (G) and (R) in series. A similar relay (Y) has its P-1 winding in the amplifier plate circuit. These three relays are biased through their secondary windings and are of the polarized type. By varying the potentiometers (G), (Y) and (R) these relays can be adjusted to operate (within their limits) at any desired current flow in the amplifier plate-cathode circuit.

3.26 Relay (G) is normally adjusted to operate when the test leads are connected to a leakage corresponding to 40 volts on a 100,000 ohm 100 volt voltmeter. The operation of relay (G) causes lamp (G) and buzzer (G) to operate, and relay (G) locks through its P-2 winding.

3.27 The momentary operation of the release key (RLS) in the test shoe operates relay (RLS-1) which in turn operates relay (RLS), thereby opening the holding circuit of relay (G) and restoring the signal circuit to normal.

3.28 Relay (Y) is normally adjusted to operate when the test leads are connected to a leakage corresponding to 60 volts on a 100,000 ohm 100 volt voltmeter. The operation of relay (Y) causes lamp (Y) and buzzer (Y) to operate and relay (Y) locks through its P-2 winding. Relay (G) is also operated but its signal and locking circuit is opened by the operation of relay (Y).

3.29 Operation of the (RLS) key restores the signal circuit as in 3.27.

3.30 Relay (R) is normally adjusted to operate when the test leads are connected to a leakage corresponding to 70 volts on a 100,000 ohm 100 volt voltmeter. The operation of relay (R) causes lamp (R) and buzzer (R) to operate and relay (R)

locks through its P-2 winding. Relays (G) and (Y) are also operated but their signal and locking circuits are open at the contacts of the operated (R) relay.

3.31 Operation of the (RLS) key restores the signal circuit as in 3.27.

3.32 The buzzers (G), (Y) and (R) are adjusted to a low, medium and high pitch so that the tester can recognize the magnitude of the leak encountered without observing the indicator lamps on the test set, after he becomes familiar with the tones.

3.33 When the (B) test key is operated, the (G) relay will operate if the test leads are connected to a leakage resistance of approximately 1.3 megohms. The (G), (Y) and (R) lamps will light on approximately 10, 20, and 27 volts, respectively.

3.34 When the (C) test key is operated, the (G) relay will operate if the test leads are connected to a leakage resistance of approximately 3.5 megohms. The (G), (Y) and (R) lamps will light on approximately 4, 8, and 13 volts, respectively.

3.35 Whether a leak condition present on a line will be detected by the test set depends upon the position of the (RG) key of the test set and the (TO) key of the test shoe. The nature of the defects detected under the various combination of positions of these keys is indicated in the following table:

Nature of Defect	Key Position			
	(RG)		(TO)	
	SH	SHG.	OPR.	NORM.
Tip and Ring Short	x			x
*Ring Ground		x	x	
Short and Tip Ground				
Ring Ground and Short		x		x

*To determine whether the trouble is a "Ring" ground only, operate the (RG) key to its (SH) position and release the (TO) key. If with the test shoe still in contact with the terminal in trouble, operation of the (RLS) key wipes out the indication, the trouble is a ring ground only. If the indication remains, it is either a short and "Tip" ground or a "Tip" and "Ring" ground.

4. TEST AND ALIGNMENT OF SET

4.01 Due to the nature of the biasing network used in the electronic circuit of the test set, it is important that battery (C-1) voltage be maintained at 1 volt above the normal central office battery voltage with a tolerance of plus or minus 1/2 volt. This battery should be checked at intervals sufficiently frequent to insure that proper voltage is maintained. (As a rule checking monthly will be sufficient.)

4.02 Battery (C-2) is used solely to maintain the correct bias on the amplifier tube. It will not be necessary to replace this battery as long as satisfactory control is obtainable.

4.03 Battery (B-1) voltage must be high enough to maintain a current of 1.0 milliampere in the detector tube plate circuit with no subscriber line connected to the test circuit. This may be read on the milliammeter in the set by operating the (OUTPUT) key (DET).

4.04 Battery (B-2) voltage must be high enough to maintain proper operation of the (R), (Y) and (G) relays in the signal circuit.

4.05 All batteries should be maintained in accordance with the B.S.P. section concerning minimum frequency of routines. They may be included in the group "C" class of service.

