

CONNECTOR TEST SET
SD-31637-01 (J34719A)
DESCRIPTION AND APPLICATION

1. GENERAL

1.01 This section describes the box type connector test set SD-31637-01 (J34719A) which is designed for testing local, toll and combination connectors and toll intermediate selectors.

1.02 This test set combines the functions of the wagon type connector test set J34711A (SD-30502-01) for testing local connectors and the wagon type test sets J34713A (SD-30387-01) and X61341 (ES-30007-01) for testing loop dialing toll connectors.

1.03 Test set SD-31637-01 has the following principal features:

(a) It is arranged for making complete operation tests on the following switches.

- (1) Regular, rotary and level hunting local connectors.
- (2) Regular, rotary and level hunting toll connectors.
- (3) Regular and rotary hunting combination connectors, as regards both the local and toll functions.
- (4) Toll intermediate selectors.

(b) It is arranged for making the so-called "rapid operation test" on local connectors and on the local side of combination connectors.

(c) It is arranged to be operated on a remote control basis by means of the No. 40A test set.

(d) The test circuit is advanced through the various test stages by the manual operation of a key, and lamps are provided to indicate the advance of the test circuit corresponding to these stages.

(e) Pulses for operating the switches under test may be obtained from either the dial in the connector test set or the dial in the remote control set or by patching to the pulsing test set J34717A (SD-31481-01). The latter arrangement can be used either without loop and leak margins simply as a pulsing device, or with margins as a means of applying pulsing tests.

(f) A busy guard feature is provided to prevent interference with busy circuits.

(g) The test set is arranged so that the proper trip and pre-trip resistance values can be selected for checking the trip relays under the various conditions as regards the type of ringing, the maximum subscriber loops and, in the case of superimposed offices, the types of subscriber sets.

(h) Means are provided for adjusting as well as testing those trip relays which are checked for their ability to trip during the ringing interval.

(i) The test set is arranged to function with the connector test line which is connected to the 99 or 90 terminal in non-level hunting connector groups, and to the 11 or 91 terminal in level hunting connector groups.

2. EQUIPMENT FEATURES

2.01 The apparatus of the connector test set is mounted in the size "E" (table size) standard metal portable test set housing. The dimensions of this box are 9-1/2" x 11-1/2" x 23"

2.02 The principal elements of the test set, consisting of a No. 206 type selector, relays, condensers, resistances and varistor, are mounted within the box. Nine lever type keys, fifteen lamps and a dial are located on top of the set. Thirteen jacks are mounted on the end of the box nearest the keys and lamps.

2.03 The apparatus which is exposed to view is shown in Fig. 1. This figure also indicates the connections which are made with the test jacks.

2.04 One two-way lever type key designated STP and RLS is used for stepping the No. 206 type selector to advance the test circuit; and for releasing the switch under test and returning the test circuit to normal. Another two-way key designated PLS and NON-REV is used for applying the pulses, generated by the pulsing test set, to the switch under test; and for testing connectors which are not arranged to reverse battery and ground when the called party answers. These keys are non-locking in each position.

2.05 The three one-way locking level type keys, designated LH, TOLL and ROT are used for testing level hunting connectors, for testing toll connectors, and for making the rapid operation tests. The two-way key designated SLB-OLP has one non-locking position (SLB) and one locking position (OLP) and is used when making the reverting call test of 10-party terminal per station connectors.

