

KS-14103 L5 TEST SET

(BREAKDOWN)

DESCRIPTION, USE, AND MAINTENANCE

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• Include information formerly contained in Section 106-330-105

Since this is a general revision, arrows normally used to indicate changes have been omitted.

1.03 The KS-14103 L5 test set can be used to:

- Break down a high resistance fault to one of low resistance
- Supply tracing current
- Measure the resistance of the fault.

1.04 The breakdown test set is designed primarily to test and break down loaded or nonloaded pulp- or paper-insulated copper conductor pairs. **DO NOT ATTEMPT TO BREAK DOWN PAIRS THAT HAVE PLASTIC INSULATION.** For testing PIC cable, use the Dynatel 710A test set outlined in Section 634-305-514.



Do not use the test set on cables having aluminum conductors. The high voltage tends to melt the wires at the fault causing an open rather than welding them as occurs with copper conductors.

1. GENERAL

1.01 This section covers the description, use, and maintenance of the KS-14103 L5 test set (breakdown).

1.02 This section is reissued to:

- Delete reference to the KS-14103 L6 test set which is covered in Section 634-305-502
- Delete reference to the B storage bag which is rated "Manufacture Discontinued"
- Add reference to the B glove bag

2. PRECAUTIONS

2.01 THE FOLLOWING PRECAUTIONS SHALL BE OBSERVED BEFORE ATTEMPTING BREAKDOWN:

- **DO NOT CONNECT TEST SET TO ONE SIDE OF PAIR AND GROUND. THIS TYPE OF CONNECTION COULD PLACE HIGH VOLTAGE ON ADJACENT WORKING PAIRS IN THE CABLE HAVING LOW INSULATION RESISTANCE AT THE FAULT.**

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

• BEFORE APPLYING BREAKDOWN VOLTAGE VERIFY THAT:

- (1) THE PAIR HAS BEEN ISOLATED AT THE CENTRAL OFFICE
- (2) ALL SUBSCRIBER CONNECTIONS HAVE BEEN REMOVED.

• ISOLATE PAIRS IN TEST LENGTH.

• ENSURE OTHER EMPLOYEES ARE CLEAR OF THE CABLE SECTION TO BE TESTED BEFORE APPLYING VOLTAGE.

• DO NOT CONNECT THE TEST SET TO PAIRS EQUIPPED WITH SPECIAL DEVICES SUCH AS LATTICE BUILD-OUT NETWORKS, AND PRESSURE TRANSDUCERS.

• DO NOT CONNECT TO 66- OR 88-TYPE CONNECTING BLOCKS. PAIR SHALL BE REMOVED FROM BLOCKS BEFORE ATTEMPTING BREAKDOWN.

• ALL SHEATH OPENINGS MUST BE TIGHTLY WRAPPED BEFORE BREAKDOWN VOLTAGE IS APPLIED.

• THE 630V SWITCH SHALL BE IN THE OFF POSITION EXCEPT WHEN BREAKDOWN VOLTAGE IS APPLIED.

• DO NOT CHANGE THE POSITION OF THE LINE-SHORT KEY OR THE 630V SWITCH WHILE THE OHMS KEY IS IN THE BREAKDOWN POSITION. THE HEAVY CURRENT FLOW MAY DAMAGE THE CONTACTS.

• IF ARCING OCCURS IN THE SET, PULL THE POWER LINE CORD. THIS SHOULD EXTINGUISH THE ARC. THEN MOVE THE 630V SWITCH TO OFF, RECONNECT THE POWER LINE CORD AND PROCEED WITH TEST.

2.02 Failure to observe these precautions may result in serious injury to personnel, equipment damage, service interruption unknown to tester, and possible damage to subscriber property.

3. DESCRIPTION

3.01 The KS-14103 L5 set is equipped with a 7A buzzer as the source of tone for the exploring coil. The KS-14103 L5 test set includes a KS-14103 L4 filter which suppresses transient currents in the breakdown circuits which, if not filtered, would cause transmission errors in data circuits.

3.02 The KS-14103 L5 test set equipped with the KS-14103 L4 filter is shown in Fig. 1. The overall dimensions of this set are 7-3/8 inches deep, 11-3/8 inches wide, and 17-1/4 inches long.

3.03 The KS-14103 L5 test set contains the following:

(a) Fifteen KS-14196 (45-volt) 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 illustrated in the cover of the set.

(b) A BL-171486 test cord equipped with a line plug and a battery plug is used to test the 45-volt batteries.

3.04 The KS-14103 L4 filter is mounted on a circular metal plate attached to the battery compartment cover. The filter protected by an aluminum cover, is equipped with a cord for connection to the output of the breakdown set and a socket for connecting either the W2FW or P2DB cords to the filter.

3.05 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.

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

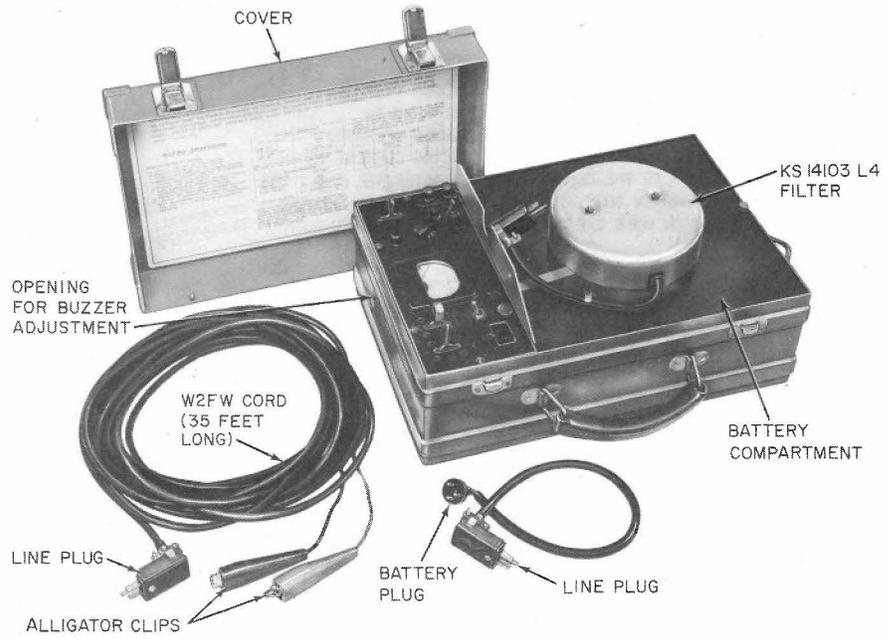


Fig. 1—KS-14103 L5 Test Set

SECTION 634-305-501

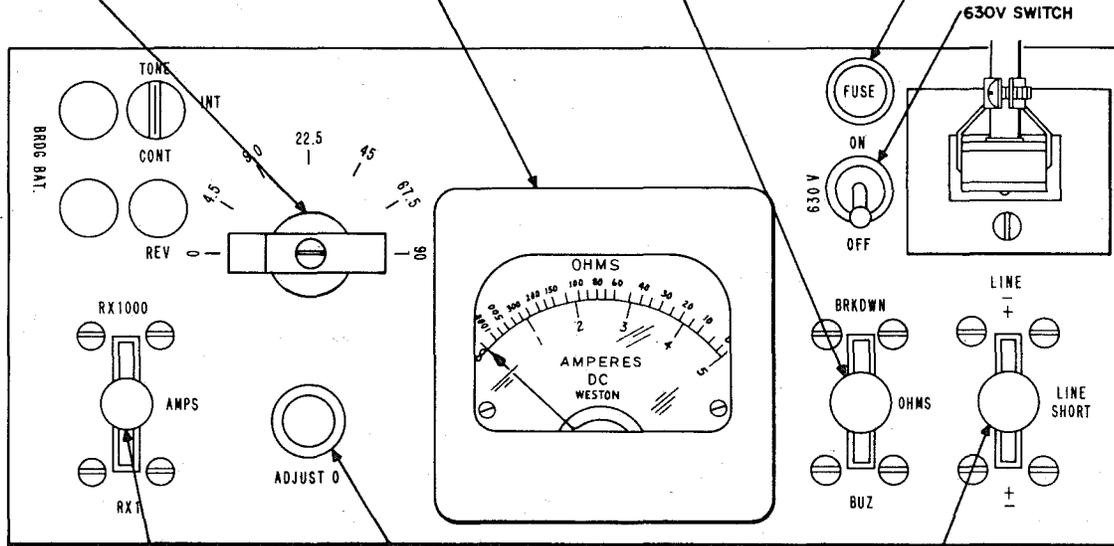
3.07 A description of the controls is given in Fig. 2.

