

**KS-14103 L6 TEST SET**  
**(BREAKDOWN)**  
**DESCRIPTION, USE, AND MAINTENANCE**

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**1. GENERAL**

1.01 This section covers the description, use, and maintenance of the KS-14103 L6 test set (breakdown).

1.02 This section includes information formerly contained in Sections 106-330-105 and 634-305-501.

1.03 The KS-14103 L6 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.*

**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.**

- 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

**NOTICE**  
Not for use or disclosure outside  
Southwestern Bell Telephone Company  
except under written agreement.

REMOVED FROM BLOCKS BEFORE ATTEMPTING  
BREAKDOWN.

- ALL SPLICES MUST BE WRAPPED BEFORE  
BREAKDOWN VOLTAGE IS APPLIED.
- THE RANGE SWITCH SHALL BE IN THE 500V  
POSITION WHEN ATTEMPTING BREAKDOWN.
- BEFORE APPLYING BREAKDOWN VOLTAGE,  
VERIFY THAT:

- (1) THE PAIR HAS BEEN ISOLATED AT THE  
CENTRAL OFFICE.

- (2) ALL SUBSCRIBER CONNECTIONS HAVE  
BEEN REMOVED.

- PERFORM SAFETY TESTS SPECIFIED ON L7  
POWER UNIT LABEL BEFORE EACH USE.
- PERIODICALLY CHECK ALL BATTERY LEADS  
INSIDE THE L8 CONTROL UNIT TO ENSURE  
THAT THEY ARE INSULATED AND NOT IN  
DIRECT CONTACT WITH THE L8 UNIT HOUSING.

*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 L6 test set consists of the L7 power unit and L8 control unit. The L7 power unit (Fig. 1) is 19 inches long, 11-1/4 inches wide, 8-1/2 inches high and weighs 38 pounds complete with batteries and removable lid which also serves as the storage compartment for the L9 power cord. Fourteen KS-14196 (45 volt)

batteries must be ordered separately. These batteries provide **630V dc at 5 amp dc power** for the breakdown test. The L7 power unit, in addition to the high voltage-high current battery supply, contains a filter for reducing interference in the circuit and a water-resistant compartment for housing the control relays and batteries. A carrying handle is provided on one end of the case and a pole stick handle on the opposite end.

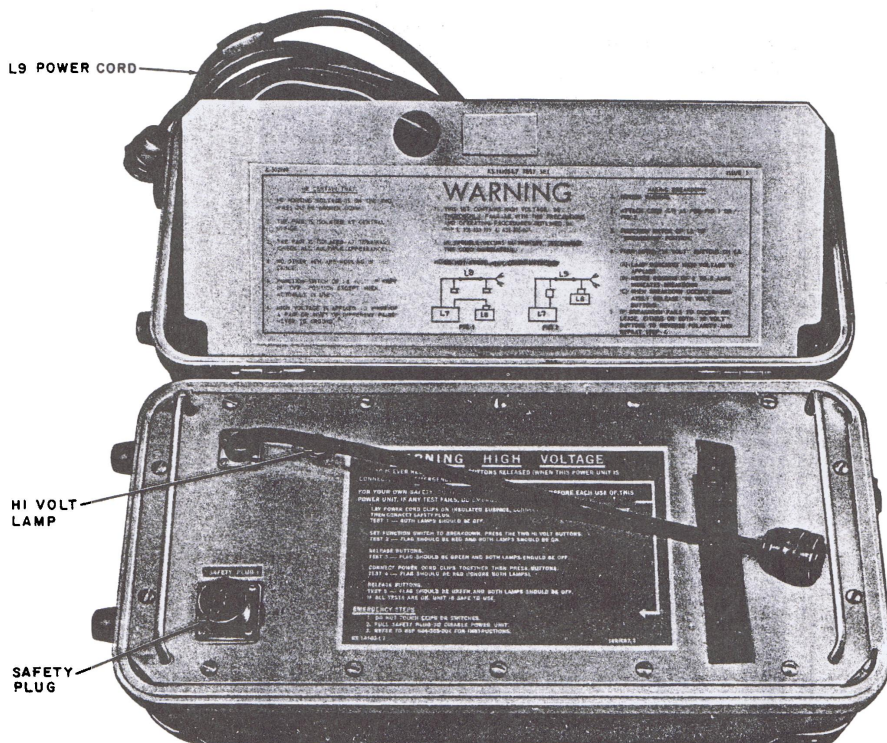


Fig. 1—KS-14103 L7 Power Unit

**3.02** The L8 control unit (Fig. 2) is 11-1/4 inches long, 9 inches wide, 6-5/8 inches high and weighs 9-3/4 pounds complete with batteries and removable lid which also provides storage space for the L10 tone cord. One KS-14368 (1-1/2 volt) battery, one KS-14369 (45 volt) battery one KS-14196 (45 volt) battery are required for power and must

be ordered separately. The control unit contains a dc voltmeter, an ohmmeter, a signal generator, a breakdown current ammeter, high voltage indicator lamp and voltage sensitive flag indicator, associated controls, and indicators within a water resistant compartment of a fiberglass case that has an adjustable shoulder strap.

