SWITCHBOARD TEST CIRCUIT PER SD-15174-01

NO. 12 SWITCHBOARD

1. GENERAL

1.01 This section describes the principal functions of the test circuit per SD-15174-01 which is used for testing the circuits of switchboards on which the cord circuits are equipped with ringdown supervisory lamps. The following tests and adjustments are made by the use of this test equipment.

2. LINE AND TRUNK CIRCUIT TESTS

Common Battery Line - Series Lamp Test
Common Battery Line - Line Relay Test
Test of Line Jack Contacts
Toll and Rural Lines or Trunks With Drops Only
Toll and Rural Lines or Trunks With Drops and Busy Lamps or With Line Lamps

3. NIGHT ALARM CIRCUIT TESTS

Operation Test
Adjustment of AU Relay

4. CORD CIRCUIT TESTS

Continuity Test (For Defective Cords, Keys and Plugs)
Operate and Release Test of Supervisory Relay
Non-Operate Test of Sleeve Relay and Check for Continuity of the Three Windings of the Supervisory Relay
Operate Test of Sleeve Relay
Ringing Test

5. EMERGENCY BATTERY TEST

With Voltmeter or With No. 2 Local Test Cabinet
Without a Voltmeter

1.02 The test circuit, as shown in Fig. 1, is arranged to apply test conditions to the circuit under test by means of the fixed resistances. The jacks are mounted in the face of the switchboard at the top of the jack space.

1.03 The various patching cords, with plugs and keys used for connecting the test circuit jacks to circuits in the switchboard on which tests are to be made are shown in Fig. 2.

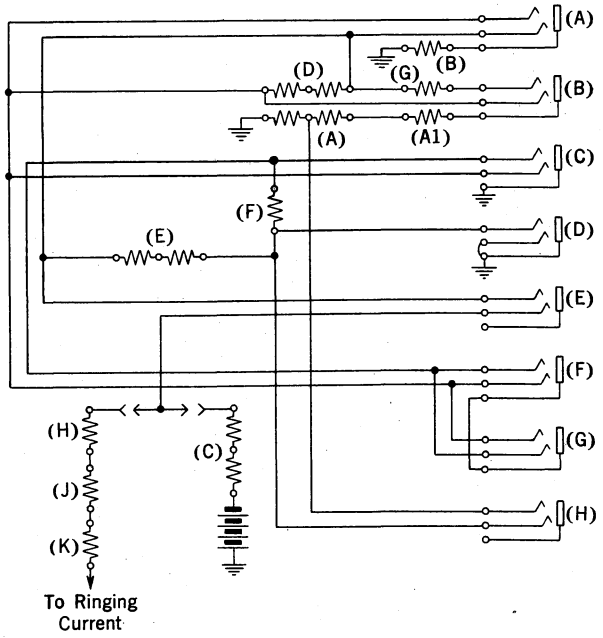

Fig. 1 - Test Circuit.

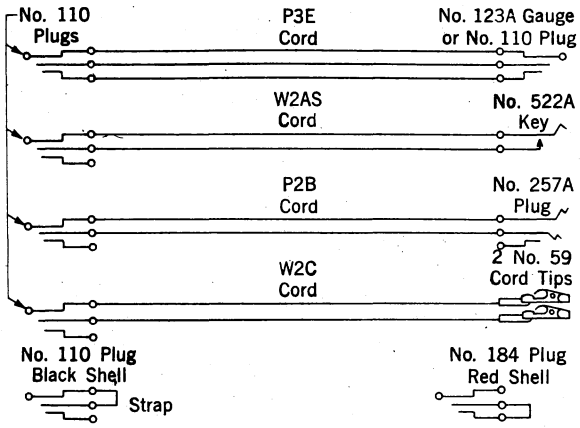

Fig. 2 - Test Cords.