AN OHMS KEY THAT APPLIES BREAKDOWN VOLTAGE TO THE DEFECTIVE WIRES WHEN OPERATED TO BRKDN (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.

A METER FOR READING THE BREAKDOWN CURRENT THROUGH THE FAULT, MEASURING THE RESISTANCE OF THE FAULTY WIRES BEFORE AND AFTER THE TROUBLE IS BROKEN DOWN, AND FOR TESTING THE BATTERIES IN THE TEST SET.

FUSE: THE FUSE (LITTELFUSE 361.031, 1/32 AMPERE) 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. THE SPARE FUSE HOLDER, LOCATED ON THE ALUMINUM CROSSPIECE DIRECTLY BEHIND THE METER, HOLDS ONE SPARE FUSE. (SEE NOTE)

A VOLTAGE SELECTOR SWITCH THAT VARIES THE VOLTAGE OF THE BUZZER CIRCUIT IN STEPS FROM 4.5 TO 90 VOLTS.



AN AMP KEY (NONLOCKING) THAT 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 TO 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 TO 2 MEGOHMS) OF THE METER. WITH THE KEY IN THE MIDPOSITION, THE CURRENT FLOW FROM THE BREAKDOWN BATTERY CAN BE READ DIRECTLY ON THE LOWER SCALE (0 TO 5 AMPERES) OF THE METER.

A LINE SHORT KEY THAT IS A 3-POSITION BATTERY REVERSING KEY, WHICH IN THE MIDPOSITION 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.

THE ADJUST 0 KNOB IS USED TO ADJUST THE OHMMETER. WITH THE LINE CORD TEST CLIPS SHORT-CIRCUIED, THE CORD CONNECTED TO THE FILTER, THE LINE SHORT KEY OPERATED TO THE ± OR F POSITION, AND THE AMPS KEY IN THE R X 1000 OR R X 1 POSITION, TURN THE KNOB UNTIL THE OHMMETER READS ZERO.

NOTE:
ON LATER TEST SETS, A 100A VARISTOR HAS BEEN SUBSTITUED FOR THE FUSE. TEST SETS WITH FUSES MAY BE MODIFIED IN ACCORDANCE WITH LOCAL PRACTICE.

Fig. 2—KS-14103 L5 Test Set Control Panel

3.08 The W2GM cord in Fig. 3 and the cords illustrated in Fig. 4 are used to connect the KS-14103 L5 test set to conductors at a central

office location ONLY. These cords must be ordered separately.

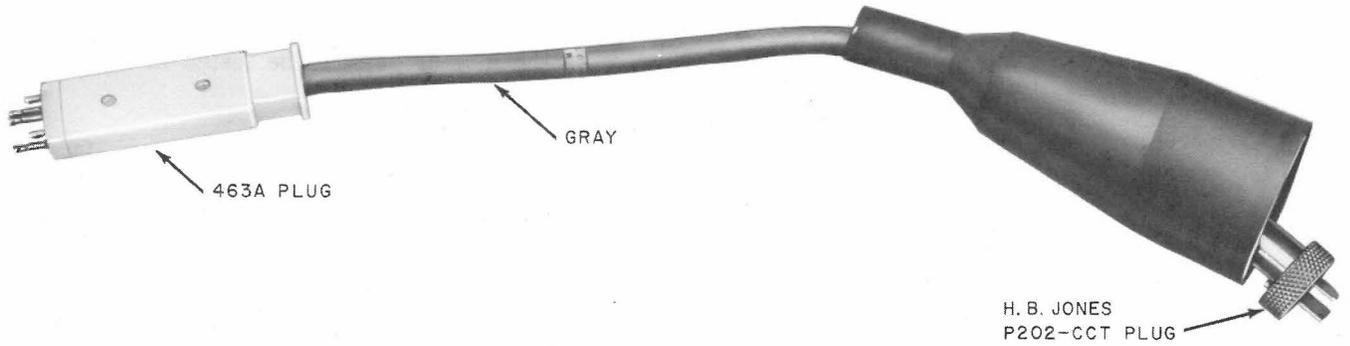


Fig. 3—W2GM Cord

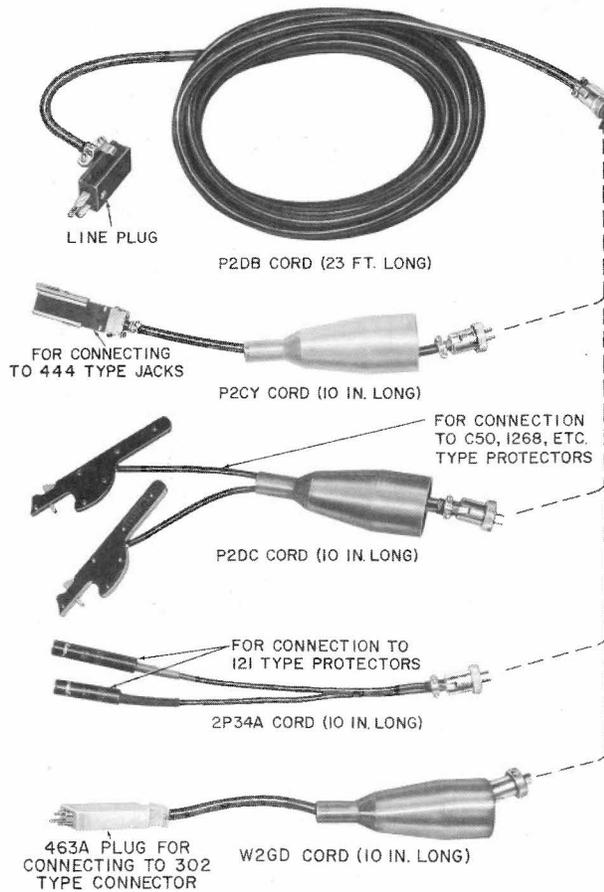


Fig. 4—Cords Used With KS-14103 L5 Test Set

3.09 The B glove bag (Fig. 5) is used to store the central office test cords.



Fig. 5—B Glove Bag

4. PREPARATORY WORK

4.01 If the pairs involved are disconnected from the central office and other terminations, the instructions given in Part 5, with the exception of 5.03 and 5.04 can be omitted. In addition, Part 6 can be omitted if no cable form type terminations exist on the pairs to be tested.

4.02 If the pairs involved cannot be isolated from the central office and other terminations, the instructions given in Parts 5 and 6 must be followed in their entirety.