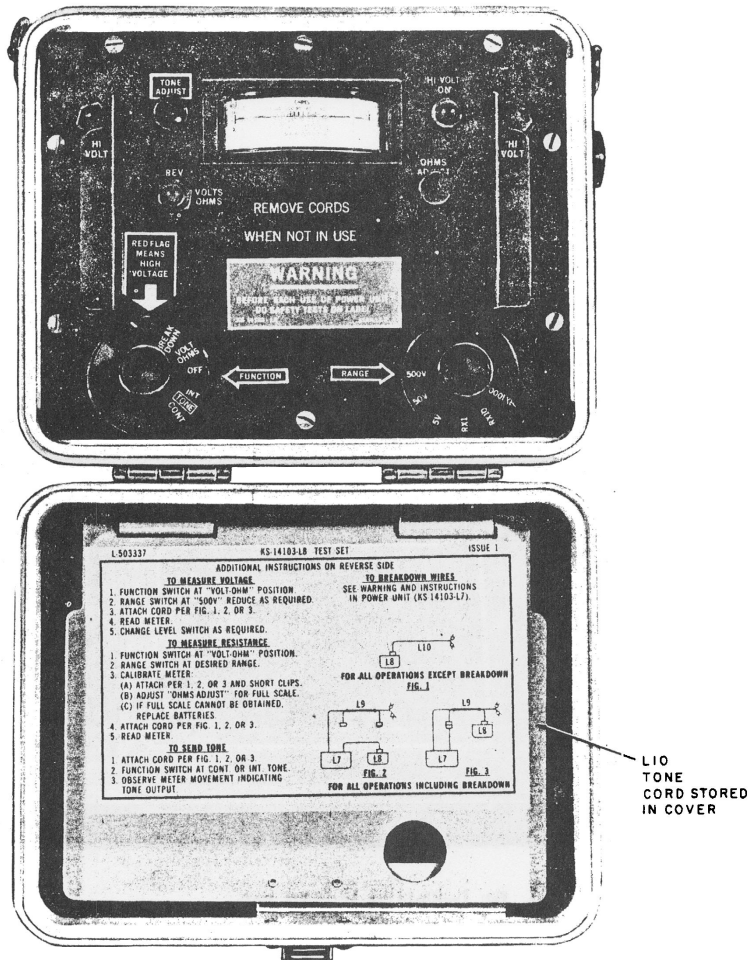


Fig. 2—KS-14103 L8 Control Unit

**3.03 Switch positions and functions: (Fig. 3)**

DC Voltmeter: (FUNCTION switch set to VOLT-OHM)

RANGE: 5 VDC, 50 VDC, 500 VDC full scale depending on RANGE switch setting. (Read red scale)

Accuracy:  $\pm 10\%$  of full scale setting.

Ohmmeter: (FUNCTION switch set to VOLT-OHM)

Range: x1, x10, x1000 of meter reading depending on RANGE switch setting (Read black scale)

Accuracy:  $\pm 10\%$  of midscale value. For the highest accuracy on a given range, use L10 cord to zero the ohmmeter. To zero ohmmeter, short test clips and adjust the OHMS ADJUST control for a reading of 0 on the meter (ohms-scale).

Signal Generator: (FUNCTION switch set to TONE INT. or CONT.)

Frequency: 577.5 Hz interrupted and continuous

Period of interrupted signal may be varied (internal adjustment) from 0.1 to 1.0 seconds.

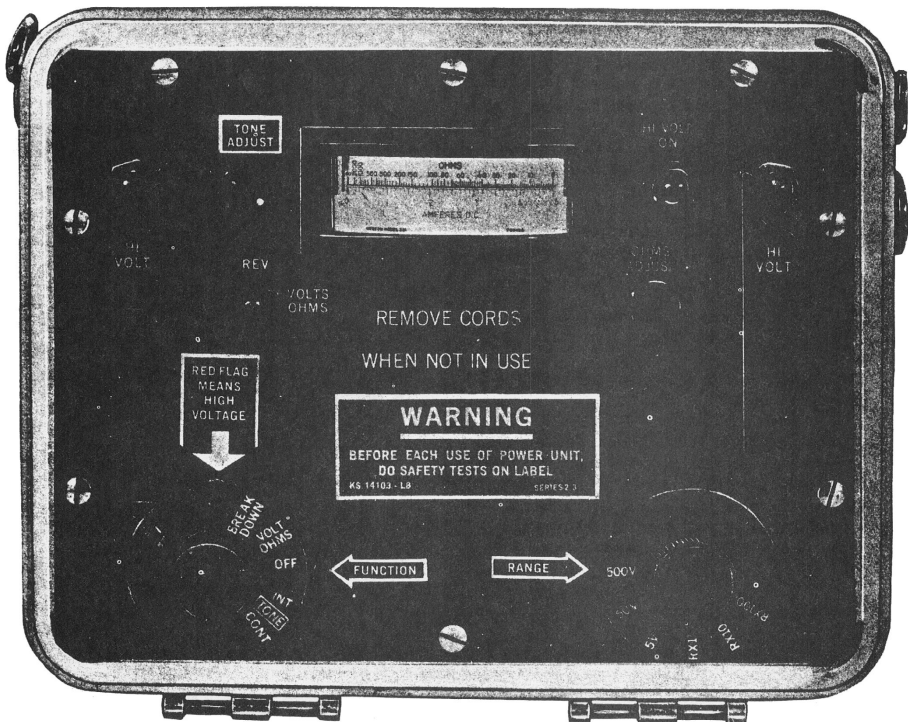


Fig. 3—L8 Control Panel

**Peak Output Voltage:** 16 volts minimum (into 100 ohm load) with TONE ADJUST control set to maximum clockwise position. 2 volts maximum (into 100 ohm load) with TONE ADJUST control set to maximum counterclockwise position.