2. LINE AND TRUNK CIRCUIT TESTS

Common Battery Line - Series Lamp Test

2.01 The C and D jacks are used for testing common battery series line lamps. Connections are made to these jacks as indicated in Fig. 3 and the free No. 110 plug of the P3E cord is inserted into the line jack until the tip of the plug touches the ring spring but does not open the break

contact. A circuit is completed from ground at the D jack through the (F) resistance in the test circuit, the tip of the P3E cord and the ring spring and contact of the line jack for lighting the line lamp. The brilliancy of the lamp is an indication of its condition or of its position in the socket.

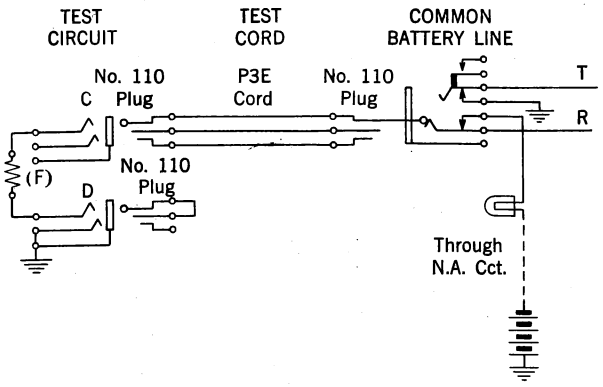

Fig. 3 - Line Lamp Test.

2.02 The test of the tip side of the line is made by using a spare line with a series lamp. Connection to the spare line is made at the M.D.F. with a W2C cord. The tip conductor of the cord is connected to the ring terminal of the line so that the lamp of the spare line may be used as an indicator. The tip of the plug of the W2C cord is inserted into the jack of the line to be tested so that the tip of the plug just makes contact with the tip spring of the jack. If the tip of the line under test has the normal ground, the lamp of the spare line will light to full brilliancy.

Common Battery Line - Line Relay Test

2.03 The B, D and H jacks are used for testing the line relays of common battery lines. Connections are made to these jacks as shown in Fig. 4 and the free No. 110 plug of the P3E cord is inserted into the line jack until the tip of the plug touches the ring spring but does not open the break contact. A circuit is completed from battery through the line relay winding to the ring spring of the line jack, the tip of the P3E cord, the D jack, resistances (E) and (D) through the B jack and No. 184 plug to resistances (A1) and (A) to ground. The resistances in the circuit limit the current to the "non-operate" value. If the relay should operate under this condition the line lamp would light indicating failure of the test. When the No. 522A key is operated, resistances (E), (D), (A1) and part of (A) are short-circuited and the "operate" current is applied to the relay which should operate and light the line lamp.

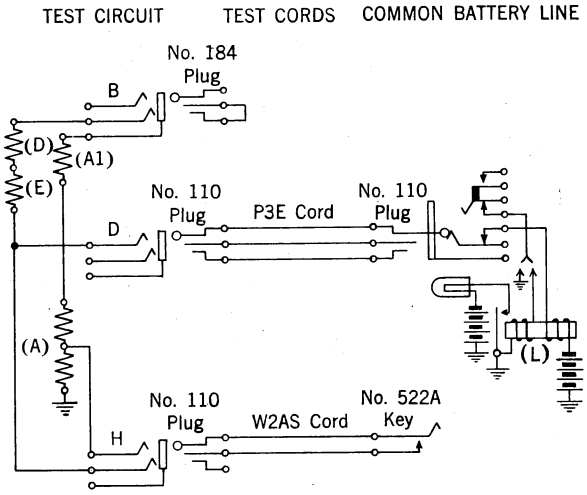

Fig. 4 - Line Relay Test.

2.04 The test of the tip side of the circuit is made in the same manner as described in 2.02. In this case, the lamp of the spare line will light dimly if the relay winding is connected to the tip side of the line.

Test of Line Jack Contacts

2.05 When connected as indicated in Fig. 5, the F and G jacks provide a means of testing that the contacts of common battery line jacks operate properly. If a P3E cord with a No. 123A gauge is provided, the gauge should be inserted into the jack under test. If the auxiliary make contacts of the jack close properly, the ground through the contacts, the sleeve of the jack, the test cord and test jacks should operate the sleeve relay of the cord circuit which will light the cord supervisory lamp. The operation of the sleeve relay also closes ground and battery through the supervisory relay to the tip and ring of the cord and to test jack F. The wiring between the F and G jacks reverses the tip and ring so that the ground is on the ring of the G jack and the battery on the tip. In case either of the inside contacts of the line jack does not open, the battery or ground will complete a circuit through the supervisory relay of the cord circuit causing it to operate and extinguish the cord supervisory lamp.