4.03 Obtain the location of all terminations of the pair or pairs to be tested in accordance with local routine.

4.04 The subscriber or subscribers on the pair or pairs involved in a breakdown test shall, if practical, be notified before service is interrupted.

4.05 Before making the test, call the test desk to determine whether other employees are working on the cable in the section where the breakdown voltage will be applied. These employees shall be advised to suspend work in the cable and wrap the splice at their locations. **The breakdown voltage shall not be applied to any cable in which there are temporary openings unless the openings are tightly wrapped.** At underground locations employees shall be advised to stay out of the manhole while the test is under way.

4.06 If possible, the pair or pairs having the lowest fault resistance (as a short) should be used for the test. If the fault cannot be broken down using individual pairs, the sides of the two pairs having the lowest insulation resistance between them may be used. **Do not break down to ground.**

4.07 The breakdown set should be applied at a termination as near as possible to the fault as determined by analysis or measurement.

4.08 Before testing, PBX lines SHALL be prepared as follows:

- (a) Make a listening test using a capacitor in series with a talking set such as a 52E test set, a 1011B, or a 1013A handset across each pair on which breakdown test is to be made at each terminal in which the pair terminates.
- (b) If no conversation is heard, remove the capacitor, and repeat test.
- (c) If no conversation is heard, momentarily (2 or 3 seconds) connect an adequate convenient ground to the ring lead. If nothing is heard, repeat test on tip lead.

(d) If test indicates that the pair is working as evidenced by conversation, dial tone, code signals, operator answering the line, etc, it shall be assumed the pair is still terminated or a cable records discrepancy exists.

(e) If the above tests can be made with no evidence of a working pair, a volt ohmmeter (KS-14510 or equivalent) is used across the pairs and then from each lead to ground to determine if dc voltage is present on the leads. If voltage is present, it is assumed the pair is terminated or a cable records discrepancy exists.

(f) *Under no circumstance should breakdown be attempted if all of the above tests cannot be met.*

5. ISOLATION AND MARKING OF PAIRS

AT CENTRAL OFFICES OR SUBSCRIBER BUILDINGS HAVING SIMILAR TERMINATIONS

5.01 Isolation and marking of pairs must be done at all central office PBX, and other subscriber locations to prevent damage to equipment.

5.02 Pairs to be subjected to breakdown tests must be isolated from central office equipment as follows:

(a) ***B-Type Frames Equipped With C50, 1177, 1268, or Similar Protectors:***

Remove the heat coils and carbon blocks and install a B warning marker, as illustrated in Fig. 6. Inspect the wire terminations and, if a Skinner rests on a lug, place a No. 7 terminal punching insulator over the lug.

(b) ***B-Type Frames Equipped with 300-Type Connectors:*** Install a C warning marker, illustrated in Fig. 7, on the pair.

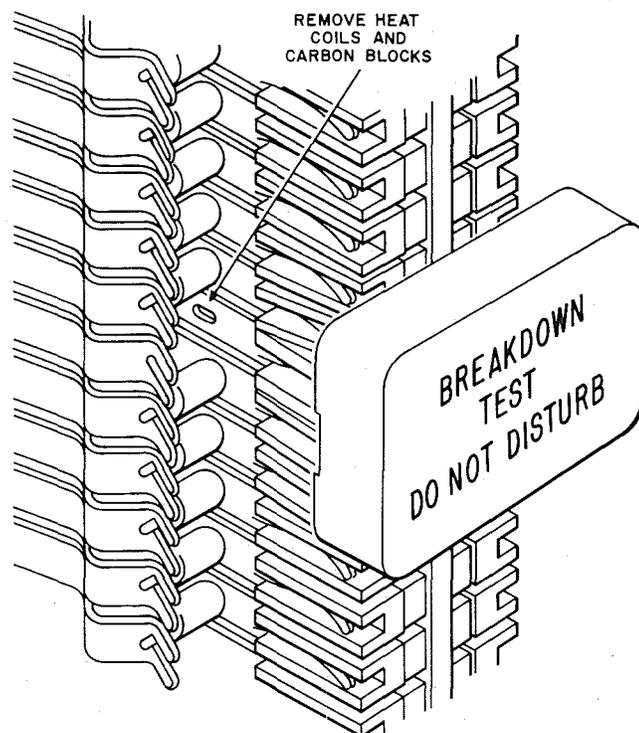


Fig. 6—B Warning Marker

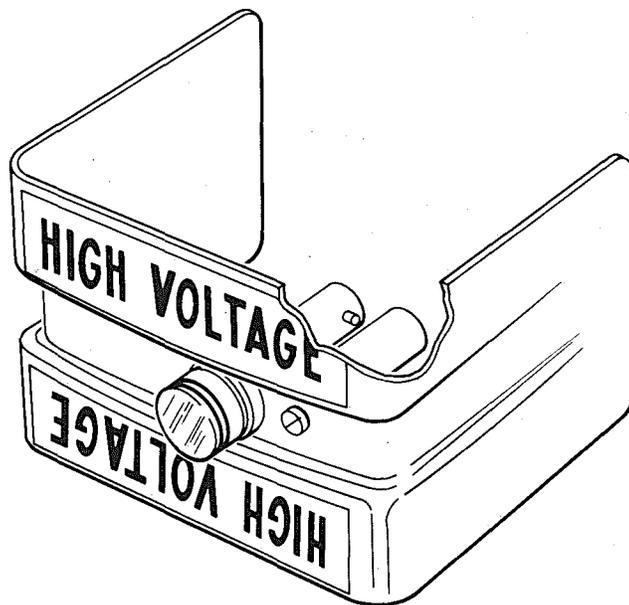


Fig. 7—C Warning Marker

(c) **B-Type Frames Equipped with 444-Type Jacks:** Install a P-11B721 fire block over the terminal lugs and then place a 16A guard in the jack of the cable pair to be tested as illustrated in Fig. 8. The 16A guard opens the contacts in the 444-type jack. The P-11B721 fire block prevents spreading of fire in the event arcing occurs. The block consists of an oval-shaped, semirigid, molded nylon tube approximately 2-1/2 inches long. A slot is provided along one edge to permit sliding the block over the lugs and skinners.

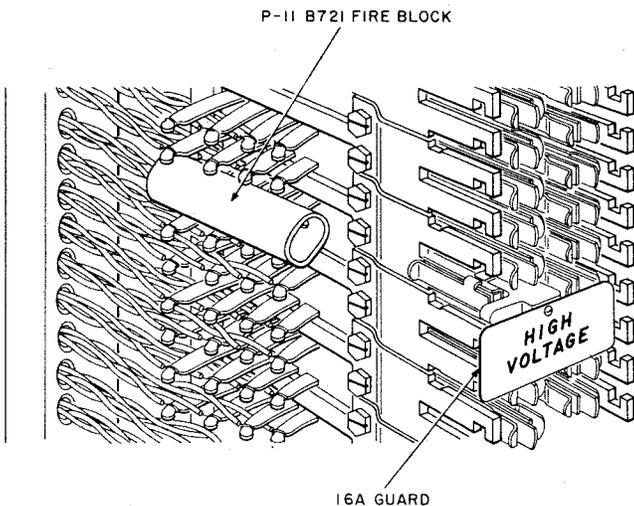


Fig. 8—Protecting B-Type Frames and 444-Type Jacks

(d) **A-Type Frame:** (An A-type frame is one having the heat coils and carbon blocks located away from the cable form, usually on the opposite side of the frame.) Lift the cross connection on the terminating strip, place red binding post caps over the lugs, and then attach a linen tag, such as Form E-1162, bearing the notation **breakdown test** to the lugs to warn that a breakdown test is in progress.