**Output Indicator:** Panel meter responds to output current

**Tone Control:** Where possible, use in maximum counterclockwise position to help preserve battery life.

**VOLT OHMS REV:** With the FUNCTION switch set to VOLT-OHM and the RANGE switch set to RX1000, ballistic tests (opens or connected station) can be made in the same manner as with the test desk voltmeter or KS-8455 test set. Having made the connections, depress the VOLT-OHM-REV button and observe needle deflection. A reading greater than one third scale deflection indicates capacitance and the probable presence of a ringer on the line.

**Flag Indicator:** Indicates the application of breakdown voltage to connected conductors.

**3.04** The KS-14103 L9 power cord is 35 feet long, weighs about 6-3/4 pounds, and is used to:

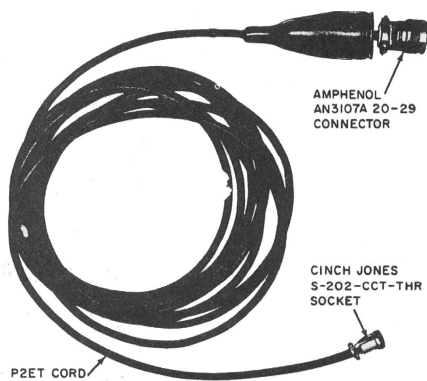
- (a) Connect the L7 power unit to the cable conductors under test;
- (b) Interconnect the L7 power unit and the L8 control unit.

**3.05** Connections to the L7 power unit are made by a nonlocking, molded connector (safety plug) which mates with the panel mounted connector on the power unit (completes battery circuit) and by a small, potted connector which mates with the pigtail assembly of the power unit. At the

other end of the cord, insulated clips are provided for connection to the cable conductors under test and a small, potted connector provides connection to the L8 control unit. Also provided is a strap to be used for securing the cord to the strand and in coiling the cord for storage.

**3.06** The KS-14103 L10 tone cord is 4 feet long, weighs 1/4 pound, and may be used with the L8 control unit for all testing except breakdown. Insulated test clips are provided at one end and a small, potted connector at the other.

**3.07** The P2ET cord (Fig. 4) and W2GM cord (Fig. 5) in conjunction with the cords illustrated in Fig. 6 are used to connect the KS-14103 L6 test set to conductors at a central office location ONLY. These cords must be ordered separately.



**Fig. 4—P2ET Cord**

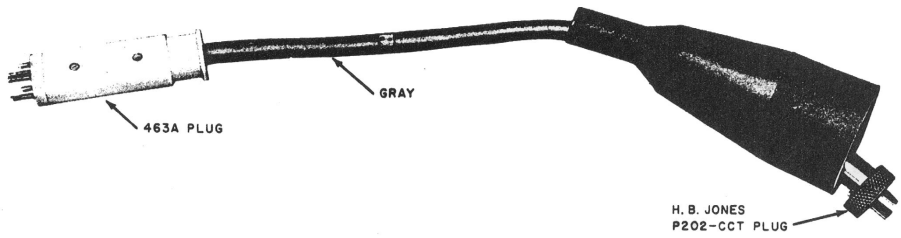


Fig. 5—W2GM Cord

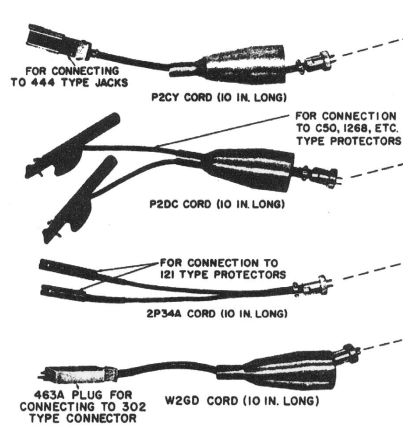


Fig. 6—Cords Used With KS-14103 I6 Test Set

- 3.08 The B glove bag (Fig. 7) is used to store the central office test cords.