4.06 When desiring to use the test set it should first be checked for proper alignment of the biasing network as follows: Patch the set to the proper (BAT-GRD) supply jack. Allow about 30 seconds to give the tubes time to heat up. Then, operate the (OUTPUT) key (AMP), to insert the milliammeter in the plate circuit of the amplifying tube and the (CT) key to close through the cathode lead. A reading of 5.0 milliamperes should be obtained or the output should be adjusted to 5.0 milliamperes by adjusting the potentiometer (AMP-BIAS). If test "B" or "C" is to be made it will be necessary to first make the above adjustment, then with the (B) or (C) key operated adjust the (B) or (C) potentiometer, respectively, as necessary to obtain a reading of 5.0 milliamperes. Restore the (OUTPUT) key (AMP) and the (CT) key.

5. CALIBRATION

5.01 After aligning the test set as in 4.06 above and before making tests "A", "B" or "C" it will be necessary to check the calibration of the test set. This should be done as follows: Operate the (BUZZ) key to (OFF) position. Operate the (G) and (CT) keys. This will place across the test leads a 150,000 ohm resistance and also operate the (CT) and (RLS) relays. This resistance is the approximate equivalent to a 40 volt leak on a 100,000 ohm voltmeter. Adjust the (G) potentiometer in a clockwise direction until the (G) lamp, if lighted, is extinguished. Now, by slowly adjusting the (G) potentiometer in a counter-clockwise direction until the (G) lamp just lights, the (G) relay is biased to operate on a 40 volt or heavier leak. Restore the (G) key to normal position and operate (Y) key. This places a 67,000 ohm resistance across the test leads which is the approximate equivalent to a 60 volt leak on a 100,000 ohm 100 volt voltmeter. Adjust as above, using the (Y) potentiometer and (Y) lamp instead of (G) potentiometer and (G)

lamp. The (Y) relay is now biased to operate on a leak of 60 volts or heavier. Restore the (Y) key and operate the (R) key. This places a 43,000 ohm resistance across the test leads and is the approximate equivalent to a 70 volt leak on a 100,000 ohm 100 volt voltmeter. Adjust as above, using the (R) potentiometer and (R) lamp. The (R) relay is now biased to operate on a 70 volt or heavier leak. Restore (R), (CT) and (BUZZ) keys. The set is now ready to test in any range with which the set is provided (see table in paragraph 2.08).

Note 1: Should it be desired to test for high magnitude leaks only, either or both (Y) or (G) signals may be rendered inoperative by adjusting their respective potentiometers to their limit in a clockwise direction.

Note 2: All "calibrate" and "test" keys not otherwise designated shall be considered normal when the arrow is in a horizontal position; i.e., in line with the arrows on the other "calibrate" and "test" keys. When the arrow is in a vertical position; i.e., not in alignment with the other arrows, the key is operated.

5.02 If it is desired to have the (G), (Y) and (R) relays operate for leaks other than 40, 60 or 70 volts, the set may be calibrated to the desired values by substituting the proper resistances for (R-4), (R-3), and (R-2), respectively. The following table gives the values for resistances (R-2), (R-3) or (R-4) and the corresponding approximate leak values to which the set may be calibrated:

(R-2), (R-3) or (R-4) Resistance Values	Corresponding Leak Values		
	Test A	Test B	Test C
150,000	40 V	10 V	4.0 V
100,000	50 V	15 V	5.5 V
66,670	60 V	20 V	8.0 V
42,860	70 V	27 V	13.0 V
25,000	80 V	37 V	21.0 V
11,110	90 V	48 V	30.0 V

6. DRAWINGS

6.01 The following drawings showing the circuit, wiring and assembly may be obtained upon request from the maintenance engineer:

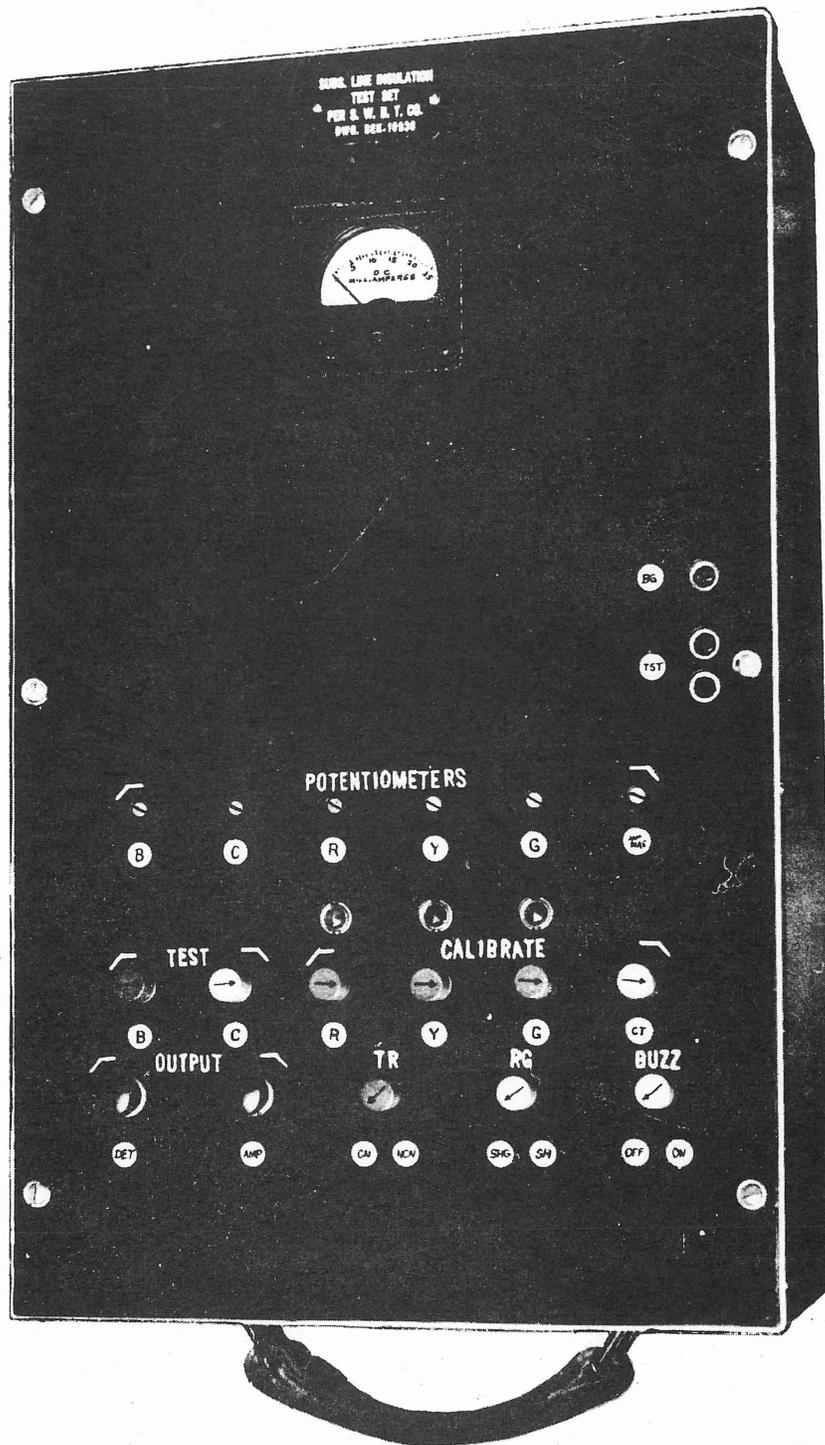
Subscriber Line Insulation Test Set -
Electronic Type - Schematic-SEK-10938

Subscriber Line Insulation Test Set -
Electronic Type - Wiring - EK-10938

Subscriber Line Insulation Test Set -
Electronic Type - Assembly and Equipment
EH-9913