(e) **Protector Frames Equipped With 302- and 303-Type Connectors:** Remove the protector unit from its socket and insert an E warning marker in place of the protector as shown in Fig. 9. The marker is red plastic with white lettering and is equipped with prongs for socket mounting.

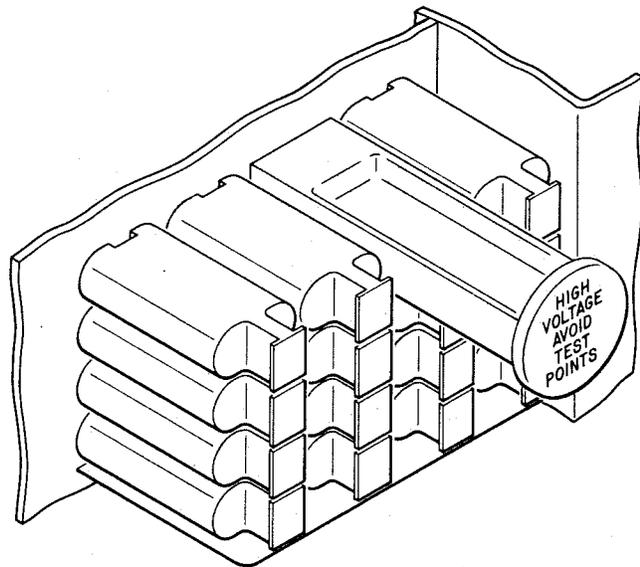


Fig. 9—E Warning Marker

(f) Mount an E warning sign from two wiring horns at the rear of the frame so as to cover the back of the 302- and 303-type connectors. The sign has cords for mounting. See Fig. 10 and 11.

5.03 Warning markers and signs, blocks, caps, and tags **SHALL NOT BE REMOVED**, or jumpers restored until the breakdown tests are completed.

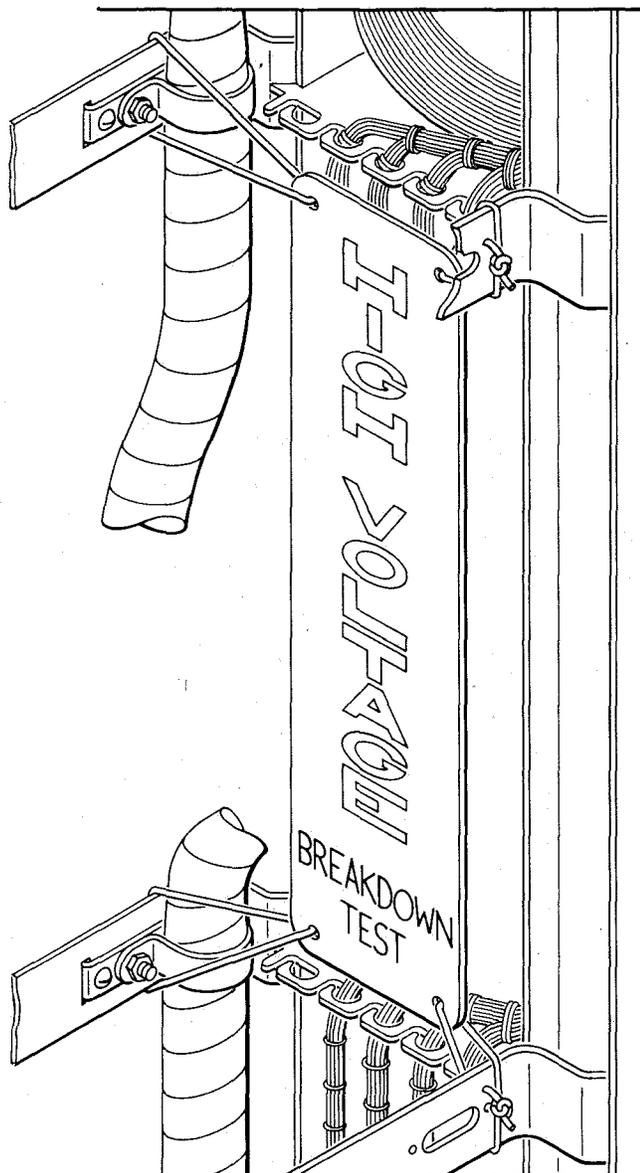
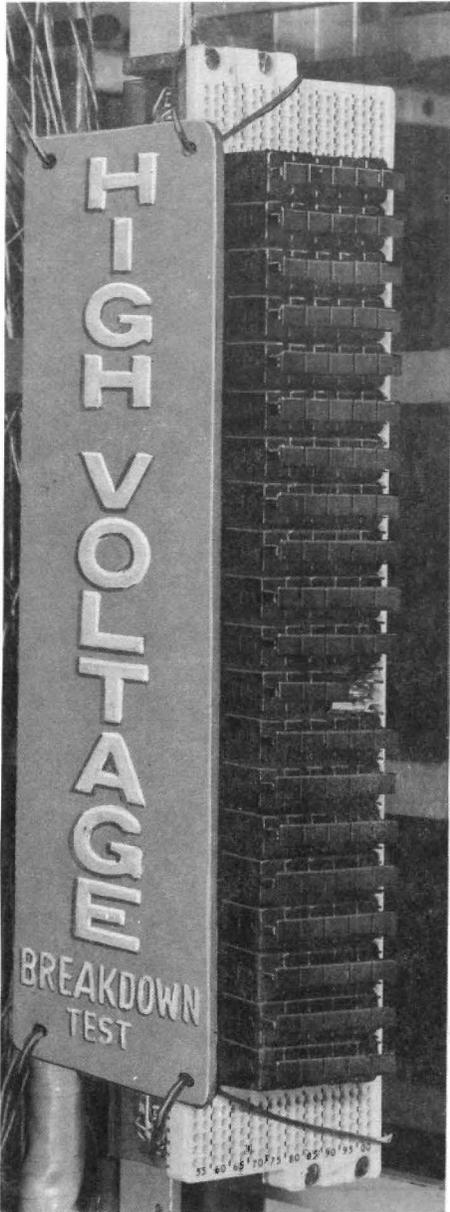