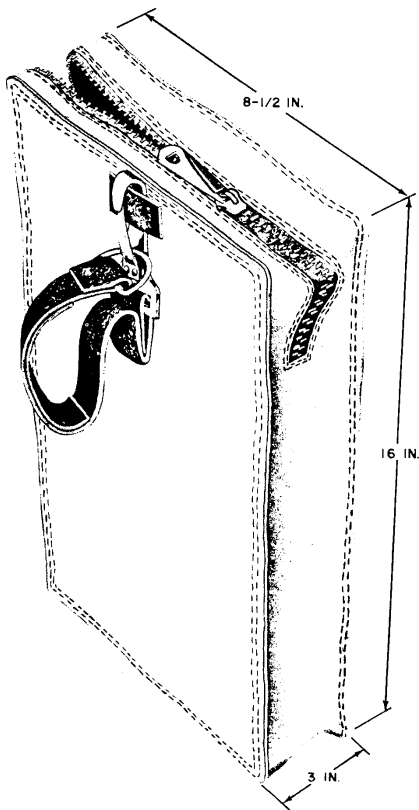


Fig. 7—B Glove Bag

#### 4. PREPARATORY WORK

4.01 The general location of the fault should be determined by analysis of the pair count affected. The resistance between wires, including the resistance of the fault, can be measured using the meter in L8 control unit.

4.02 If the general location of the fault is such that the pair or pairs involved can be isolated from the central office and from other terminations by opening the pairs at a cross-connecting terminal, control point, or access point, much preparatory work can be avoided.

4.03 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.

4.04 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.

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

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

4.07 Before making the test, call the test desk to determine whether other employees are working on the cable in the section in which the breakdown voltage will be applied. These employees shall be advised to suspend work in the cable and wrap the splice at their locations in the standard manner. ***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.



**4.08** 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.***

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

**4.10** Before testing, PBX lines SHALL be prepared as follows:

- (1) 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.
- (2) If no conversation is heard, remove the capacitor and repeat test.
- (3) 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.
- (4) 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.
- (5) If the above tests can be made with no evidence of a working pair, check for voltage across the pairs and then from each lead to ground. Use the L10 cord and L8 control unit with the FUNCTION switch set on VOLT OHMS and the RANGE switch on 5V, 50V, or 500V as appropriate (7.04 and 7.05). A volt ohmmeter may also be used for this test (KS-14510 or equivalent). If voltage is present, it is assumed the pair is terminated or a cable records discrepancy exists.
- (6) ***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 offices, 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. 8. Inspect the wire terminations and, if a skinner rests on a lug, place a No. 7 terminal punching insulator over the lug.

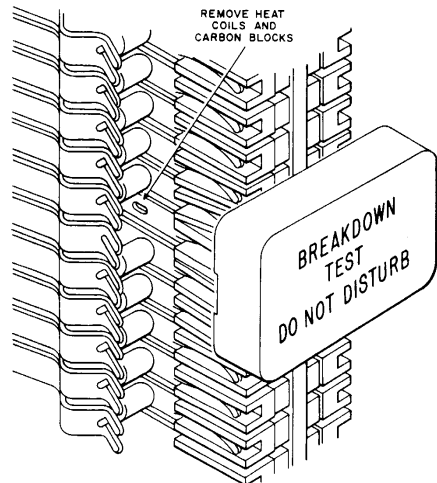


Fig. 8—B Warning Marker

(b) **B-Type Frames Equipped with 300-Type Connectors:** Install a C warning marker, illustrated in Fig. 9, on the pair.

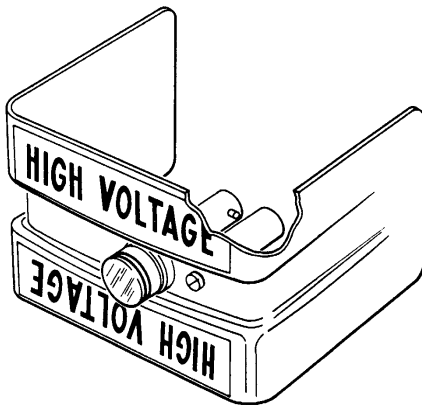


Fig. 9—C Warning Marker

(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. 10. 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.

(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.

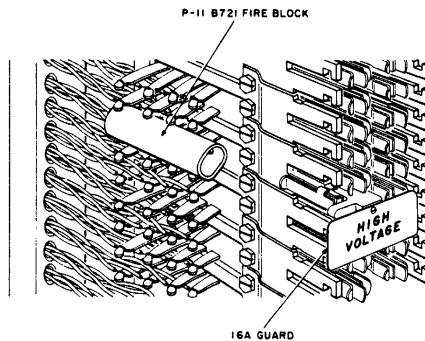


Fig. 10—Protecting B-Type Frames And 444-Type Jacks

(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. 11. The marker is red plastic with white lettering and is equipped with prongs for socket mounting.