2.06 If, when the gauge (or plug) in the jack to be tested is rotated or pushed to one side, the supervisory lamp flickers or goes out it indicates that either the outside (make) contacts or one or both of the inside (break) contacts are not functioning properly. If in addition clicks are heard in the operator's telephone set it indicates that the trouble is in connection with the inside contacts rather than the outside contacts.

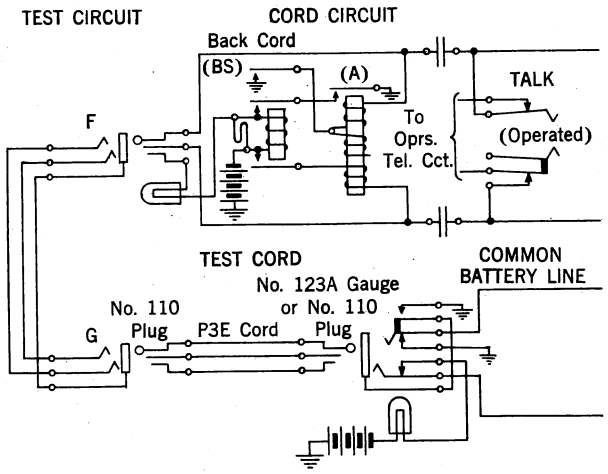

Fig. 5 - Test of Line Jack Contacts.

Toll and Rural Lines or Trunks With Drops Only

2.07 The D and E jacks, when connected as indicated in Fig. 6, are used to test the operation of line or trunk drops. While making this test the heat coils of the line or trunk should be removed in order to disconnect the line and station equipment from the circuit so that the line condition will not affect the test. When the No. 522A key associated with the W2AS cord is operated, a circuit is closed from ground on the ring of the D jack through the test cord, (E) resistance in the test circuit, P2B cord, line or trunk drop, ring of E jack and (C) resistance in the test circuit to battery. If in proper adjustment, the drop should operate when the No. 522A key is depressed.

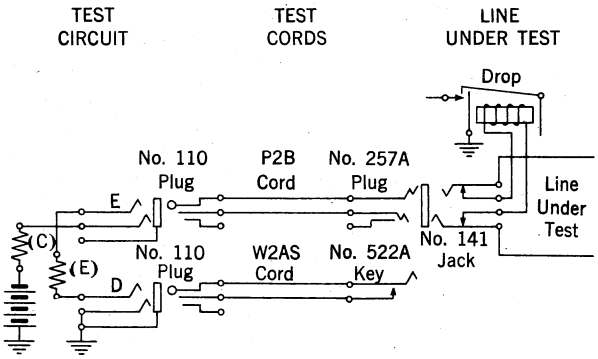

Fig. 6 - Test of Toll and Rural Lines and Trunks With Drops Only.

Toll and Rural Lines or Trunks With Drop and Busy Lamps or With Line Lamps

2.08 The D and E jacks, when connected as indicated in Fig. 7, are used to test the operation of the ringing relay of lines or trunks with line lamps, with or without busy signals and the drop of a line or trunk having a drop and lamp busy signals. While making this test the line or trunk should be opened to remove the line and station equipment from the circuit so that the line condition will not affect the test. When the No. 522A key associated with the W2AS cord is operated, a circuit is closed from ground on the ring of the D jack through the test cord, (E) resistance in the test circuit, W2C cord, line or trunk relay or drop, ring of E jack and (H), (J) and (K) resistances in the test circuit to ringing current. If in proper adjustment, the drop should operate when the No. 522A key is depressed or if the line has a line lamp, the lamp should light when the No. 522A key is released.