Fig. 10—E Warning Sign Installed On Back Side of 302 Connector

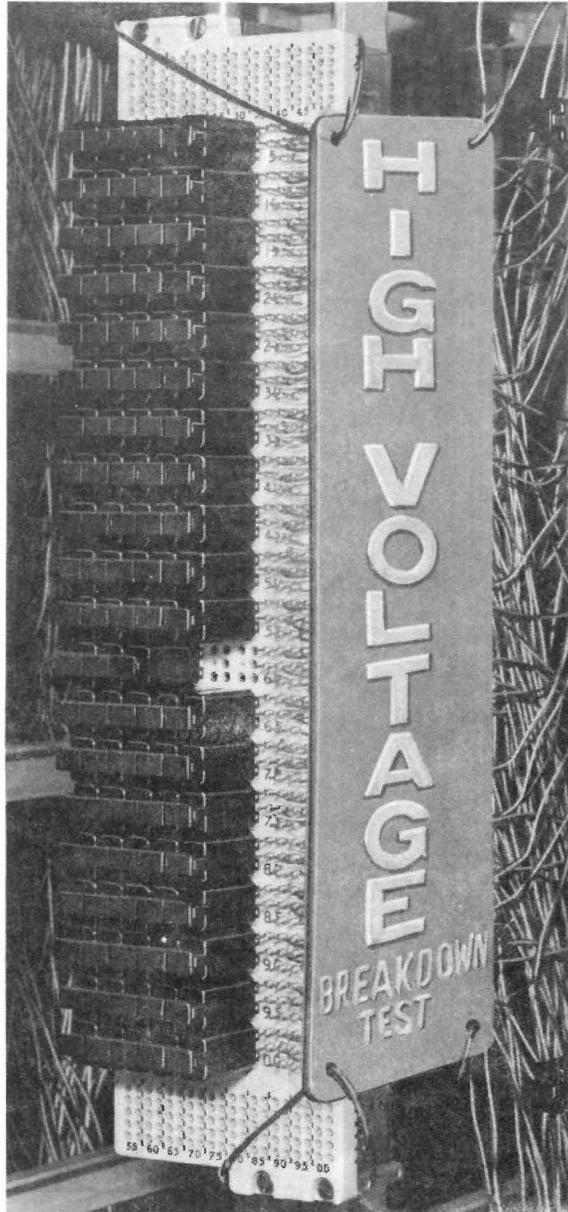
AT DISTRIBUTION AND CROSS-CONNECTING TERMINALS

5.04 Visit all distribution and cross-connecting terminal appearances of the pair or pairs in the section to be energized and proceed as outlined below.

(a) Make a listening test, using a capacitor in series with a talking set such as a 52E test set, a 1011B or a 1013A handset across each pair on which breakdown test is to be made at each terminal in which the pair terminates. If no conversation is heard, remove the capacitor



A



B

Fig. 11—E Warning Signs Installed On 303-Type Connectors

and repeat the test. If this test indicates that the pair is dead, disconnect all wires including connections at cross-connecting terminals, and remove all protectors associated with the pairs except those equipped with 107B or 107C protectors. The 107B or 107C protectors should be temporarily replaced with 107D protectors

(dummy-protectors). If the test indicates that the pair is working as evidenced by conversation, dial tone, code signals, operator answering the line, etc, it shall be assumed that there is a discrepancy between the cable records and the pair terminations. In that event, the count shall be determined by identifying the pairs by tone.

(b) Remove dirt and corrosion products from all terminals in which the test pair or pairs appear and rearrange wires, if necessary, to provide at least 1/4-inch clearance from the binding posts of these pairs.

(c) Depending on the nature of the termination, at each appearance cover the tip and ring terminals of the pair or pairs and fuse mountings with red B binding post caps or binding post insulators. Then tie a linen tag, on which is written **breakdown test** and the date on one of the caps or insulators at each appearance, except at the location where the breakdown voltage is applied. It is important that the tag and string be so placed that they are not in contact with any binding posts in the terminals as, at some later date, a high-resistance fault might result due to dampness. A pair so prepared and marked is illustrated in Fig. 12.

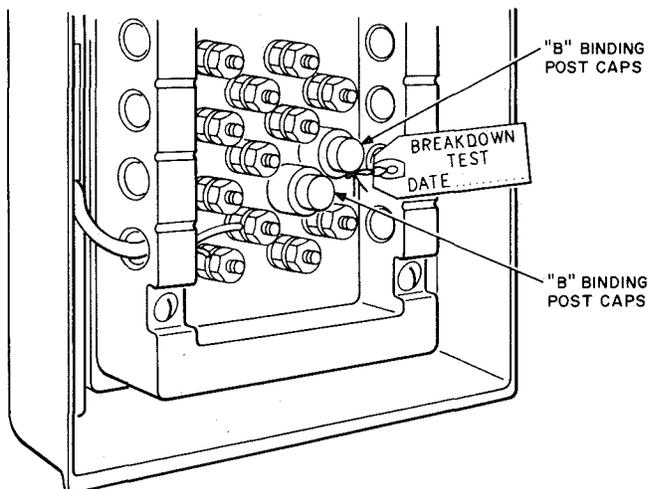


Fig. 12—F-Type Terminal Correctly Protected

- (d) Disconnect open-wire connections at the terminal of the pair or pairs involved.
- (e) Remove carbon protection from cable terminals so equipped to prevent burning in **grounds**.

AT CONTROL POINTS AND ACCESS POINTS

5.05 In dedicated plant where paper or pulp-insulated conductor cable is utilized, control points and access points are constructed with an IN and OUT PIC cable stub for conductor identification. In order to open the pair under test the B wire

connector must be removed. To isolate this pair, clear and sleeve the ends or wrap with plastic tape. Attach a linen tag on which is written **breakdown test** and the date.

6. PREVENTION OF DAMAGE TO CABLE FORMS

6.01 *There is a possibility of a fire starting in a cable form or in the skimmers. An observer, therefore, must be stationed to watch for arcing or smoke to immediately take steps to terminate the test either through grounding the pair or by requesting the employee in the field to stop applying voltage.*

6.02 Before test voltage is applied to a pair or pairs in a cable containing a textile form, place a No. 7 terminal punching insulator (if needed) or a fire block over the terminating lugs. However, this may not be possible when the skimmers terminate on binding posts.

6.03 When the voltage is applied at a cable form, the employee applying the voltage is usually in position to watch the cable form and turn the set off, if necessary. If this is not the case, an observer within talking distance is required as an assistant.

6.04 When the voltage is applied at a distribution terminal, etc, an observer is required at the form. If arcing or smoke is seen, proceed as follows:

(a) At B-type frames equipped with C50, 1268, and similar protectors, the observer at the form shall stop the test by removing the B warning marker. This will short-circuit and ground the pair, thereby indicating to the employee at the breakdown set that the fault has broken down and no further voltage should be applied. Breakdown tests shall be discontinued until the cable form has been repaired.

(b) At B-type frames equipped with 444-type jacks, at A-type frames, or at frames equipped with 302- or 303-type connectors, the observer cannot stop the test as simply as in (a) above. A talking circuit must, therefore, be set up ahead of time between the observer and the employee with the breakdown set so that the employee can be advised immediately in case trouble develops.

7. TESTING PROCEDURES

7.01 *The set should preferably be operated in a car or truck. If this is impractical, the set should be placed on a waterproof covering such as a rubber blanket or B splice covering, or hung from a pole step by the test set handle.*

7.02 Make sure that the filter is plugged into the line jack in the rear right-hand corner of the panel of the breakdown set. Insert the line plug of the W2FW cord into the output jack of the filter in the set. Select the appropriate short cord in Table A, and connect it to the free end of the W2FW cord.

Note: Always use the KS-14103 L4 filter in the circuit when using the L5 test set to break down a fault. This prevents errors in SAGE and similar type data circuits operating on carrier pairs in the same cable in which the breakdown set is being used.

TABLE A

CORDS USED WITH BREAKDOWN TEST SET

CODE	APPLICATION
P2DC and P2DB	On C50, 1268, and similar protectors
W2GD	302-type connectors
2P34A and P2DB	On 300-type connectors
W2GM	303-type connectors
P2CY and P2DB	On 444-type jack
W2FW (See note)	On A-type frames and distribution or cross-connecting terminals

Note: In using the P2CY, 2P34A, P2DC, W2GD, and W2GM cords, make sure that the rubber insulating boot covers the test connector.

7.03 Connect the free end of the cord to the cable pair. **Never connect between one wire and ground.** It is permissible to connect to wires of different pairs when a cross is involved.

7.04 The method of connecting to the lugs of a terminating strip is shown in Fig. 13 and to an N-type terminal in Fig. 14.

7.05 Check for office battery by placing the AMPS switch in RX1000 position and move the LINE SHORT switch from \pm to \mp position and observe meter deflection. A difference in deflection indicates office battery.