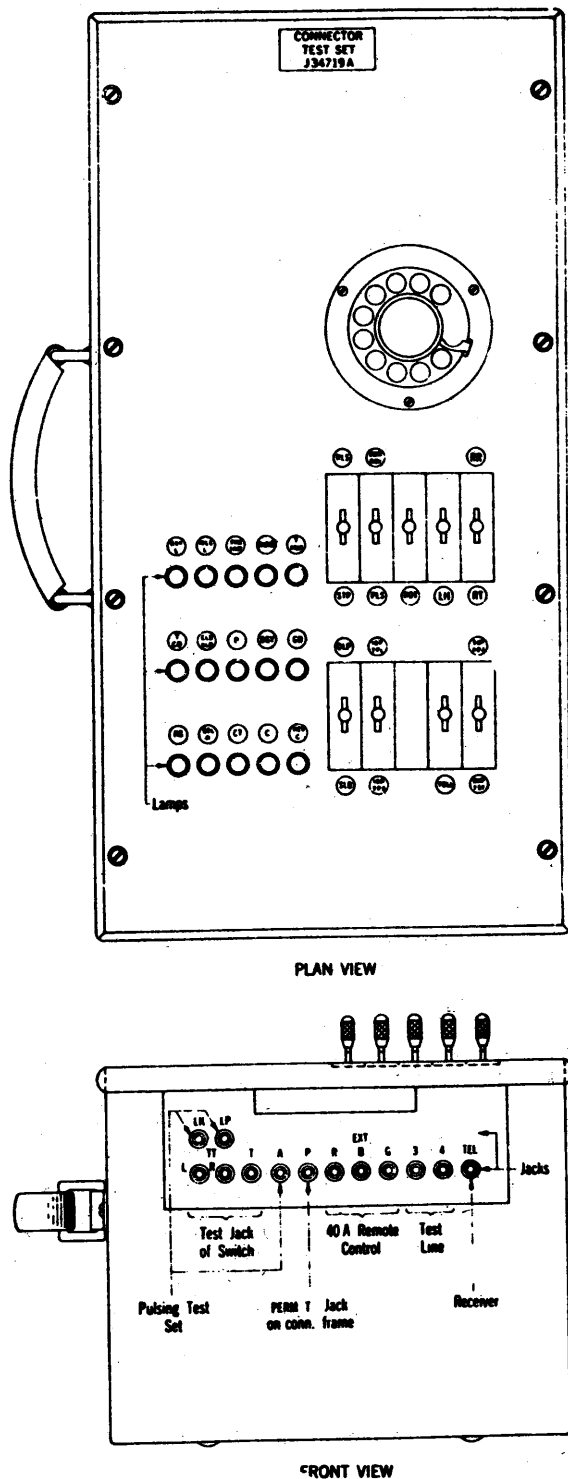


Fig. 1.

2.06 The other three two-way lever type keys are locking in each position. The one designated RT-RR is used to test the tip and ring side ringing codes of 10-

party terminal per line connectors. The RT position is used also when testing the reverting call feature of 10-party terminal per station connectors. The key designated 10P TPS and 10P TPL is used when testing 10-party terminal per station and 10-party terminal per line connectors under certain conditions as outlined in 3.16 and 3.18. The one designated SUP TST-SUP ADJ is used when testing and adjusting the trip relays under certain conditions as outlined in 3.16 and 3.18.

2.07 Eight of the lamps indicate the various stages of the test circuit as follows:

| <u>Lamp</u> <u>Lighted</u> | <u>Test to be Applied</u> |
|-------------------------------|---|
| BSY L | Busy Line |
| IDLE L | Idle Line |
| DEL R | Delayed Ring - Toll Only (Pass-by for Local) |
| PRE TRIP | Pre-trip |
| RING | Ringing after Pre-trip |
| T TRIP | Trip - (Tone Applied) |
| T CO | Noisy Wiper Cord - (Tone Removed) |
| CLD HLD | Called Party Hold - Local Only (Pass-by for Toll) |

2.08 The other seven lamps provide test indications as follows:

| <u>Lamp</u> <u>Lighted</u> | <u>Test Indication</u> |
|-------------------------------|---|
| GD | Circuit under test is busy, or Circuit under test returns ground after the loop in test set is closed (except toll connectors). |
| BSY | Non-level hunting connector passes busy line test (see also flashing CT lamp for toll), or Any connector reaches test line terminal on idle line test |
| C | Toll connector returns ground on C lead. |
| CT (flashing) | Toll connector passes busy line test, or |
| CT (steady) | Toll connector cuts through after ringing is tripped. |
| RS | Connector rings satisfactorily. |
| REV C | Local connector - Reversed tip and ring. |
| | Toll connector - Tip and ring are continuous |
| P | Local connector only - Permanent signal circuit is satisfactory. |

2.09 The dial is for use where desired in place of the dial of the remote control set, or in place of the pulsing test set.

2.10 The T jack is used to connect to local and toll connectors and to toll intermediate selectors. The two jacks designated TT are used to connect to combination connectors.

2.11 The jacks designated 3 and 4 are connected to the connector test line jacks, the P jack is connected to the permanent signal jacks (where provided) on the connector frame, and the TEL jack is used in connection with the test receiver.

