

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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KS-14103 TEST SET

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1. GENERAL

1.01 This section replaces Issue 5. It describes the KS-14103 Test Sets used in locating high resistance faults in exchange cables including those having aluminum conductors.

1.02 The section has been rewritten. It advises that the KS-14103 List 5 Test Set is now being supplied. The List 5 set is essentially a List 3 set equipped with a KS-14103 List 4 Filter.

1.03 **The List 4 Filter is included in the breakdown circuit to suppress transient currents which, if not filtered, would cause transmission errors in SAGE and similar type data circuits operating on carrier pairs in the same cable in which the breakdown set is being used.**

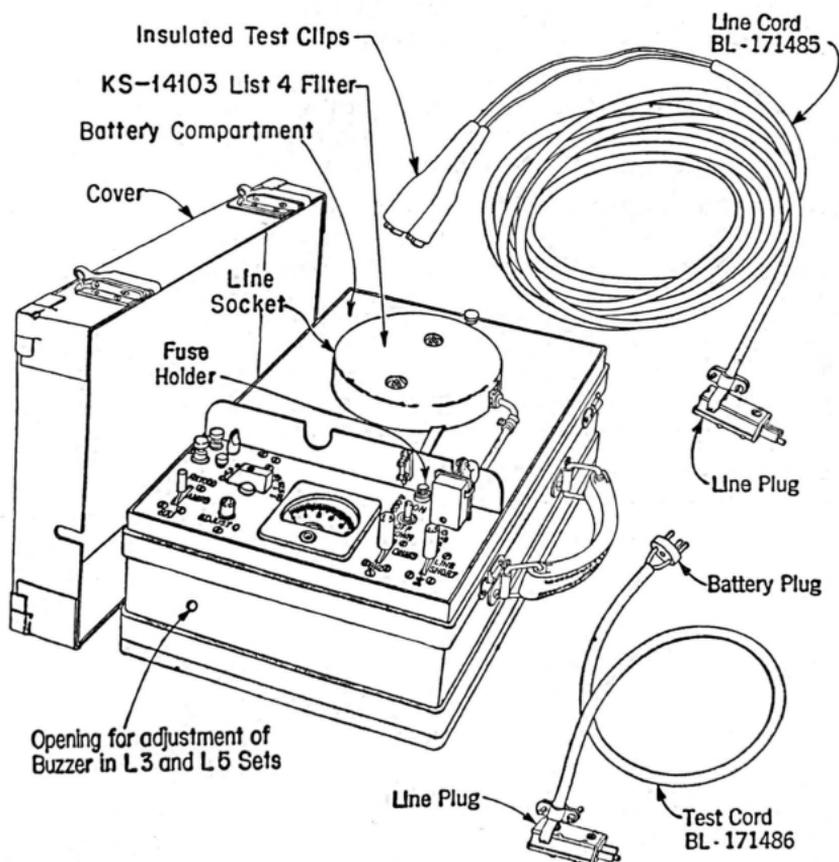
1.04 The KS-14103 List 4 Filter is available for modifying superseded breakdown sets in the field to make them equivalent to the List 5 set.

1.05 The superseded KS-14103 Test Sets (which include the List 2 and List 3 sets) are similar except that the KS-14103 set is equipped with a 7B Buzzer and the List 2 and List 3 sets with a 500-cycle KS-14485 Buzzer, as the source of tone for the exploring coil. Also, the List 2 set is equipped with a plastic panel and the List 3 set with an aluminum panel.

1.06 The description in Part 2 and the maintenance in Part 4 are applicable to all KS-14103 sets. The description and maintenance of the KS-14485 Buzzer in the List 2, List 3 and List 5 sets are covered in Part 5.