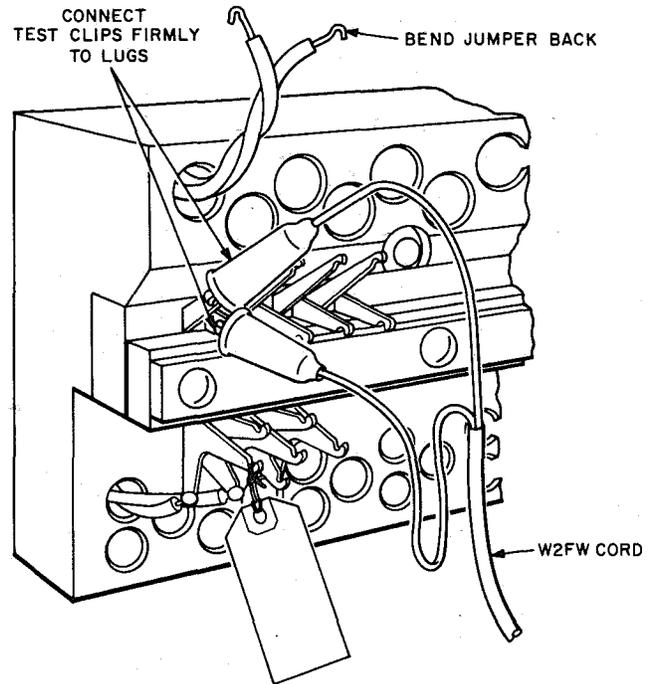
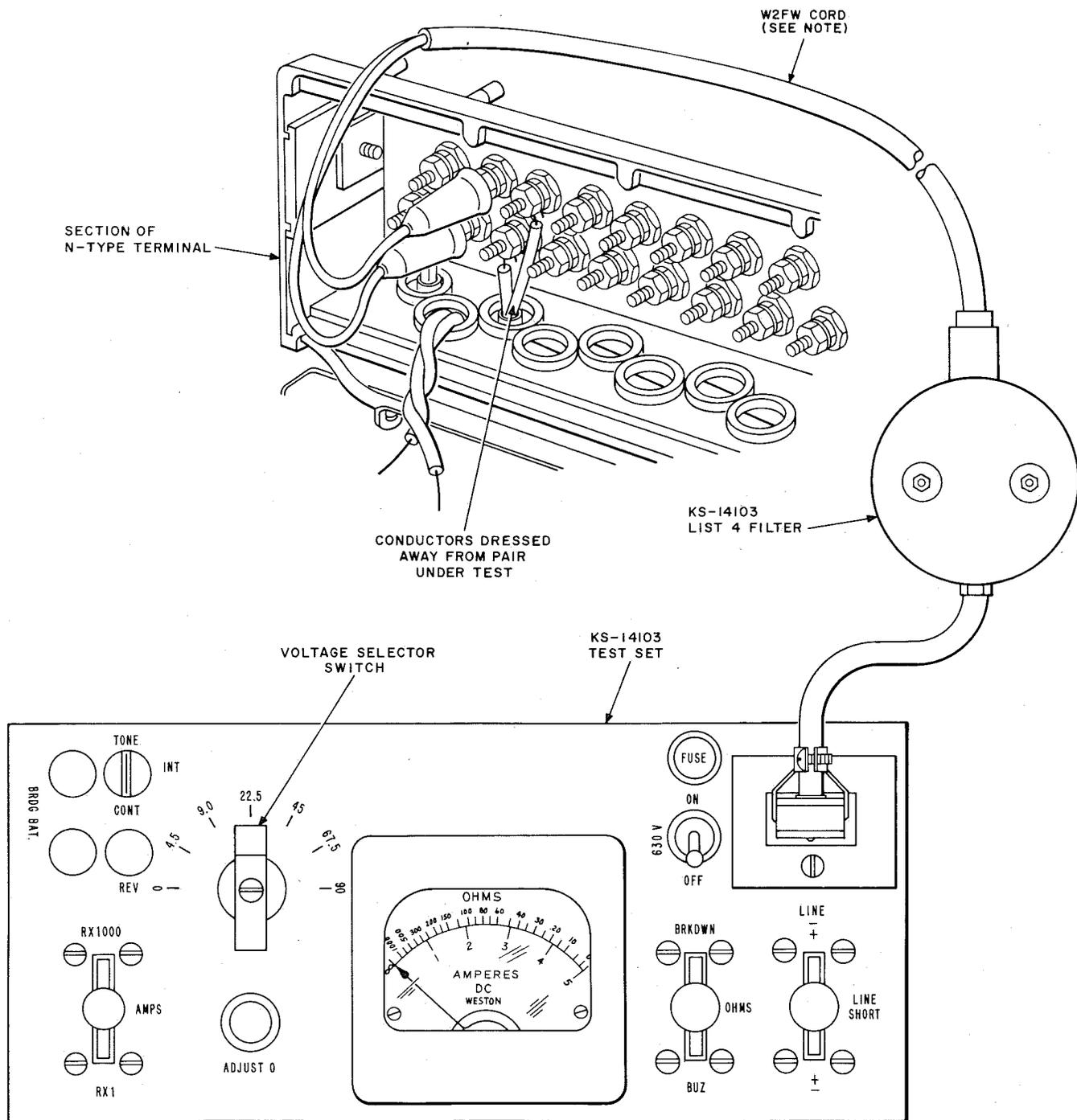


Fig. 13—Test Clips Connected to Terminal Strip



NOTE
 AT TERMINALS, CLEAR PAIR UNDER TEST BY REMOVING
 DROP WIRES AND BRIDLE WIRE TO PROTECTORS.

Fig. 14—Test Clips Connected To N-Type Terminal

RESISTANCE MEASUREMENTS

7.06 The total resistance of the fault in series with the loop resistance of the pair between

the fault and the breakdown set can be measured with the keys and switch in the following positions. (See Fig. 15 for control panel.)