2.12 Jacks R, B, and G are used to connect to the No. 40A remote control set when employed.

2.13 Jacks A, LK, and LP are used to connect to the pulsing test set when employed.

2.14 The No. 206-type selector within the set is used for advancing the test circuit through the various test stages.

2.15 The cords, test receiver, remote control test set and individual plug used with the connector test set are shown in Fig. 2. All of this apparatus is furnished with the set.

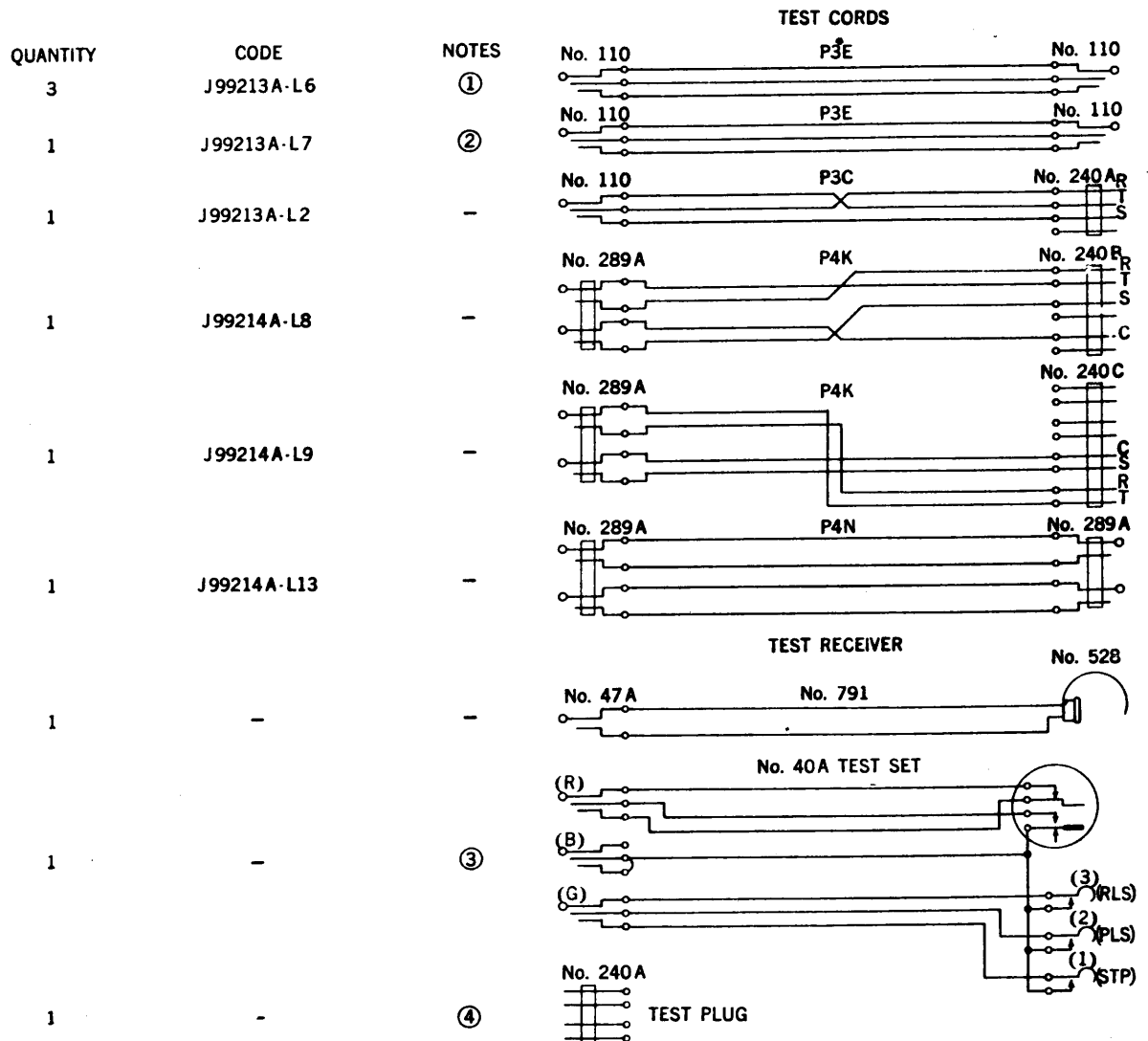


Fig. 2.