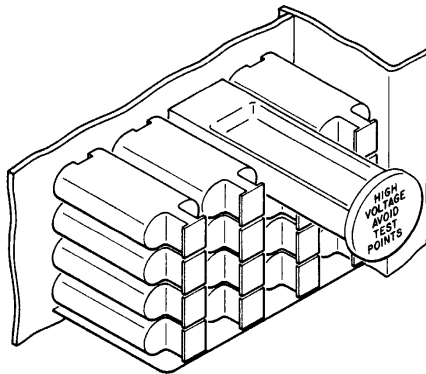
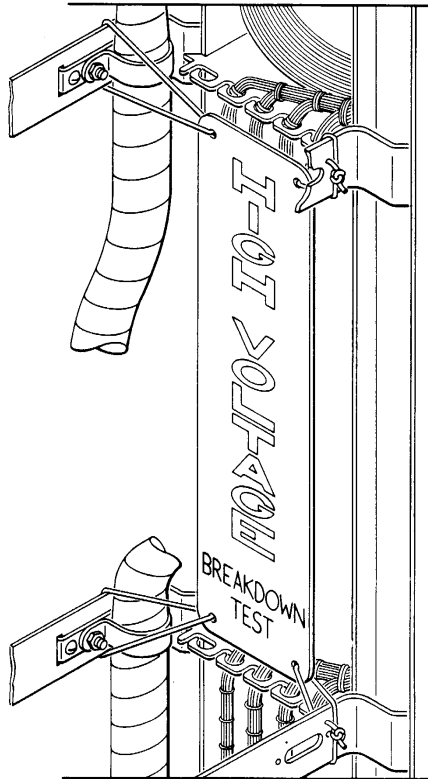


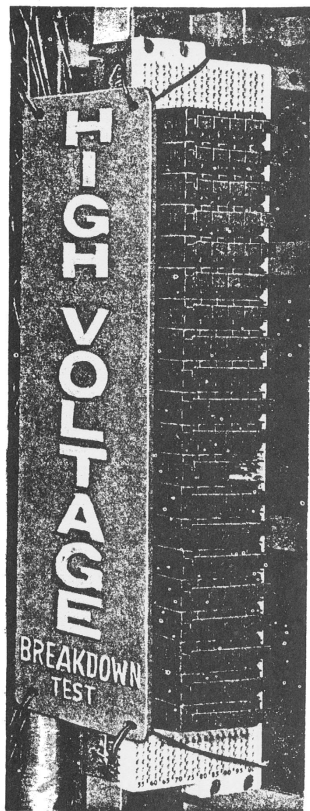
Fig. 11—E Warning Marker

(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. 12 and 13.

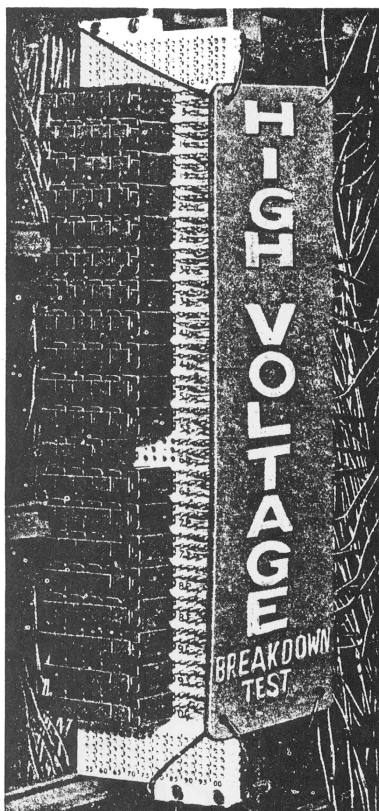
**5.03** Warning markers and signs, blocks, caps, and tags ***shall not be removed***, or jumpers restored until the breakdown tests are completed.



**Fig. 12—E Warning Sign Installed On Back Side of 302-Type Connector**



A



B

Fig. 13—E Warning Sign Installed On 303-Type Connector

## AT DISTRIBUTION AND CROSS-CONNECTED 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 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 as illustrated in Fig. 14.
- (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**.

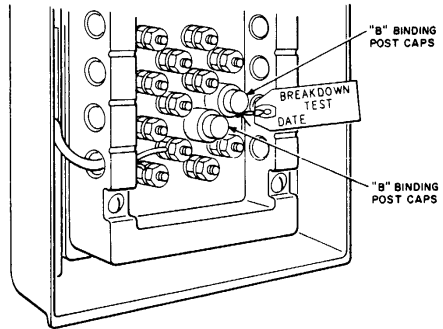


Fig. 14—F-Type Terminal Correctly Protected

## 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 where arcing or smoke can be seen so steps can be taken immediately 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

### PRETESTING

**7.01** To assure the isolation of a cable section, check for office battery using the L8 control unit with the L10 cord attached to the pair to be tested. Place the FUNCTION switch in the VOLT-OHM position and the RANGE switch to 500V. Measure the voltage between tip and ring as well as tip-ring-ground of the pair to be tested. Change RANGE switch as required to read any voltage present. The presence of voltage indicates that the pair is not isolated. **DO NOT PERFORM FURTHER TESTS UNTIL THE PAIR IS CLEARED.**

### BALLISTIC TEST (OPENS OR CONNECTED STATIONS)

**7.02** If the test is to be made at the CO, select the appropriate cord as listed in Table A. If the test is to be made in the field, use the L10 cord.

**TABLE A**

**CORDS USED WITH BREAKDOWN TEST SET**

CODE	APPLICATION
P2ET	Connects to other test cords for central office use <b>ONLY</b>
W2GM	303-type connectors
W2GD	302-type connectors

**7.03** Tests for opens and connected stations can be made by operating the VOLT-OHM REV pushbutton switch (Fig. 3) and observing the meter deflection with the switches in the following positions.

SWITCH	POSITION
FUNCTION	VOLT-OHM
RANGE	R $\times 1000$

A reading greater than one third scale deflection is an indication of capacitance and the probable presence of a ringer on the line.