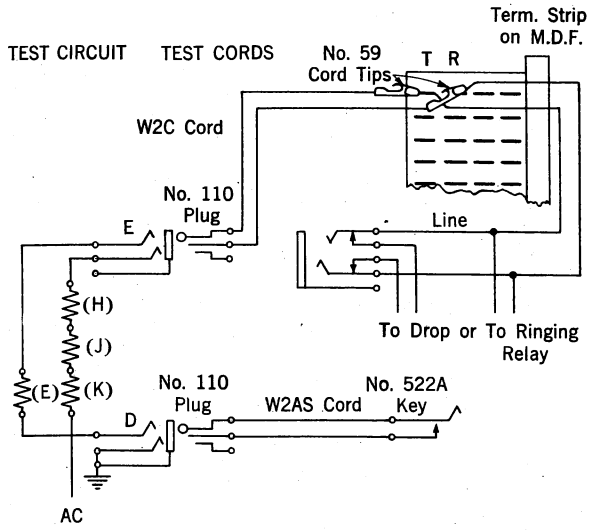

Fig. 7 - Test of Toll and Rural Lines and Trunks With Drop and Busy Lamps or With Line Lamps.

3. NIGHT ALARM CIRCUIT TESTS

Operation Test

3.01 The C and D jacks when connected as indicated in Fig. 8, furnish a circuit for testing the operation of the night alarm feature. If the No. 522A key associated with the W2AS cord is held operated and the free No. 110 plug of the P3E cord is inserted into the line jack until the tip of the plug just touches the ring spring of the jack, a circuit is completed from ground on the ring of the D jack, through the (F) resistance the tip of the cord, ring spring and contact of the line jack and the line lamp for operating the night alarm circuit. If the circuit is functioning properly, the night alarm bell should ring.

3.02 While holding the test connections as described in 3.01, the position release key is operated to release the relay

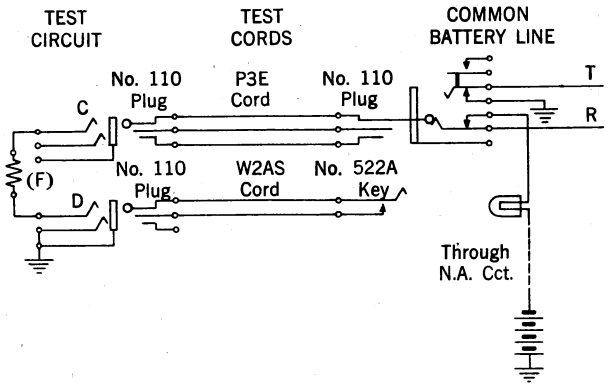

Fig. 8 - Night Alarm Relay Operation Test.

that causes the night alarm bell to ring. In case the AU relay remains operated the bell will ring again indicating a sticking condition of the AU relay.

Adjustment of AU Relay

3.03 Jacks C and D also provide a circuit for applying an adjust current to the AU relay of the night alarm circuit, when connected to the terminals of a spare line (without heat coils in place) as indicated in Fig. 9. The connection establishes a circuit from ground on the tip of the line jack, through the W2C cord, the ring of the C jack, (D), (E) and (F) resistances in the test circuit, tip of the C jack, test cord, ring of the line jack, lamp and night alarm circuit to battery. This circuit is necessary for warming the line lamp and thereby increasing its resistance. The operation of the No. 522A key associated with the W2AS cord completes a circuit from ground at the D jack, through the (F) resistance in the test circuit, the tip of the C jack, tip of the W2C cord, R terminal, ring spring and contact of the line jack and the line lamp to operate the AU relay of the night alarm circuit.