2. DESCRIPTION

2.01 **The KS-14103 List 5 Test Set** contains a group of dry batteries connected in series to provide an output of 630 volts, a cutoff switch in series with the 630 volts, a switch for applying this voltage across the two defective wires, a key for reversing the polarity of battery and a buzzer for supplying the tracing current for the exploring coil with a key for making the current continuous or intermittent. A meter is provided for reading the current through the fault, for checking the resistance of the faulty wires before and after the trouble is broken down and for testing the dry batteries in the set. The output circuit is equipped with a KS-14103 List 4 Filter which so suppresses the breakdown current that it will not cause interference on SAGE and similar type data circuits. The List 5 set equipped with the filter is shown in the following sketch.



2.02 The set contains 15 KS-14196 (45-volt) dry batteries, two KS-6570 (4.5-volt) batteries and one KS-14495 (1-1/2-volt) battery. A diagram of the battery connections is attached to the underside of the filter. Instructions for operating the set are shown in the sketch in the cover of the set.

2.03 The voltage of the buzzer circuit can be varied in sets from 4.5 to 90 volts by means of the selector switch. By switching the TONE key, either continuous or intermittent tracing current can be applied.

2.04 The OHMS key applies breakdown voltage to the defective wires when operated to BRKDWN (nonlocking) position. When operated to BUZ (locking) position, tracing current is applied to the defective wires after the fault has been broken down. This key must be in the center position when the ohmmeter circuit is used.

2.05 The LINE SHORT key is a three-position battery reversing key, which in the mid-position disconnects the test set circuit from the line socket and shunts the wires of the pair through a drainage resistor. The forward and back positions are used to reverse the test set connections to the LINE jack. When making a breakdown test, these positions are used to reverse the polarity of the battery being applied to the line.

2.06 The AMPS key (nonlocking) controls the meter circuit. When this key is in the R x 1 position, the resistance across the wires can be read directly from the upper scale (0-2000 ohms) of the meter; with the key in the R x 1000 position the resistance across the wires is 1000 times the reading of the upper scale (0-2 megohms) of the meter. With the key in the mid-position, the current flow from the breakdown battery can be read directly on the lower scale (0-5 amperes) of the meter.

2.07 The BL-171485 Line Cord is provided for connecting the set to the cable conductors. One end of the cord is equipped with a plug and the other with Universal Test Clips. A second cord, BL-171486 Test Cord, having a plug at each end, is provided for use in testing the 45-volt batteries. The cords can be stored by winding them around the List 4 Filter.

2.08 **The KS-14103 List 4 Filter** consists of an 0.5 microfarad shunt capacitor in series with two 230R Inductors. These components are interposed between the KS-14103 set and the line cord and are mounted on a circular metal plate attached to the battery compartment cover. The filter is protected by an aluminum cover. The filter is equipped with a cord for connection to the output of the breakdown set and a socket

for connecting the BL-171485 Line Cord to the filter. The filter is illustrated in the sketch in Paragraph 2.01.

2.09 **The case is equipped with a notched handle for use in suspending the set from a pole step.** The handle is spring-loaded. It can be placed in the vertical position, thus permitting the workman to use both hands to engage the handle on a step.

2.10 Auxiliary battery for Wheatstone bridge measurements can be obtained from the BRDG-BAT binding post terminals on the set. This voltage is controlled by the selector switch, in steps from 4.5 to 90 volts. The REV key can be used as a battery reversing key when the bridge is employed for locating opens.

2.11 The ADJUST O knob is used for adjusting the ohmmeter. With the line cord test clips short-circuited, the cord connected to the filter, the LINE SHORT key operated to the \pm or \mp position and the AMPS key in the R x 1000 or R x 1 position, turn the knob until the ohmmeter reads zero.

2.12 The fuse in the meter circuit is to protect the meter and other components in the event the keys are thrown improperly.

2.13 The set is equipped with a KS-14485 Buzzer for supplying tracing current to the faulty wires after the insulation has been broken down.