### VOLTAGE MEASUREMENTS

**7.04** Any voltage on the pair can be measured with the L8 control unit and the L10 cord with the switches in the following positions:

SWITCH	POSITION
FUNCTION	VOLT-OHM
RANGE	500V

**7.05** Attach the L10 tone cord to L8 control unit and to the pair to be tested. Read meter and change RANGE switch as required.

**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 switches in the following positions:

<b>SWITCH</b>	<b>POSITION</b>
<b>FUNCTION</b>	VOLT-OHM
<b>RANGE</b>	$R \times 1$ , $R \times 10$ , $R \times 1000$

Resistance measurements are made before and after breakdown: before to determine which pair to apply breakdown voltage, after to measure distance to fault.

**Note:** The ohmmeter should be zeroed by shorting the ends of the test leads and turning the knob of the OHMS ADJUST control to obtain a zero reading on the meter.

**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.

**TABLE B****WIRE RESISTANCES**

GAUGE	APPROX. FEET PER OHM	APPROX. OHM PER 1000 FT.
19	125	8
22	62	16
24	40	26
26	25	42

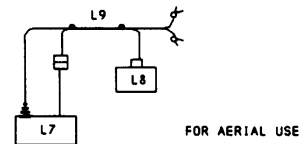
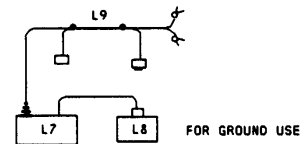
**Note:** The loop-feet-per-ohm is one half the single-conductor-feet-per-ohm.

**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** With the FUNCTION switch on the L8 control unit in the OFF position, connect the L7 power unit to the L8 control unit using the L7 interconnecting cord and L9 power cord. (Fig. 15)

**7.10** Place FUNCTION switch to breakdown position and perform safety tests as outlined on L7 power unit label.

**FOR AERIAL USE****FOR GROUND USE****Fig. 15—L7 and L8 Connections**



*Should indicator flag show red (Fig. 16) when connections are made and HI VOLT switches are not pressed, PULL SAFETY PLUG IMMEDIATELY, DO NOT ATTEMPT TO USE. Both units should be returned for repair.*

Upon completion of the safety test, return the FUNCTION switch to the OFF position.

7.11 Observe the following test sequence when making breakdown.

- (1) Attach clips to pair under test.
- (2) NEVER CONNECT BETWEEN ONE WIRE AND GROUND.
- (3) Place RANGE switch to 500V.

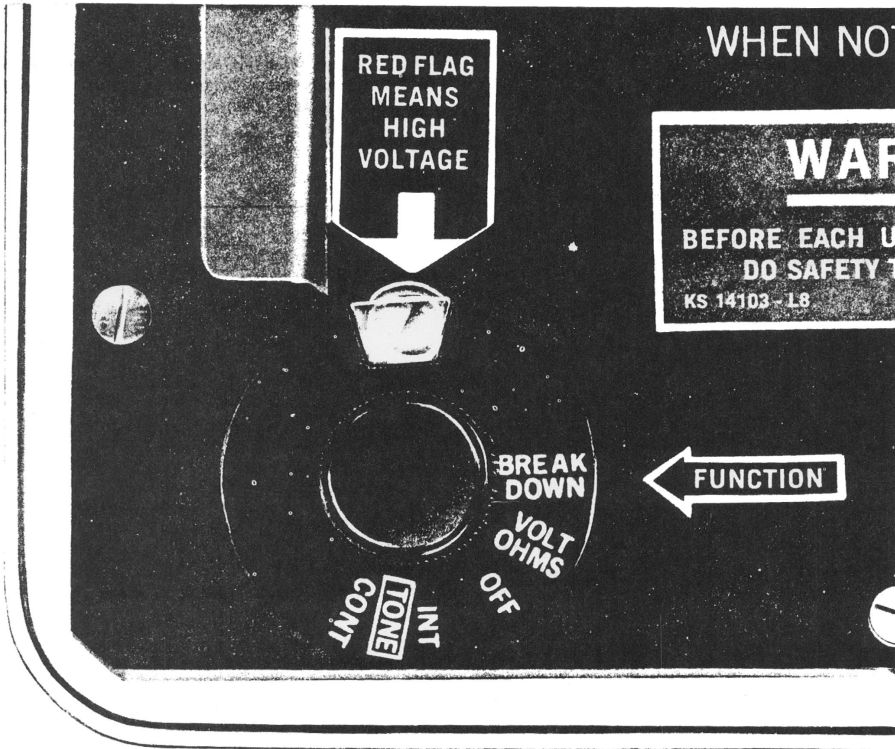


Fig. 16—Indicator Flag On L8 Control Unit



- (4) Place FUNCTION switch to the BREAKDOWN position (flag will be GREEN).
- (5) Depress both HI VOLT switches momentarily (about one second). Flag will show red and HI VOLT ON lamp will light indicating the presence of high voltage.
- (6) Continue to depress and release both HI VOLT switches until a reading greater than 2 amps is indicated on the meter.
- (7) When the fault breaks down, the meter will show a reading of 2 to 5 amperes. Release the HI VOLT switches.
- (8) Measure the resistance of the loop per 7.06. If the tip-to-ring resistance is less than 750 ohms, proceed as outlined in 7.15.
- (9) If the resistance cannot be reduced to 750 ohms or less, transfer operations to another pair, taking the necessary precautions exercised on the initial test pair. If operations on this pair are not successful, try a third pair.
- (10) Sometimes the fault can be broken down by applying voltage from the terminal at the other end of the faulty section.
- (11) When breakdown occurs, immediately release the HI VOLT switches.