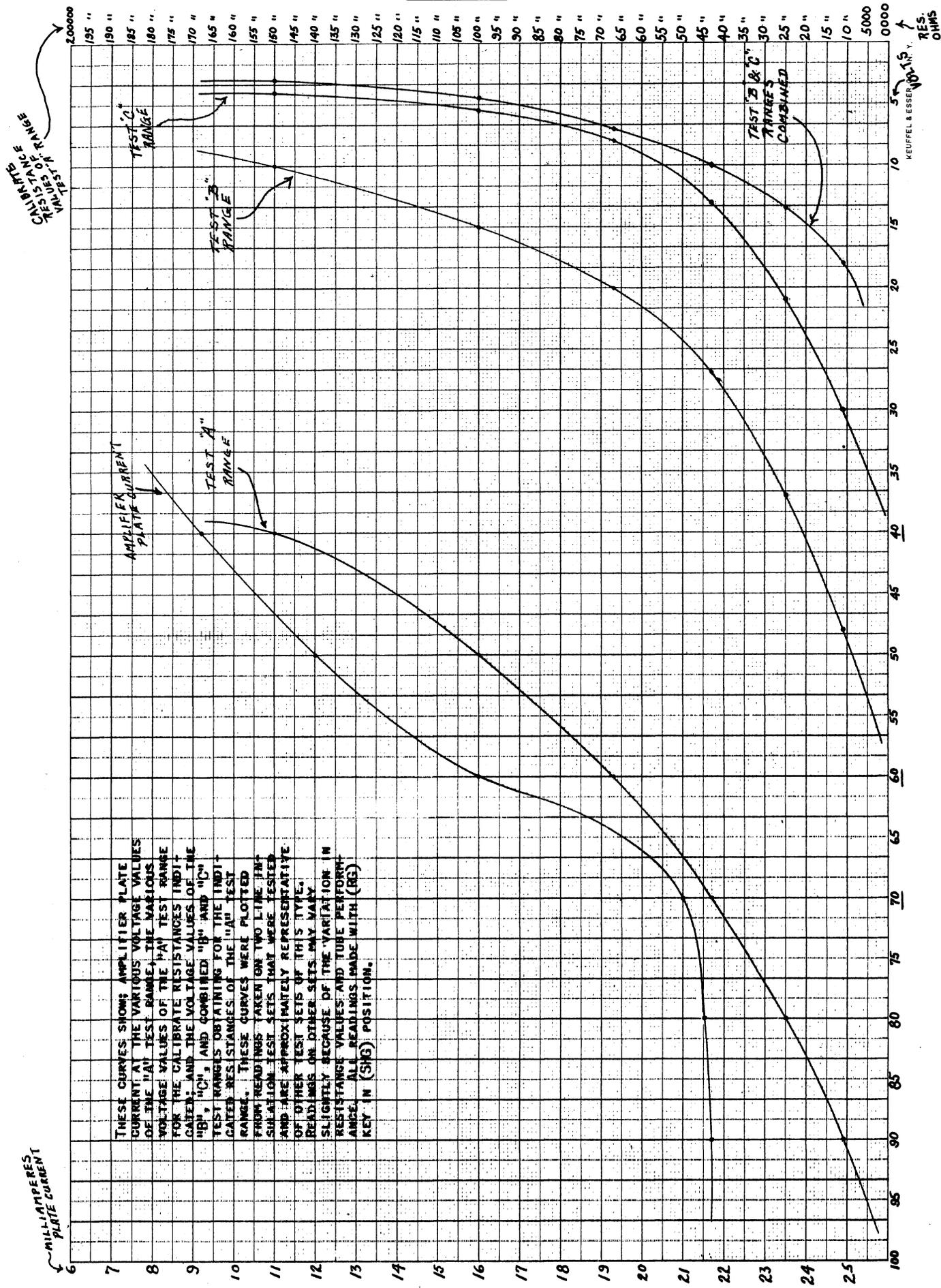
Test Shoes for Subscriber Line Insulation
Test Set - Electronic Type - EF-8463

EXHIBIT A



Line Insulation Test Set

EXHIBIT B



THESE CURVES SHOWS AMPLIFIER PLATE CURRENT AT THE VARIOUS VOLTAGE VALUES OF THE "A" TEST RANGE, THE VARIOUS VOLTAGE VALUES OF THE "B" TEST RANGE FOR THE CALIBRATE RESISTANCES INDICATED, AND THE VOLTAGE VALUES OF THE "B", "C", AND COMBINED "B" AND "C" TEST RANGES OBTAINING FOR THE INDICATED RESISTANCES OF THE "A" TEST RANGE. THESE CURVES WERE PLOTTED FROM READINGS TAKEN ON TWO LINE IN SOLATION TEST SETS THAT WERE TESTED AND ARE APPROXIMATELY REPRESENTATIVE OF OTHER TEST SETS OF THIS TYPE. READINGS ON OTHER SETS MAY VARY SLIGHTLY BECAUSE OF THE VARIATION IN RESISTANCE VALUES AND TUBE PERFORMANCE. ALL READINGS MADE WITH (S) KEY IN (S) POSITION.

MILLIAMPERES
PLATE CURRENT

RES. OHMS
KEUFFEL & ESSER
NO. 15