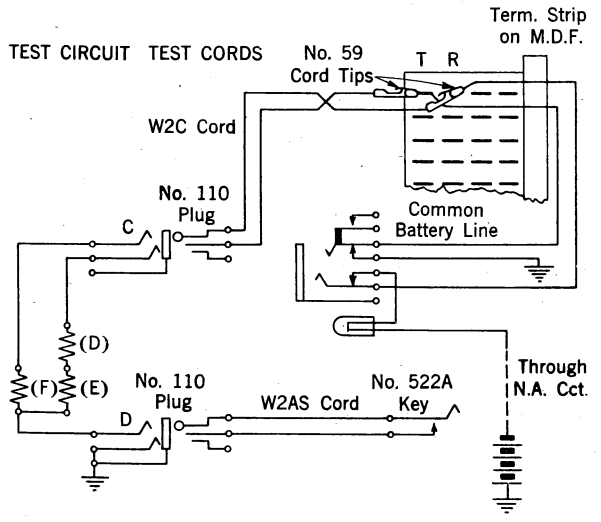

Fig. 9 - Adjustment of Night Alarm (AU) Relay.

4. CORD CIRCUIT TESTS

Continuity Test (for Defective Cords, Keys and Plugs)

4.01 The C and F jacks when connected as shown in Fig. 10 are used to test cords, plugs and keys of the cord circuit for cutouts or noisy conditions. The front or calling cord used in making the test is connected to jack F. The talking key of this cord is operated and the operator's telephone circuit used to listen for clicks during the tests. The cord to be tested is connected to jack C. The ground on the sleeve of jack C operates the sleeve relay which connects battery and ground through the supervisory relay, the ringing key, jack C to the resistances (D), (E) and (F) and the supervisory relay of the cord used for making the test.

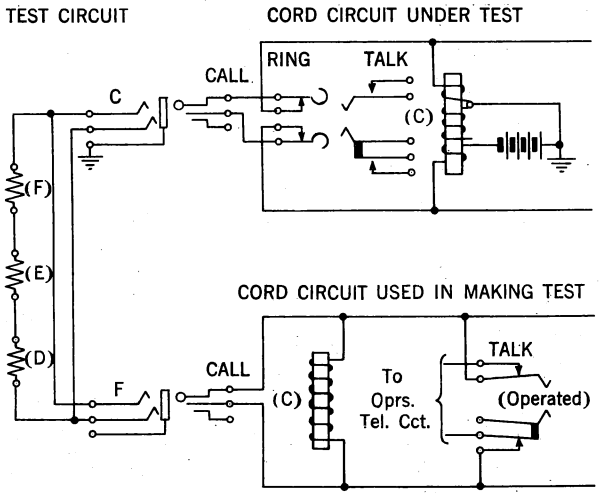

Fig. 10 - Continuity Test.

4.02 Various manipulations of the associated cord and plug connected to the C jack, also tapping on the key top and slight sidewise movement of the key lever will indicate cutouts, faulty connections, dirty contacts, etc., by clicks and noises in the telephone set connected to the position.

4.03 When the talking key of the cord under test is operated to the talking position and then allowed to restore unrestrained, any clicks heard in the telephone set will indicate that the key of the cord under test has overthrown far enough to open one or both of the break contacts of the ringing unit of the key and the key is therefore not in proper adjustment.

4.04 When testing cord circuits which have a second key lever for ringing on either the calling or answering cord, the lever is operated to the position to ring on the cord not connected to the test jack and allowed to restore unrestrained. For

example, when testing the calling cord, the lever is operated to the position for ringing on the answering cord, then released; when testing the answering cord the key is operated to the position for ringing on the calling cord and released.

Operate and Release Test of Supervisory Relay

4.05 The A, C and F jacks, when connected as indicated in Fig. 11, are used for testing the operation and release of the supervisory relay. The sleeve relay operates when the cord is connected to jack C and supplies battery and ground to the supervisory relay windings. The short-circuited plug inserted into jack F for a short time gives the supervisory relay a "soak." When the plug is removed the cord supervisory lamp should light. Then when the No. 522A key is operated short-circuiting the (D) resistance, the "operate" current flows through the relay and resistances (E) and (F). The lamp is extinguished when the relay operates. When the key is released the "release" current flows through resistances (D), (E) and (F) and the relay. When the relay releases the lamp is lighted.

