

## PBX CORD CIRCUIT TEST SET

SD-66484-01 (J54703A)

### DESCRIPTION

#### 1. GENERAL

1.01 This section describes the PBX cord circuit test set (Fig. 1) designed primarily to test the cord circuits of the various types of PBX switchboards in general use. This test set is also used for making tests of switchboard position circuits. One of the features of the test set is the provision for making ac continuity tests to determine the continuity and bridge balance of the various parts of the cord circuits. The test set uses the normal PBX battery supply.

1.02 This section is reissued for the following reasons:

(a) To change apparatus as follows:

- (1) 528 receiver — replaced with 716D receiver.
- (2) 863 cord — replaced with an M2DC cord.
- (3) W3A cord equipped with 110 plug and three 59 cord tips — replaced with 3W3A patching cord.

(b) To revise the circuit diagram to agree with the schematic diagram.

(c) To include reference in Preparation to a patch jack box (to be constructed and used when testing the 608-type PBX switchboard).

(d) To add Part 3, Preparation, which was formerly covered in Part 4, Application.

(e) To revise Part 4, Application, to more closely agree with the operational tests for the PBXs.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

#### 2. DESCRIPTION OF APPARATUS

2.01 The apparatus of the test set is assembled in the "Size A" (hand-size) standard metal portable test box which is approximately 6 inches long by 4 inches wide by 4 inches deep. Within the box are several resistors and capacitors and a repeating coil. Mounted on the top or panel are three lever-type keys designated EXT-SP, TRNS-TRK, and FL-T, a turn-button key designated LV-HV, a test (TST) lamp, a high frequency buzzer, and two binding posts for the test receiver cord.

2.02 Four jacks, which are located in one end of the box (Fig. 2), are designated EXT, TRK, SP, and BAT G. The front and rear PBX cords under test are connected to the TRK and EXT jacks. An idle cord is normally connected to the SP jack and a W3A cord is connected to the BAT G jack. These latter two cords supply battery, ground, and ringing current to the test set.

2.03 The TST lamp functions as an indicator when testing cord circuit holding bridges and dialing circuits.

2.04 The buzzer supplies tone for the ac continuity test.

2.05 The following apparatus is not provided as part of the test set and is furnished only when specified on order:

(a) Patching cord, W3A cord, 12 feet long, equipped with three KS-6780 connecting clips, and one 310 plug (3W3A cord), for connecting battery and ground to the test set.

(b) Test receiver, 716D receiver, attached to an M2DC cord equipped with two 35 cord tips for monitoring purposes.