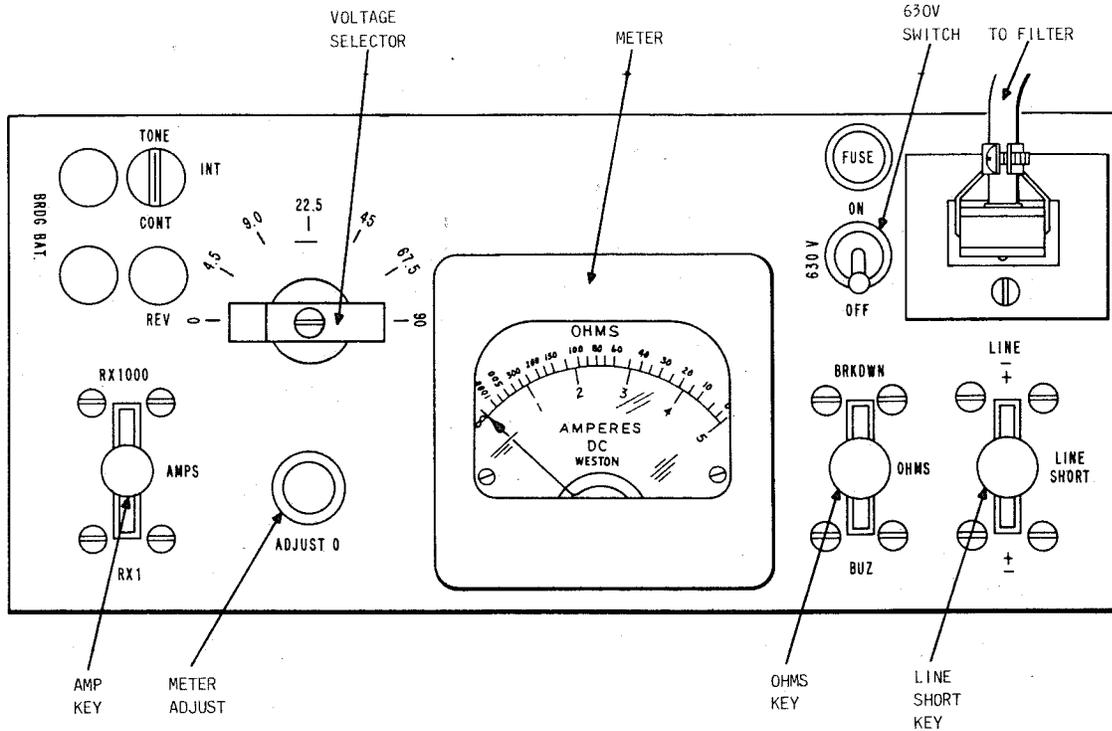


Fig. 15—Resistance Measurements

KEY OR POSITION	POSITION
OHMS KEY	OHMS
630V SWITCH	OFF
LINE SHORT KEY ± or ∓	
AMPS KEY	R × 1 or R × 1000

Note: The ohmmeter can be adequately zeroed by shorting the ends of the test leads and turning the knob of the ADJUST 0 potentiometer.

7.07 When the fault is broken down, the approximate distance to the fault can then be calculated by multiplying the resistance (in ohms) by the feet-per-ohm value of the loop. See Table B.

Note: The loop-feet-per-ohm is one half the single-conductor-feet-per-ohm.

TABLE B

LOOP-FEET-PER-OHM FOR CABLES

GAUGE OF CABLE	APPROXIMATE LOOP-FEET-PER-OHM
COPPER	
19	60
22	30
24	20
26	12

7.08 The actual distance to the fault usually will be less than the calculated distance because the resistance measurement includes the resistance of the fault which depends on the quality of the weld made with the breakdown voltage. The resistance of loading coils must also be taken into account.

MAKING BREAKDOWN

7.09 Make the breakdown tests as follows: (See Fig. 16 for controls.)

- (a) Operate OHMS key to OHMS position.
- (b) Operate 630V switch to ON position.
- (c) Operate LINE SHORT key to \pm position.
- (d) Momentarily operate OHMS key to BRKDNW position (about 1/2 second).
- (e) Operate LINE SHORT key to the \mp position.
- (f) Again momentarily operate OHMS key to BRKDNW position (about 1/2 second).
- (g) Operate LINE SHORT key to forward position.
- (h) Continue to operate OHMS and LINE SHORT keys, as described in (c) through (f) throughout the test until a reading on the meter is obtained.

7.10 When the fault breaks down, current will flow through the fault, and the meter will show a reading of 1 ampere or more. Then measure the resistance of the loop as covered in 7.07. If the resistance is less than 750 ohms, proceed as covered in 7.21 and 7.22.

7.11 If the resistance cannot be reduced to 750 ohms or less, transfer operations to another pair, taking the necessary precautions as exercised on the first pair. If operations on this pair are not successful, try a third pair.

7.12 Sometimes the fault can be broken down by applying voltage from another terminal.

7.13 If the fault cannot be broken down by applying 630-volt potential between the wires of the pair, apply the breakdown potential between the sides of the pairs having the lowest insulation resistance after the necessary precautions on the two pairs have been taken. If operations on these wires are not successful, try the other wires of these pairs or wires of other pairs.

7.14 If, in breaking down a fault using the sides of two pairs (cross conductors), the meter gives an indication of a breakdown and the buzzer will not operate, do not again apply breakdown voltage until each of the two pairs is tested for battery and ground.

7.15 The conductors should be tested for battery and ground as follows. Turn the 630V switch to the OFF position and set the OHMS key at OHMS. Ground one test clip of the line cord and set the AMPS key to the $R \times 1000$ position. If no reading is obtained, repeat this test on the

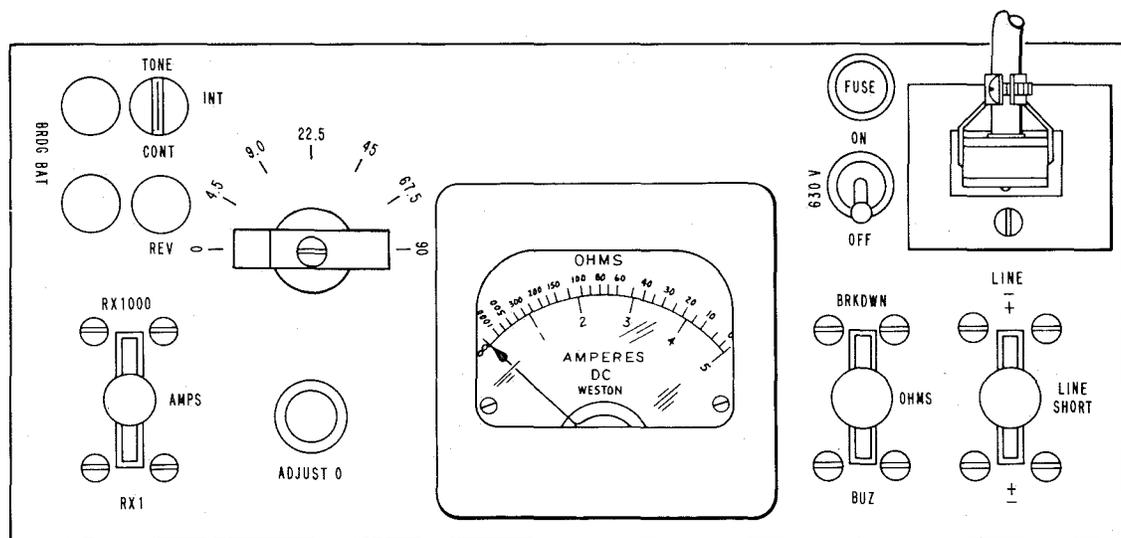


Fig. 16—Making Breakdown

other wire of the crossed conductors used in the breakdown test. A reading in either test indicates a heavy cross with battery or ground in which case breakdown voltage should be applied only to paired conductors.

7.16 The 630V switch should be in the OFF position except when the high voltage is applied. **Never manipulate the 630V switch unless the OHMS key is in the OHMS position.**



Do not change the position of the LINE SHORT key or the 630V switch while the OHMS key is in the BRKDN position, as the heavy current flow may damage the contacts.

7.17 If arcing occurs in the set, **disconnect the line cord by pulling the filter cord plug at the control.** This will extinguish the arc. Now turn the 630V switch to OFF, reconnect the line cord, and then proceed with the test.

7.18 Whenever more than one employee is involved, care shall be taken that the breakdown voltage key is not operated by one employee while there is a possibility of the other coming in contact with the lead clips, cable, or terminal.

7.19 Care should be taken to keep the test set panel and battery compartments free of foreign objects such as clippings, solder, etc. Periodic checks should be made by removing the test panel and examining the compartment to prevent possible short circuiting of the test set.

APPLYING TRACING TONE TO FAULTY PAIR

7.20 When the condition outlined in 7.10 has been met, turn the 630V switch to OFF and set the voltage selector switch (0 to 90 volts) to 4.5 volts.

7.21 Operate the OHMS key to the BUZ position and move the voltage selector switch to successively higher voltages until the buzzer operates. Leave the LINE SHORT key in either the forward or backward position. Always operate the buzzer at the lowest voltage possible. This will minimize interference of adjacent circuits and will reduce the likelihood of the tone (tracing current) carrying beyond the fault. It will also minimize damage to

the buzzer contacts. The buzzer may be operated continuously or intermittently and is controlled by the TONE key.