2.14 An oil cap cover is mounted on the front of the case to permit ready adjustment of the buzzer with a screwdriver.

KS-14103 List 2 and List 3 Test Sets

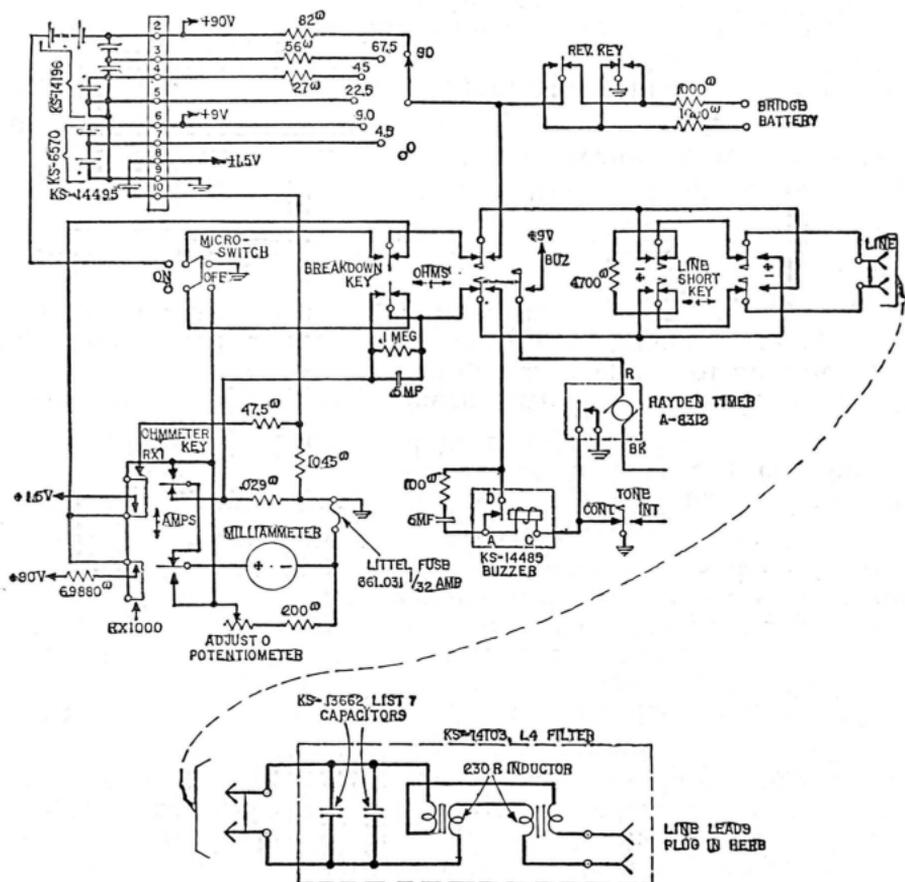
2.15 The KS-14103 List 2 and List 3 are similar to the KS-14103 List 5 Test Set except that they were not originally equipped with the KS-14103 List 4 Filter. The KS-14103 set has a 7B Buzzer in place of a KS-14485 Buzzer.

Modifying Superseded Sets

2.16 The superseded sets can be readily modified in the field to make them equivalent to a List 5 set. To do this it is only necessary to replace the existing cover with a KS-14103 List 4 Filter and connect the cord on the filter to the output side of the test set. The circuit label of a modified set should be replaced with a B-181785 Circuit Label. This label has a self-adhering gummed back to facilitate placing.

3. CIRCUIT DIAGRAM

3.01 Schematic circuit diagrams of the KS-14103 Test Set and List 4 Filter are shown below.



4. MAINTENANCE

4.01 Batteries: The KS-14196 batteries in the set should be tested about twice a month and at any other time when their condition is doubtful. This test is made by short-circuiting the breakdown set leads, inserting the plug into the LINE jack and then with the 630V switch operated to the ON position, momentarily throwing the OHMS key to the BRKDN position. If the current flow is less than two amperes and the batteries have given reasonable service, they should be discarded. If they have been in use only a short time and there

is reason to suspect that only a few of the batteries are depleted, they should be tested individually as described below.