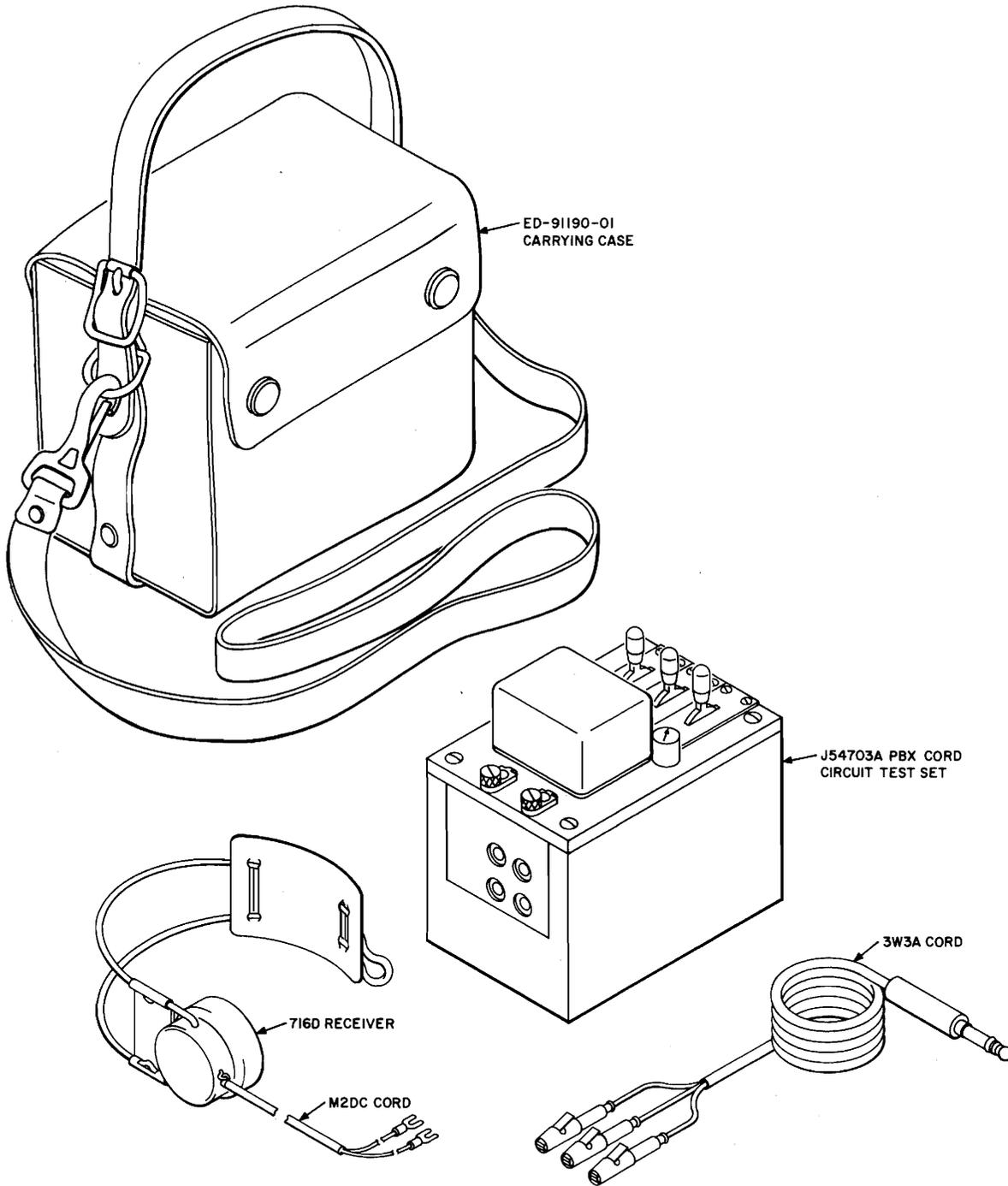


Fig. 1 — PBX Cord Circuit Test Set Equipment

(c) Light weight leather carrying case used for more convenient carrying of the test set and protection from damage.

**2.06** The LV-HV (low voltage — high voltage) key prepares the test set circuit for operation with either 14 to 28 volts or 32 to 52 volts at the PBX.

**2.07** The FL (flash) key establishes resistance paths to produce currents required for the operation and release of the supervisory relays when making current flow tests.

**2.08** The EXT (extension) key changes the test resistors to provide soak and loop conditions when performing supervisory relay tests.

**2.09** The TRK (trunk) key controls the sleeve condition on the TRK jack to provide battery or ground as required.

**2.10** The TRNS (transfer) key transfers the tip and ring testing leads in the test set from the TRK jack to the EXT jack and vice versa.

**2.11** The SP (spare) key connects the ring of the SP jack to the ring of the TRK jack and the top of the SP jack through the TST lamp to the tip of the TRK jack. Battery, ground, and ringing current are supplied from the cord in the SP jack to the cord under test in the TRK jack. The SP key is used when testing the dc bridges, the dial splitting feature in the attendant telephone circuit, and the recall feature of the PBX.

**2.12** The T (tone) key controls the operation of the buzzer and connects the buzzer tone to the testing circuit through balanced resistors.

**2.13** The TST (test) lamp is connected in series with the tip conductor between the SP jack and the SP key. The brilliancy of the lamp indicates the continuity of the various dc bridges referred to in 2.11.

### 3. PREPARATION

**3.01** Perform the following steps as required for preparation.

(a) Operate the LV-HV key to the HV position.

(b) Connect test receiver to REC binding posts on the test set.

(c) Connect the 310 plug of the W3A cord to the BAT G jack.

(d) Connect the tip and sleeve conductors of the W3A cord to the PBX ground.

(e) Connect the ring conductor of the W3A cord as specified in the operation test for the PBX being tested.

(f) Connect the front cord of the cord circuit to be tested to the TRK jack.

(g) Connect the rear cord of the cord circuit to be tested to the EXT jack.