**7.12** If the fault cannot be broken down by applying the breakdown voltage between the wires of a pair, apply the breakdown potential between the sides of the pairs having the lowest insulation resistance. OBSERVE ALL PRECAUTIONS OUTLINED FOR INITIAL TEST PAIRS.

**7.13** If the flag on the L8 control unit remains red after the HI VOLT switches are released or if arcing occurs in the set, pull safety plug from the L7 power unit and disconnect the L9 power cord. DO NOT OPERATE FUNCTION SWITCH TO OFF POSITION UNTIL L9 POWER CORD IS REMOVED FROM L7 POWER UNIT.

**7.14** Whenever more than one employee is involved, care shall be taken that the HI VOLT switches are not operated by one employee while there is a possibility of the other coming in contact with the test clips, cable, or the terminal.

## **APPLYING TRACING TONE TO FAULTY PAIR**

**7.15** Attach the L10 tone cord from the L8 control unit to the faulty pair (also see diagram on inside cover of L8 control unit). Position the FUNCTION switch to the TONE position (either INT or CONT) and rotate the TONE ADJUST control to the full counterclockwise position. This will minimize interference on adjacent circuits and reduce the possibility of the tone (tracing current) carrying beyond the fault. Observe movement of the meter needle indicating tone output.

**7.16** With the tone operating, the exact location of the fault can be determined by locating it with an exploring coil. Listen for tone in both directions on the cable, the tone will be strongest toward the fault. If the tone is weak, rotate the TONE ADJUST control clockwise to a useful level. If the control unit is left unattended, close the cover for protection.

**7.17** After the fault has been located, turn the FUNCTION switch to the OFF position and disconnect the tone cord.

## **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.*

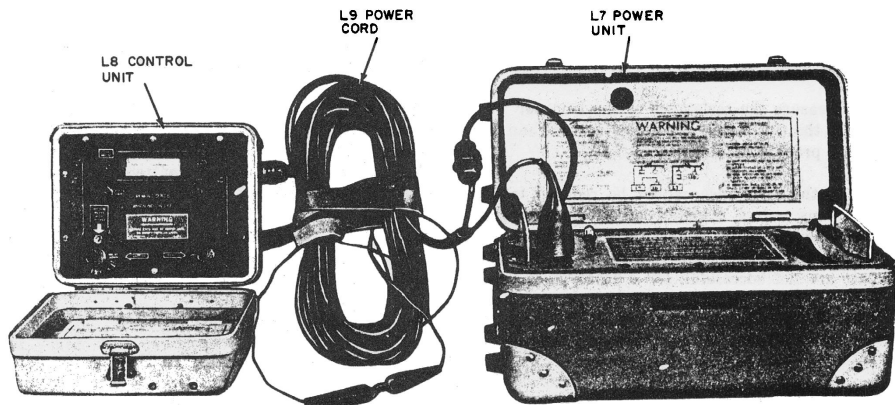
**8.04** On plant operating under the Dedicated Plant Plan, restore all connections and remove any tags as soon as practical after tests have been completed.

**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 crew working in the cable that tests have been completed.

## 9. MAINTENANCE

**9.01** Maintenance should be limited to replacement of batteries and/or HI VOLT lamp. The following tests can be performed to tell which batteries need replacement.

**9.02** Interconnect the L7 power unit with the L8 control unit using the L9 power cord (Fig. 17) and short the clips of the cord. Set the L8 FUNCTION switch to BREAKDOWN, the RANGE switch to 500V and depress both HI VOLT switches.



**Fig. 17—Interconnecting L7 Power Unit With L8 Control Unit Using L9 Power Cord**

(a) Replace the KS-14369 battery in the L8 control unit (Fig. 18) and check HI VOLT lamp if the flag indicator stays green, the HI VOLT lamp does not light, or the function relay in the L7 power unit does not click.

**Note:** Ensure that all leads are insulated and provide sufficient clearance of the battery terminals from the L8 case housing.