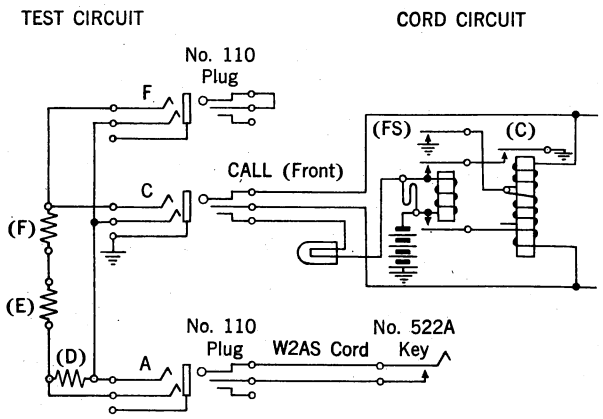

Fig. 11 - Operate and Release Test of Supervisory Relay.

Non-Operate Test of Sleeve Relay and Check for Continuity of the Three Windings of Supervisory Relay

4.06 The B and C jacks, when connected as shown in Fig. 12, provide a non-operate test of the cord circuit sleeve relay. Direct ground on the sleeve of the C jack will operate the sleeve relay, which connects battery and ground through the supervisory relay to the test jacks. When the cord under test is connected to the B jack, ground through the (A1) and (A) resistances is placed on its sleeve as a non-operate test for the sleeve relay. The battery and ground from the cord in the C jack through resistances (F), (E) and (G) cause the (A) relay of the cord under test to operate. The R lamp of that cord will light unless the sleeve relay operated or the supervisory relay failed to operate.

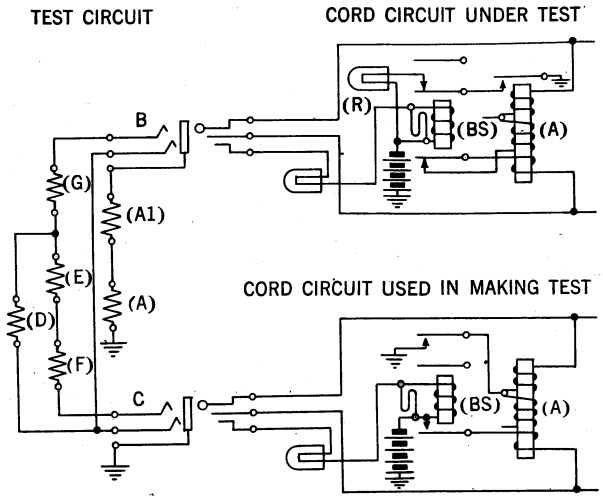

Fig. 12 - Non-Operate Test of Sleeve Relay and Check of Supervisory Relay.

Operate Test of Sleeve Relay

4.07 Jacks A and B, connected as shown in Fig. 13 provide an operate test of the cord circuit sleeve relay. When the cord to be tested is connected to jack A the ground through resistance (B) makes an operate test of the sleeve relay. When the relay operates it connects battery and ground through its associated supervisory relay, through jacks A and B to the supervisory relay of the cord used for the test. This supervisory relay operates and lights the associated R lamp as an indication of a proper test. The sleeve relay of this cord does not operate on account of the resistances (A1) and (A).

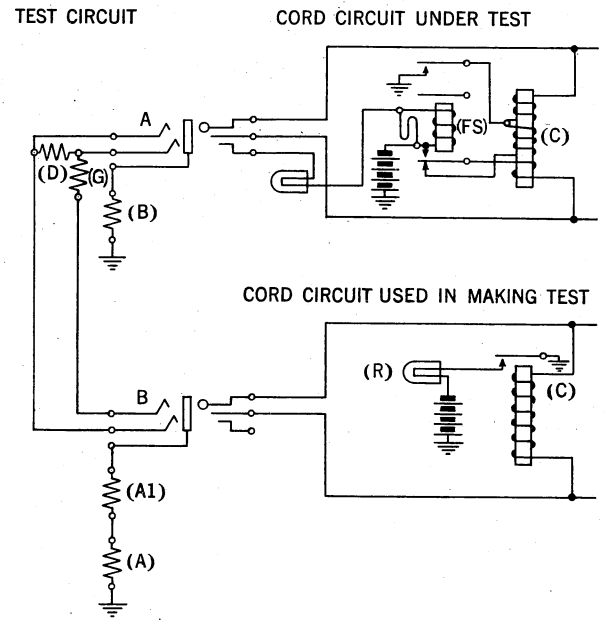

Fig. 13 - Operate Test of Sleeve Relay.