3. CIRCUIT FEATURES

3.01 The connector test set circuit is arranged to be controlled by means of a No. 40A remote control set. If desired, however, the corresponding keys and the dial on the connector test set can be employed as indicated below. The pulsing test set J34717A (SD-31481-01) can be used in place of the dial either without loop and leak margins simply as a pulsing device, or with margins as a means of applying the pulsing tests.

3.02 The information in 3.03 to 3.33 is based upon local connectors. Paragraphs 3.35 to 3.44 cover the principal functions which apply to toll connectors only.

Pulsing or Dialing

3.03 In making the tests it is necessary to direct the connector to the connector test line. This is ordinarily done in the following ways for the four different conditions.

(a) If using the pulsing test set and the remote control test set, the remote control PLS (No. 2) key is depressed long enough to pulse 99. See Fig. 4.

(b) If using the pulsing test set, without the remote control test set, the PLS key on the connector test set is operated long enough to pulse 99. See Fig. 4.

(c) If using the remote control test set, without the pulsing test set, 99 is dialed with the dial of the remote control test set. See Fig. 3.

(d) If using neither the pulsing test set nor the remote control test set, 99 is dialed with the dial of the connector test set. See Fig. 3.

Advancing the Test Circuit

3.04 The testing methods require that the test circuit be advanced through the various positions in which the proper conditions for the tests are applied. These positions and the corresponding tests are indicated by the lighting of the progress lamps designated BSY-L, IDLE-L, etc. No two progress lamps will be lighted at the same time. The advance of the testing circuit is, with two exceptions, made by momentarily depressing the remote control STP (No. 1) key, or by momentarily operating the STP key on the connector test set. See Fig. 4. The two exceptions are the DEL-R position through which the test circuit advances automatically in the case of local connectors, and the CLD-HLD position through which it advances automatically in the case of toll connectors.

Returning Test Circuit to Normal

3.05 From all positions, except the BSY-L and IDLE-L positions, the test circuit can be returned to normal by depressing and holding the remote control RLS (No. 3) key, or by operating and holding the RLS key on the connector test set, until none of the progress lamps are lighted. See Fig. 4. If the test circuit is in the BSY-L or IDLE-L position, and it is desired to return it to normal, it is necessary to advance the circuit beyond these positions, by means of the STP key, where the RLS key may be used.

Release of Switch under Test

3.06 The operation of the RLS (No. 3) key of the remote control test set or the RLS key of the connector test set also releases the switch under test. See Fig. 4.

Busy Guard Feature

3.07 The test set is so designed that if it is connected to a busy circuit the test set loop can not be closed, thereby preventing interference to service. Referring to Fig. 3, if the switch is busy, ground is returned over the sleeve of the T jack thereby operating the SC relay and lighting the GD lamp as a busy signal. If the busy signal is ignored and the test circuit is stepped to position 1, the HC relay can not operate, since the circuit is open at the SC relay, and therefore the loop is not closed.

Busy Line Test-Leak

3.08 Referring to Fig. 4, the busy line test is made with the test set selector in position 1. In this position the BSY-L lamp is lighted and the SL relay operates. The operation of this relay prepares a path for connecting ground from the PLS key through local contacts of the LP jack, and through the LK jack to a relay of the pulsing test set which results in pulses being supplied over the tip and ring of the A jack under the leak condition. The proper leak condition is set up in the pulsing test set before operating the PLS key.

Note: If, instead of operating the PLS key, the number is dialed, the connector test set supplies a 15,000 ohm leak condition. See Fig. 3.

3.09 The operation of the PLS key in Fig. 4 also causes the PL relay to operate, which in turn operates the PL1 relay thereby closing the tip and ring so that the pulses can be transmitted to the connector. The connector returns a ground on the sleeve to operate the SC relay and thereby light the GD lamp.