(h) Connect an idle front cord of the cord circuit to be tested to the SP jack.

*Note:* When testing the cord circuit of the 608-type switchboard, a patch jack box is to be constructed to adapt the cord circuit test set to the plugs of the cord circuit. Refer to Figure 3 for construction of patch jack box.

### 4. APPLICATION (Figure 4)

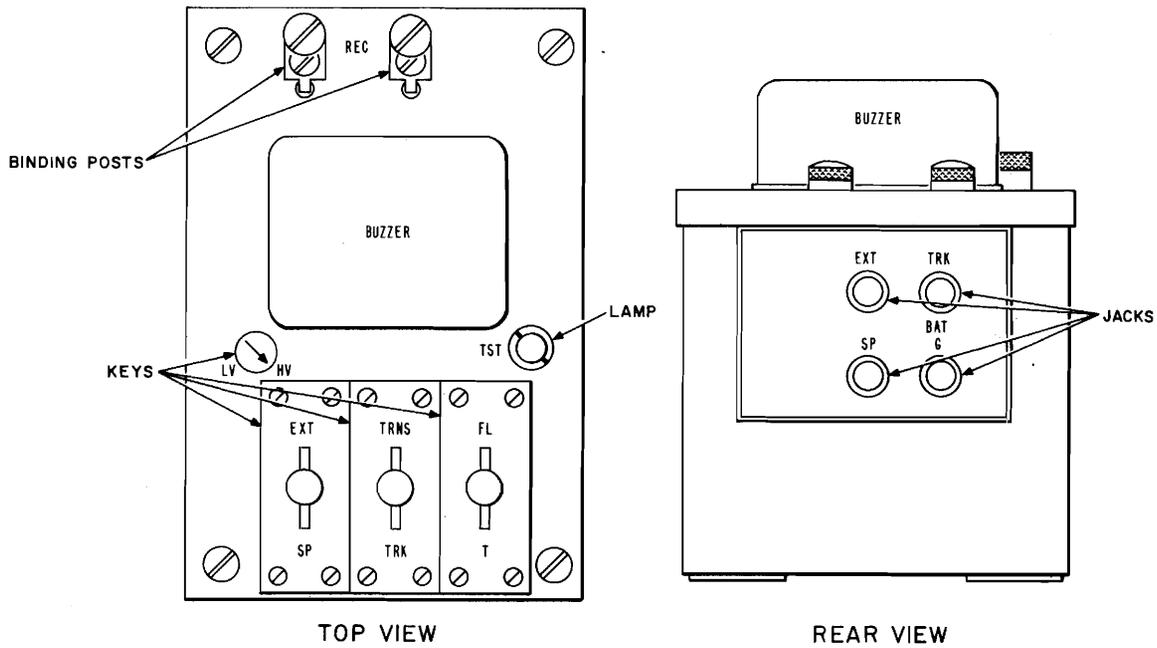
#### A. General

**4.01** With all keys normal, a resistor in series with the test receiver simulating the minimum insulation resistance of a PBX extension is connected across the T and R leads of the rear cord under test. This resistance is approximately 6860 ohms for the low voltage boards and approximately 14,860 ohms for the high voltage boards.