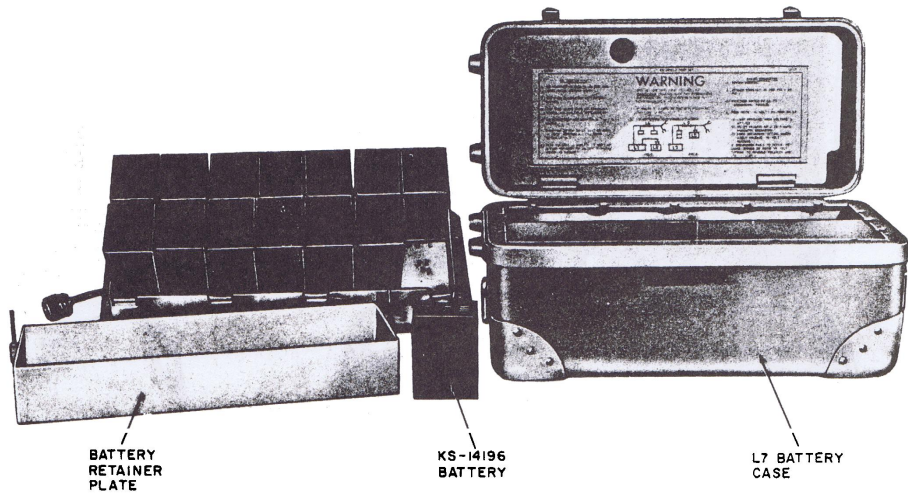


Fig. 18—Battery Replacement In L7 Power Unit

- (b) Replace the fourteen KS-14196 batteries in the L7 power unit (Fig. 19) if the meter reads less than 2 amps.

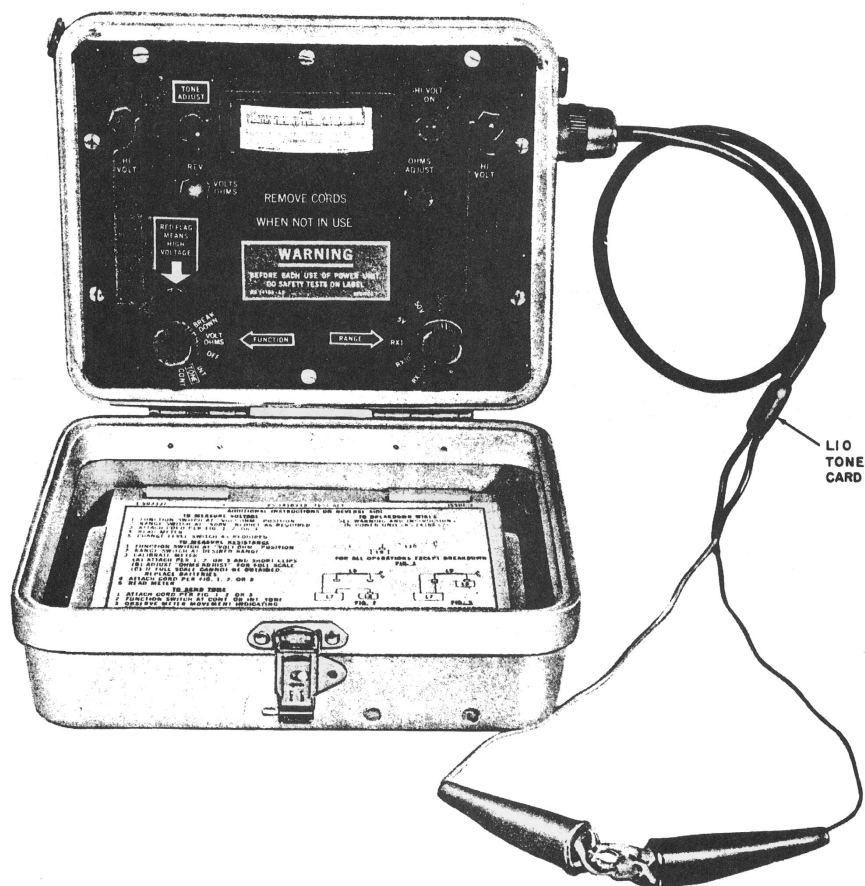
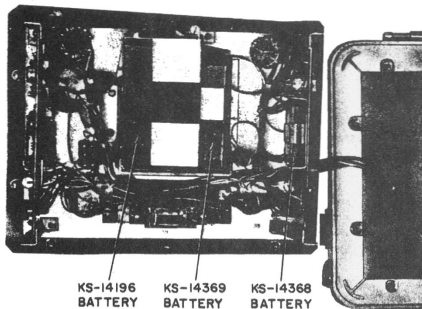


Fig. 19—Testing Batteries In L8 Control Unit

**9.03** Disconnect the L9 power cord and connect the L10 tone cord to the L8 control unit. Short the clips of the L10 tone cord (Fig. 20).



**Fig. 20—Battery Replacement In L8 Control Unit**

- (a) Replace the KS-14368 battery in the L8 control unit if the meter cannot be zeroed with the FUNCTION switch set to VOLT OHMS and the RANGE switch to RX1 or RX10.
- (b) Replace both KS-14196 and KS-14369 batteries in the L8 control unit if the meter will not zero when the RANGE switch is in the RX1000 position.
- (c) Replace the KS-14196 battery in the L8 control unit if the meter needle does not move when the FUNCTION switch is placed in a TONE position and the TONE ADJUST control is rotated full clockwise.

## **10. PARTS**

**10.01** Replacement Parts: The following parts for the KS-14103 L6 test set may be obtained.

### **BATTERIES**

- KS-14196 (45 volts)
- KS-14368 (1.5 volts)
- KS-14369 (45 volts)

### **CORDS**

- KS-14103 L9
- KS-14103 L10

P2ET (For central office use ONLY)—Connects to L6 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.