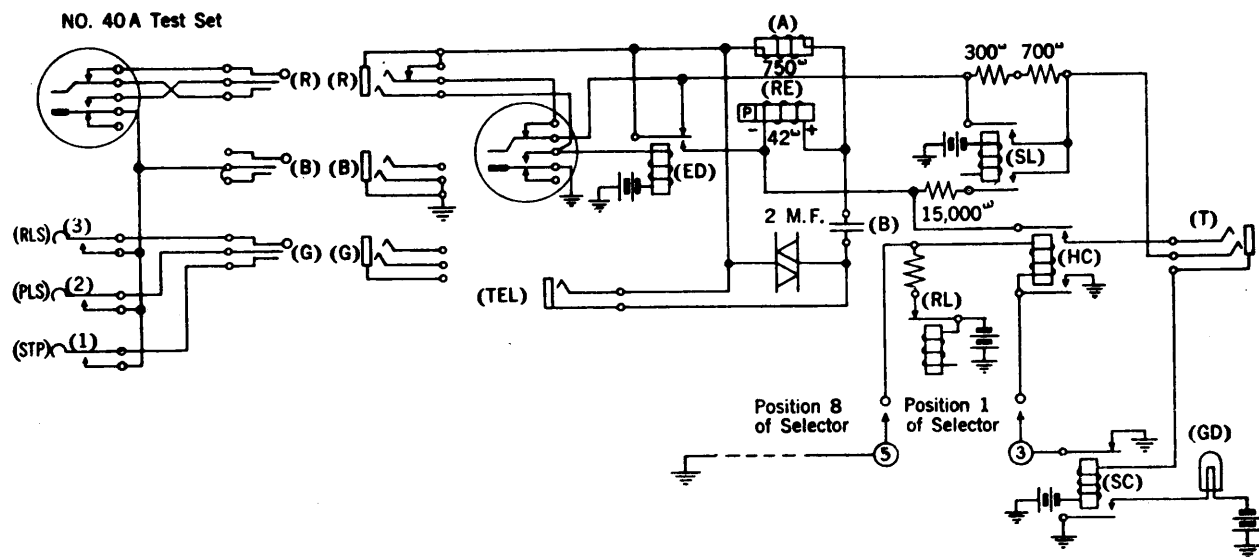


Fig. 3.