7.22 With the buzzer operating, the exact location of the fault can be determined by tracing it, using an exploring coil. First listen to the tone in the cable in both directions from the set. If the tone is heard in both directions, reduce the buzzer voltage until the tone is heard in only one direction. If the set is left unattended, place the cord in the slots provided for that purpose, put the cover on, and if at a pole, suspend the set from a pole step by the folding handle provided on the set.

7.23 After the fault has been located, turn the keys to their normal position and disconnect the test set.

8. RESTORING CIRCUITS TO NORMAL

8.01 Any circuits working on the pair or pairs should be restored to service. The B binding post caps and the tags should be removed at the working appearances.

8.02 At terminations where the pair or pairs are not working, the B binding post caps and the linen tags may be left on. An employee visiting the terminal at a later date should remove the tags used to mark pairs on which breakdown tests were made.

8.03 **Employees visiting the terminals on the date marked on the tag should not disturb the caps or tags.**

8.04 On plant operating under the Dedicated Plant Plan, restore all connections and remove any tags as soon as practical after tests have been completed.

8.05 On completion of the breakdown test, the employee shall notify personnel at the test desk or cable fault locating bureau who will, in accordance with local routine, notify the employees working in the cable that tests have been completed.

9. MAINTENANCE

9.01 **Batteries:** The KS-140196 batteries in the set should be tested at any 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 and the LINE SHORT key to either the \pm or \mp position, momentarily throwing the OHMS key to the BRKDNW position. If the current flow is less than 2 amperes, the batteries 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.

9.02 To test the individual KS-14196 batteries, remove the battery to be tested and insert the special BL-171486 test cord (Fig. 17). 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 position and the 630V switch to OFF, throw the OHMS key momentarily to BRKDNW position. If the current flow is less than 2 amperes, the battery should be replaced.

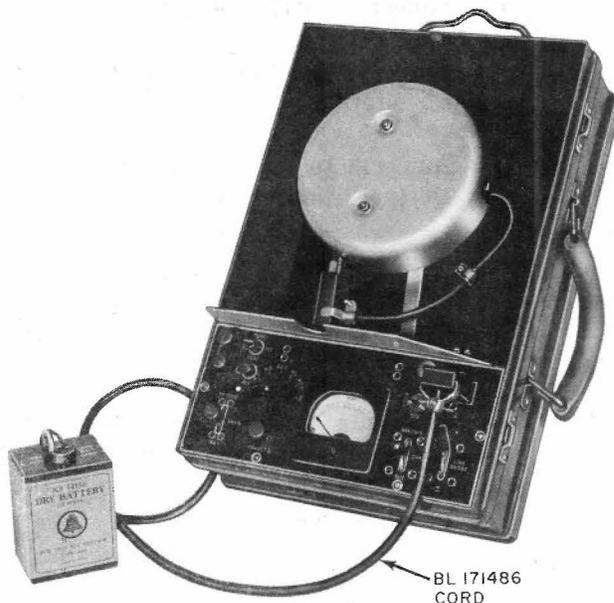


Fig. 17—Testing Individual Battery

9.03 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.

9.04 See Fig. 18 for battery replacement.

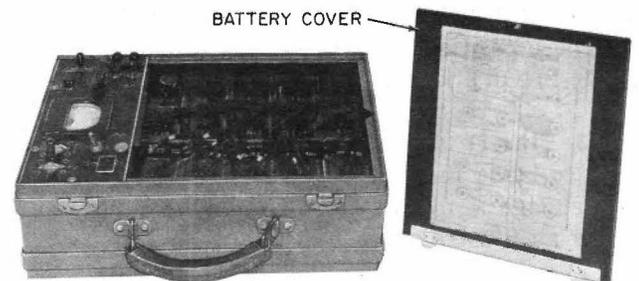


Fig. 18—Battery Replacement

9.05 To make a more positive test of the condition of the 4-1/2 volt KS-6570 batteries, connect a KS-8455 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.

9.06 The 1-1/2 volt KS-14495 battery should be changed when the ohmmeter in the KS-14103 test set cannot be adjusted to zero as outlined in 7.06.

9.07 Fuse: The fuse (Littelfuse 361.031, 1/32 ampere) 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. The spare fuse holder, located on the aluminum crosspiece directly behind the meter, holds one spare fuse.

Note: On later tests sets, a 100A varistor has been substituted for the fuse. Test sets with fuses may be modified in accordance with local practice.

10. MAINTENANCE OF BUZZER IN L5 TEST SET

10.01 The output of the KS-14485 L1 buzzer should be kept at or near the maximum for best results when used as a source of exploring coil tone.

10.02 Buzzer Adjustment: Connect the line cord to the set and short the test clips.

At any position along the line cord, place a 101B or 105D 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 to 4.5 volts, OHMS key operated to BUZ (locking) position, TONE key to continuous, and LINE SHORT key operated.

10.03 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 in Fig. 19.

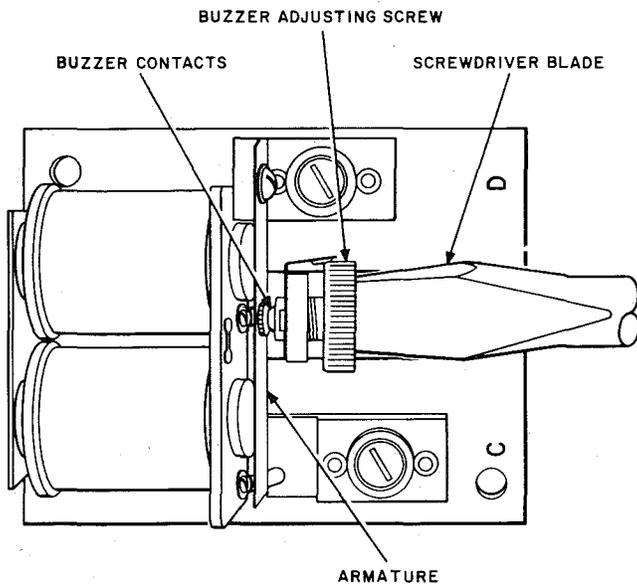


Fig. 19—KS-14485 L1 Buzzer

10.04 Back off the adjusting screw by turning it in a counterclockwise 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 counterclockwise until the maximum is reached.

Note: Do not force the adjusting screw as it is made of brass and the threads can be stripped easily.

11. PARTS

11.01 Replacement Parts: The following parts for the KS-14103 L5 test set may be obtained.

BATTERIES

KS-6570 (4.5 volts)

KS-14196 (45 volts)

KS-14495 (1.5 volts)

CORDS

BL-171486 (Battery test cord)

W2FW (Connects set to terminals)

P2DB (For central office use ONLY)—Connects to L5 set and to the following cords:

P2CY—Connects to 444-type jacks

P2DC—Connects to C50, 1177, or 1268 protectors

2P34A—Connects to 121-type protectors or 300-type connectors

W2GD—Connects to 302-type connectors. Cannot be used on 303-type connectors due to a tip-ring reversal in the panel wiring

W2GM—Connects to 303-type connectors. Cannot be used on 302-type connectors due to a tip-ring reversal in the panel wiring.

FILTER

KS-14103 L4

FUSE

Littlefuse 361.031, 1/32 ampere

11.02 When repairs are required, the sets should be returned in accordance with local procedures for making repairs. No field repairs other than changing the batteries or the filter are recommended. When necessary to replace the earlier model test sets, the KS-14103 L6 should be ordered.