4.02 To test the individual KS-14196 batteries remove the battery cable plug from the battery to be tested and insert the special test cord. The other end of the test cord should be plugged into the jack in the test panel. Then with the LINE SHORT key operated to \mp and the 630V switch to OFF throw the OHMS key momentarily to BRKDOWN position. If the current flow is less than two amperes the battery should be replaced.

4.03 An indication of the condition of the two 4-1/2-volt KS-6570 batteries may be obtained by shorting the line cord, throwing the OHMS key to the BUZ position and operating the LINE SHORT key. This test should be tried with the selector switch on 4.5 volts and on 9 volts. For both these positions, the buzzer should produce a steady audible sound. Otherwise, it indicates that the voltage of one or both of the 4-1/2-volt batteries is low and the battery or batteries should be replaced. After replacing, the above procedure should be repeated.

4.04 To make a more positive test of the condition of the 4-1/2-volt KS-6570 batteries connect a KS-8455, 89A Test Set, or an equivalent voltmeter across the terminals marked BRDG and BAT. Then short-circuit the clips of the line cord, set the selector switch to 9 volts and operate the OHMS key to BUZ. If the reading on the voltmeter is less than 6.5 volts the batteries should be replaced.

4.05 The 1-1/2-volt KS-14495 battery should be changed when the ohmmeter in the KS-14103 Test Set can not be adjusted to zero as outlined in Paragraph 2.11.

4.06 Fuse: The 1/32 ampere Littelfuse No. 361.031 in the meter circuit is located in the faceplate of modified sets. In other sets it is located under the instrument panel, which must be removed to change the fuse.

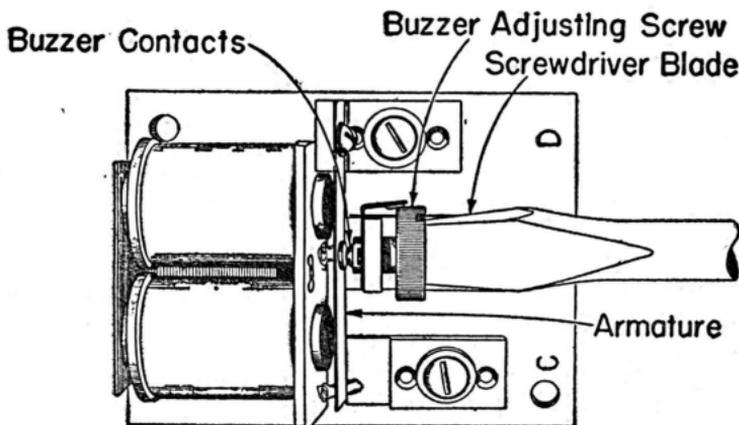
5. MAINTENANCE OF BUZZER IN L2, L3 AND L5 TEST SETS

5.01 The output of the KS-14485 Buzzer should be kept at or near the maximum for best results when used as a source of exploring coil tone.

5.02 Buzzer Adjustment: Connect the line cord to the set and short the test clips. At any position along the line cord, place a 75B Test Set connected to a 147-type Amplifier and 723A Receiver. Then set the controls on the KS-14103 L2, L3 or L5 Test Set for continuous tone. The control settings

used are: selector switch at 4.5 volts, OHMS key operated to BUZ (locking) position, TONE key to continuous, LINE SHORT key operated.