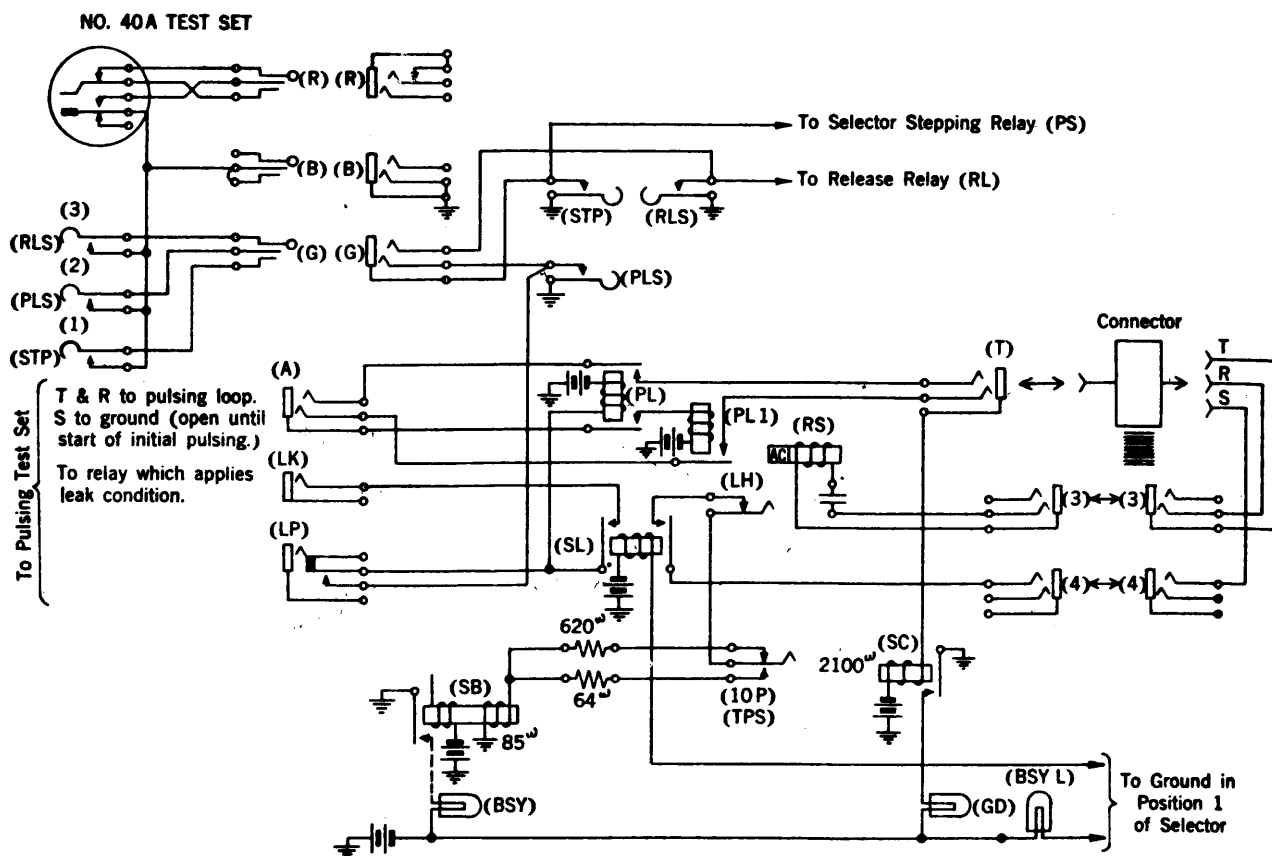


Fig. 4.

3.10 The test set presents a busy line condition to the connector. For non-level hunting connectors, other than the 10-party terminal per station type, the LH and 10 P-TPS keys are normal and the condition is ground through 705 ohms. For 10-party terminal per station type, the 10 P-TPS key is operated and the condition is ground through 149 ohms. For level hunting connectors, the LH key is operated and the condition is an open circuit.

3.11 Except in the case of level hunting connectors, the SB relay operates and lights the BSY lamp when the connector seizes the test line as an indication that the connector has satisfactorily met the test. In the case of level hunting connectors the SB relay is not in the sleeve circuit, but the test circuit is so arranged that the relay operates through a path, not shown in Fig. 4, when the PLS key is depressed or when one of the dials is pulled off normal. The BSY lamp lights but it does not show that the connector has reached the test line and it is necessary to depend upon the busy tone as an indication of a satisfactory test.

Idle Line Test-Loop

3.12 Referring to Fig. 5, the idle line test is made with the test selector in position 2. In this position the IDLE-L lamp is lighted and the SL relay is restored to normal. The release of this relay prepares a path for connecting ground from the PLS key through the LP jack to a relay of the pulsing test set which results in pulses being supplied over the tip and ring of the A jack under the loop condition. The proper loop condition is set up in the pulsing test set before operating the PLS key.

Note: If, instead of operating the PLS key, the number is dialed, the connector test set supplies a 1000 ohm pulsing loop condition. See Fig. 3.

3.13 The operation of the PLS key in Fig. 5 also causes the PL relay to operate, which in turn operates the PL1 relay, thereby closing the tip and ring so that