Ringing Test

4.06 The F and G jacks when connected as shown in Fig. 14 provide for a test of the ringing keys. When the ringing key of the cord under test is operated the R lamp of the cord used for the test should light as an indication that ringing current and ground are properly sent out over the tip and ring of the cord being tested. The position master ringing key and the emergency ringing key and hand generator may be tested under these same test conditions.

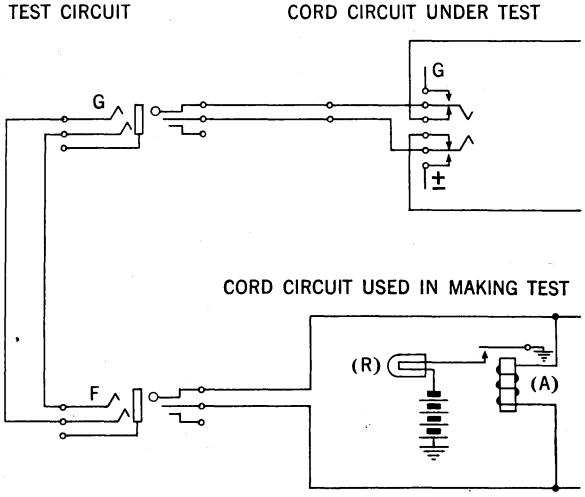

Fig. 14 - Ringing Test.

5. EMERGENCY BATTERY TEST

With Voltmeter Test Circuit or With No. 2 Local Test Cabinet

5.01 When a voltmeter test circuit is provided in the switchboard or the No. 2 local test cabinet is connected to the emergency talking battery the D jack is used for testing the voltage of the emergency battery. If either front or back cord of the cord circuit arranged to use the emergency battery is connected to jack D of the test circuit, as indicated in Fig. 15, ground on the sleeve of this jack will operate the sleeve relay, which connects battery through one winding of the supervisory relay to the ring of the cord and through the jack to ground. When the emergency battery key, EMB, is operated, this load is transferred from the office storage battery to the emergency battery and the voltmeter is connected across the battery. If the local test cabinet is used, its G key must be operated and a No. 109 plug with tip and ring short-circuited inserted in the TST jack. The voltage of the emergency battery can then be read on the voltmeter.

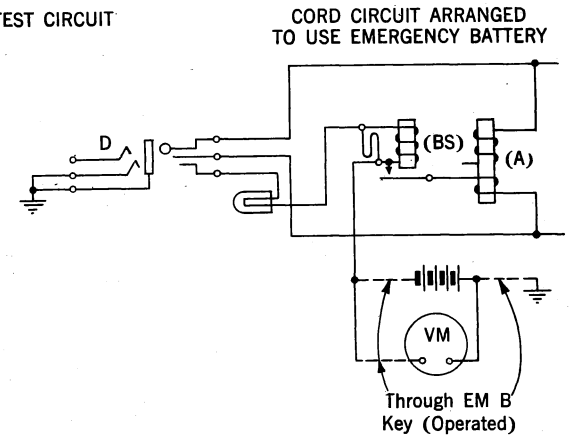

Fig. 15 - Emergency Battery Test.

Without a Voltmeter

5.02 If the voltmeter test circuit is not provided, or the local test cabinet is not connected to the emergency talking battery, the C and F jacks may be used for testing the condition of the emergency battery as shown in Fig. 11. When the emergency battery key is operated and either front or back cord of the cord circuit equipped with emergency battery is connected to jack C and the short-circuited plug inserted in the F jack as described in 4.03, the extinguishing of the cord circuit supervisory lamp is an indication that the battery voltage is sufficient to operate the cord circuit sleeve and supervisory relays.