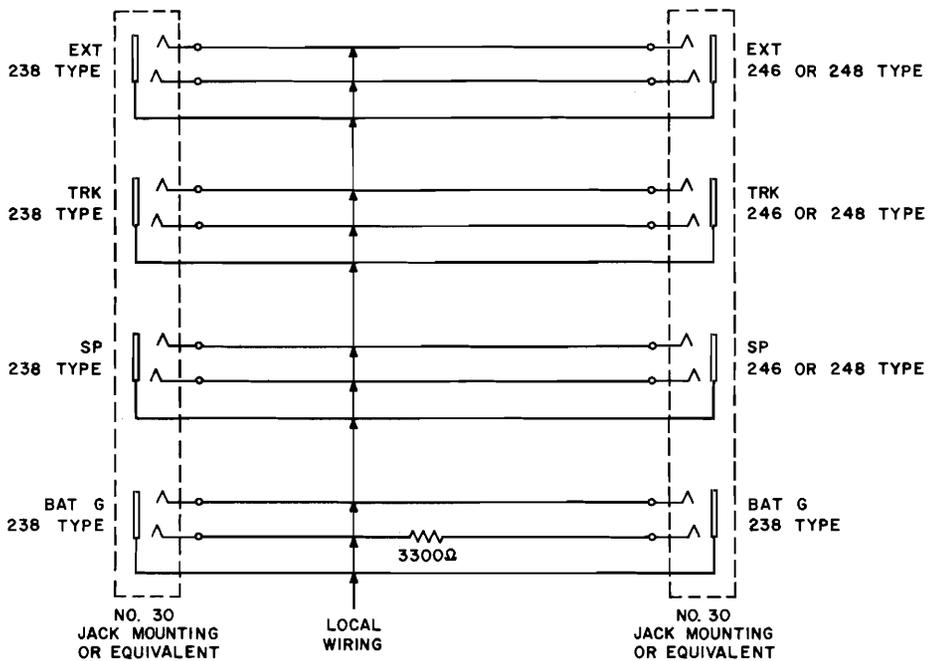
#### B. Supervisory Relay Test

**4.02** With preparations completed and all keys normal, the rear supervisory relay does not operate and both supervisory lamps are lighted. Operating the FL key connects ground to the ring of the rear cord causing the relay to operate and the rear supervisory lamp to extinguish.

**4.03** The operation of the EXT key (FL key remains operated) removes the ground from the ring lead and connects a resistor across the tip and ring of the cord in parallel with the high resistance path through the test receiver. This provides a resistance across the tip and ring of



**Fig. 2 — Cord Test Set Location of Jacks, Keys, and Lamp**



**Fig. 3 — Patch Jack Box to Adapt PBX Cord Circuit Test Box J54703A For Use With 608A PBX**

the cord of approximately 870 ohms for the low voltage boards and approximately 2900 ohms for high voltage boards. These resistances limit the current to a value which holds the supervisory relay operated as indicated by the rear supervisory lamp remaining extinguished.

**4.04** Releasing the FL key while the EXT key remains operated opens the lower resistance path which causes the relay to release as indicated by the lighting of the supervisory lamp. By intermittently operating and releasing the FL key, a flashing test is obtained.

**4.05** Operation of the TRNS key transfers the testing circuit to the front cord for duplication of the above test.

#### C. Cord Bridge Test

**4.06** When checking a low resistance bridge (40 to 350 ohms), operating the TRK and SP keys causes battery and ground to be supplied to the tip and ring of the cord circuit from the cord in the SP jack. The TST lamp indicates by its brilliancy when compared with similar tests on other circuits. When checking a high resistance bridge (1200 to 1870 ohms), operating the TRK, SP, and FL keys causes battery and ground to be supplied to the tip and ring of the cord circuit in the SP jack. The receiver is connected to the tip and ring of the EXT jack. The high resistance bridge is tested by noting the volume of the click produced when one terminal of the receiver cord is removed from the binding post of the test set and is tapped intermittently against the same binding post.

#### D. Dial Circuit Test

**4.07** With the SP and TRK keys operated, battery and ground is supplied to the tip and ring of the cord circuit from the cord in the SP jack. When the talk and dial key is operated on the cord circuit and the dial is rotated off normal, the TST lamp will increase in brilliancy. As the dial returns to normal, the TST lamp should flicker as the dial pulses are transmitted. The receiver is also connected through the EXT jack to the cord circuit which permits the maintenance personnel to listen for excessive clicks during dialing.

#### E. Recall Relay And Through Supervision Test

**4.08** With the SP and TRK keys operated, battery and ground is supplied to the tip and ring of the cord circuit from the cord in the SP jack. The resistors in series with the receiver prevent the rear cord supervisory relay from operating which causes the rear lamp to light. Operation of the FL key causes the rear cord supervisory lamp and the TST lamp to extinguish. When the FL key is released, the rear cord supervisory lamp lights but prevents the TST lamp from relighting.

**4.09** Operation of the ringing key in the spare cord circuit causes the front cord supervisory lamp and TST lamp to light. No ringing tone should be heard in the receiver. Releasing the ringing key causes the front cord supervisory lamp and TST lamp to extinguish. Operation of the talk and dial key in the cord circuit causes the TST lamp to light.