5.03 Insert a screwdriver having a 1/4-inch blade in the hole on the front of the case and engage it in the slot on the buzzer adjusting screw, as illustrated below:



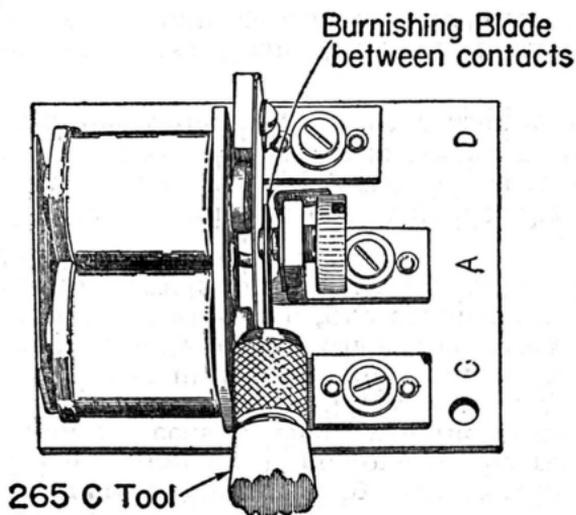
KS-14485 BUZZER

5.04 Back off the adjusting screw by turning it in a counter-clockwise direction until the tone in the receiver connected to the amplifier ceases. Then turn the adjusting screw slowly in a clockwise direction until the tone is heard again. Keep turning the screw until maximum tone is heard in the receiver. This will usually occur when the screw is turned about 1/8 of a revolution after the tone commences. If in turning the screw, the tone starts to fall away again, turn it counter-clockwise until the maximum is reached.

5.05 If a 147-type Amplifier is not available, the same procedure may be followed using the 75A Test Set and the 107A Amplifier. The adjustment is not so precise with this combination, however, unless the 507A Filter is used with the 107A Amplifier.

5.06 **Cleaning Contacts:** Remove the set from its case by unscrewing the four screws on the instrument panel. Back off the buzzer adjusting screw and insert the blade of the

265C Contact Burnisher between the contacts as illustrated below.



5.07 Press the armature against the blade and at the same time move the blade back and forth across the contacts three or four times. When unable to clean the contacts by burnishing, dip the flat end of a clean toothpick into mineral spirits and deposit the liquid on the contacts. Then rub the flat end of the toothpick between the contacts to remove any deposit on the contacts. When the contacts are thoroughly dry, burnish them with the 265C Tool. Then adjust the buzzer as outlined above.

6. REPLACEMENT PARTS

6.01

Batteries

Battery, KS-14196

Battery, KS-6570

Battery, KS-14495

Buzzer

Buzzer, KS-14485

Screw, Adjusting, for KS-14485 Buzzer

Armature, for KS-14485 Buzzer

Cords

- Cord, BL-171485 (line cord)
- Cord, BL-171486 (battery test cord)

Filter

- Filter, KS-14103 List 4

Fuse

- Fuse, Littelfuse 361.031 1/32 amp.

Label

- B181785 Circuit Label

Timer

- Timer, Haydon, A8312, for KS-14103 Test Set

6.02 When repairs are required the sets should be returned in accordance with local routine for making repairs, or, if authorized the following replacement parts can be installed in the field. Before making a field replacement, remove all batteries from the set. Then remove the instrument panel by loosening the four flat head screws.

6.03 KS-14485 Buzzer: Disconnect wires from "A," "C," and "D" terminals by removing terminal screws. Remove the two nuts and washers at opposite corners of the buzzer and remove the buzzer. Secure the new buzzer in its place and reconnect the "A," "C," and "D" wires to their proper terminals.

6.04 Contacts for KS-14485 Buzzer: When the buzzer contacts are worn, remove the adjusting screw. Then remove the buzzer armature after unscrewing the two screws which fasten it in place. Place the new armature in position, keeping the lock washers between the armature and the heads of the screws. Thread the new adjusting screw very carefully into position so as not to strip the fine threads. After the threads are engaged, lift the locking arm clear of the knurled edge of the screw while turning the screw down into position. Use the contact on the end of the adjusting screw as the mid-point to center the armature contact and tighten the screws holding the armature. The buzzer can then be adjusted as previously described.

6.05 Haydon Timer, A8312: To make the replacement, unsolder the two motor leads and the two switch contact leads. Unfasten the four nuts and lock washers holding the timer in place. Remove the old timer, place the new one in position and fasten in place. Replace the leads and solder them.