#### F. Recall Relay For Nonthrough Supervision Test

**4.10** With the SP and TRK keys operated, battery and ground is supplied to the tip and ring of the cord circuit from the cord in the SP jack. The resistors in series with the receiver prevent the rear cord supervisory relay from operating which causes the rear lamp to light. Operation of the night and through-dial key in the cord circuit causes the TST lamp to extinguish. Operation of the ringing key in the spare cord circuit causes the TST lamp and front supervisory lamp to light. When the ringing key is released, the front supervisory lamp and TST lamp extinguish.

#### G. Cord Splitting Feature Test For 550-Type, 551-Type and 600C PBXs

**4.11** With the SP and TRK keys operated, operate the talk and dial key of the cord circuit under test. Dial the digit 0 and allow the dial to return to normal. Restore the talk and dial key. The rear cord supervisory lamp and TST lamp are lighted. If the FL key is operated, the rear supervisory lamp and TST lamp are extinguished. When the FL key is restored to normal and EXT key is operated, the rear cord supervisory lamp flashes at the rate of approximately three times per second. This will continue until the talk and dial key of the cord circuit under

test is operated. The operation of the talk and dial key causes the rear supervisory lamp to light steadily.

#### H. Cord Splitting Feature Test For 608-Type PBX

4.12 With the T key operated, operate the TALK key of the cord circuit under test. This supplies a tone from the test set to the attendant telephone set. Operation of the SPLIT key on the switchboard removes the tone from the attendant telephone set. Another operation of the SPLIT key removes the split and tone is again heard.

#### I. AC Continuity Test

4.13 With the T key operated, the test circuit is set up to make an ac continuity test of the cord circuit. This test checks the cord for such defects as opens, cut-outs, and microphonic effects in keys, frayed cords, low resistance to ground of the ring side of the circuit, open shunt windings of the supervisory relays, etc.

*Note:* When testing cords have the windings of the supervisory relays connected to both tip and ring, operate the EXT key to short circuit the A and B resistors in the test set.

4.14 When making an ac continuity test, the operation of the T key closes a circuit to the buzzer, and the interruptions of the buzzer produce an alternating potential in the secondary of the repeating coil. The current setup divides between the tip and ring of the cord. As long as the circuit conditions of the tip are the same as for the ring, there will be no difference in voltage at the outer ends of the resistors C and D, at which point the receiver is connected and no tone is heard. Resistors A and B in the test circuit are intended to balance the resistance of the supervisory relays. Any defect in the cord circuit causes a greater flow of alternating current in one side of the circuit than in the other and produces a corresponding voltage difference between the points where the receiver is connected. Tone will then be heard.

#### J. Make Contacts Of Ringing Keys Test

4.15 With the operation of SP key in the test set, the night and through-dial key in the spare cord, and the ringing key of the front cord under test, ringing current will be applied to the

TRK jack causing the TST lamp to light steadily. Ringing current from the TST jack to the SP jack causes the front cord supervisory lamp on the spare cord circuit to light steadily. When the ringing key is released, the lamps are extinguished.

*Note:* When the 604C PBX is being tested, disregard the front supervisory lamp on the spare cord circuit. It will remain lighted throughout the test.

4.16 Operation of the TRNS key transfers the testing circuit to the ringing current on the rear cord connected to the EXT jack. The same test can be applied by operating and releasing the rear ringing key of the cord under test.

#### K. Nonclick Test Of Keys

4.17 With the talk and dial key and night and through-dial key on the cord circuit under test and the SP key on the test set operated, battery and ground are applied from the spare cord through the SP and TRK jacks to the front cord circuit. Battery and ground are furnished from the tip and ring of the cord circuit under test to the receiver through the EXT jack. Under this condition, no click is heard when the talk and dial key is allowed to return to normal. Overthrow on the night and through dial key is checked by restoring the SP key and operating the TRK key. This action shorts out the B resistor in the receiver circuit. Battery and ground are furnished by the cord circuit under test to the receiver. No click is heard when the night and through dial key is returned to normal.

4.18 Overthrow on the front ringing key can be checked by operating the front ringing key and allowing it to return to normal. No click should be heard when the ringing key is released.

4.19 The back ringing key can be checked for overthrow by operating the TRNS key and repeating 4.18.

#### 5. MAINTENANCE

5.01 By removing the four screws in the test set panel and lifting the set out of the case, the apparatus becomes accessible for repairs. Occasional adjustment of the buzzer may be necessary in order to maintain a satisfactory tone but other repairs will usually be made upon service order.

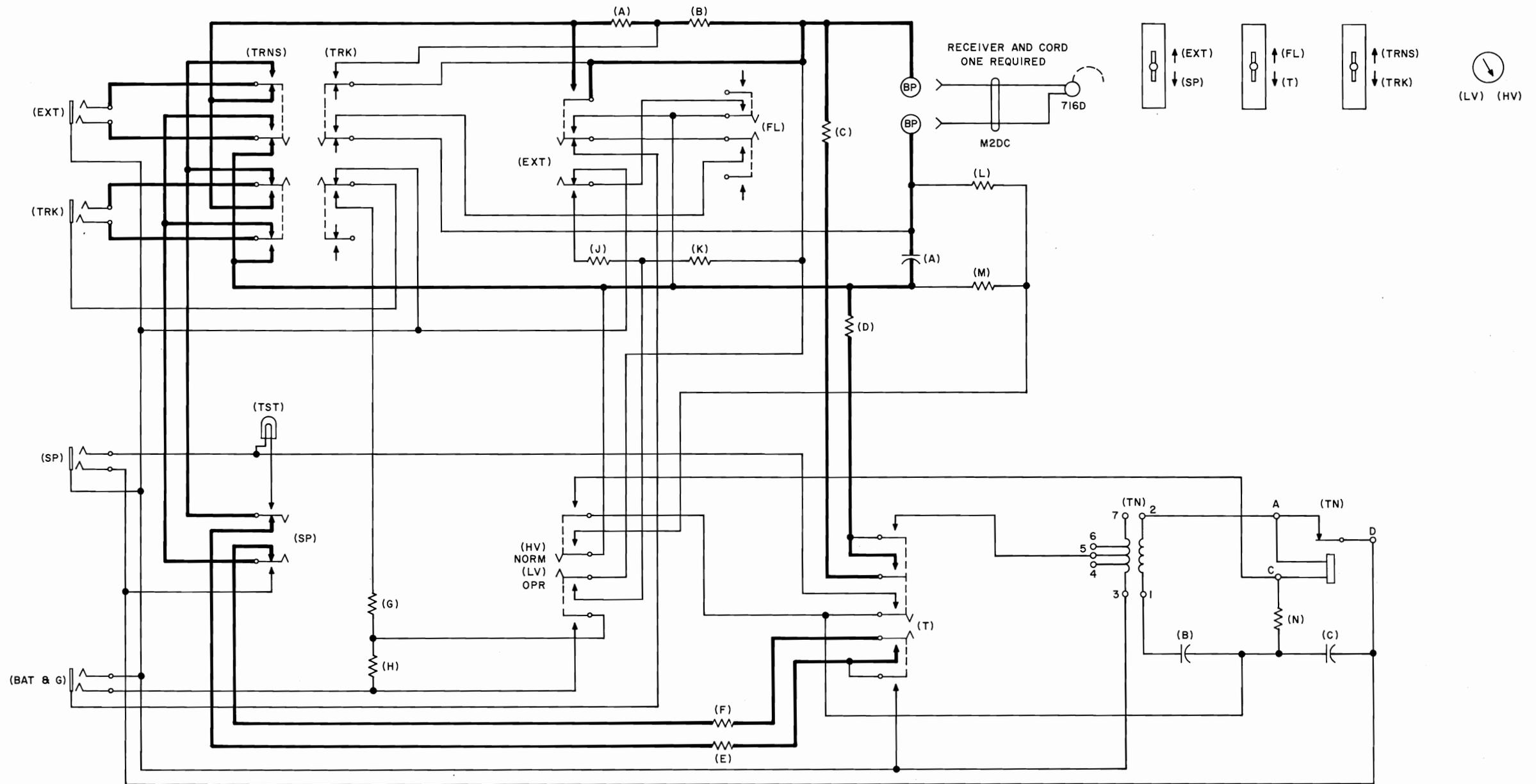


Fig. 4 — PBX Cord Circuit — Schematic Diagram