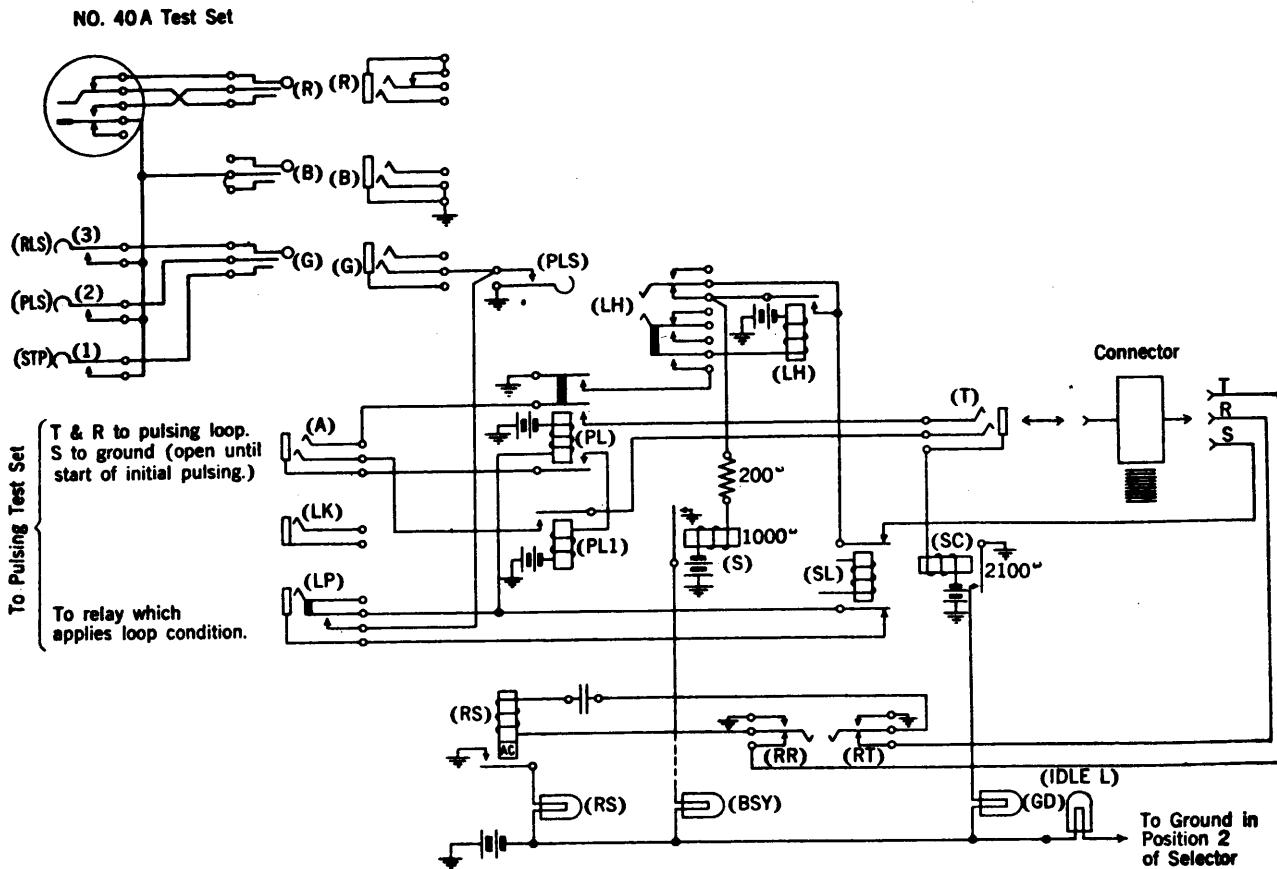


Fig. 5.

the pulses can be transmitted to the connector. The connector returns a ground on the sleeve to operate the SC relay and thereby light the GD lamp.

3.14 The test set presents an idle line condition to the connector, which is battery through 1200 ohms. In the case of level hunting connectors, however, the LH key is operated and the sleeve circuit is open at the LH relay, and therefore the test line is busy to all other connectors until the PLS key is operated to start the test. The operation of the PLS key results in the operation of the LH relay to close the sleeve circuit and thereby present an idle condition.

Note: If, instead of operating the PLS key, the number is dialed, the LH relay is operated through a path, not shown in Fig. 5, when one of the dials is pulled off normal.

3.15 When the connector seizes the test line the S relay operates and lights the BSY lamp. The RS relay operates each time ringing current is applied by the connector and the RS lamp follows the operation of the relay. In the case of 10-party terminal per line connectors, either the RR or RT key is previously operated depending upon whether the ringing code dialed results in ringing on the ring side or on the tip side of the line. The RS lamp follows the code ringing.

3.16 When the test circuit is advanced from the idle line test position, it automatically passes by the delayed ring position to the pre-trip position. For those test sets which are wired in accordance with Fig. B of the circuit drawing SD-31637-01, the pre-trip resistance values for the various conditions and the keys which apply these values are indicated on the drawing. For those test sets which are wired in accordance with Fig. A of the circuit drawing, the values and the keys are indicated in Table A included herein.

Table A

Resistance Values - Fig. A of SD-31637-01

Superimposed Offices

| <u>Type of Connector</u> | <u>Pre-Trip</u> | <u>Trip</u> |
|-----------------------------|-----------------|-------------|
| (a) 2,4 and 8 Pty. (Test) | 1230 | 900 |
| (b) 2,4 and 8 Pty. (Adjust) | 1120 | 970 |
| (c) 10 Pty.Term.Per Sta. | 2660 | 1100 |
| (d) 10 Pty.Term.Per Line | 2440 | 1050 |

A-C. - D-C. Offices

| | | |
|---------------------|------|---------|
| (e) 2 and 4 Pty. | 3000 | 1100 or |
| (e) 2 and 4 Pty. | 3000 | 1200 |
| (a) 8 Pty. (Test) | 1230 | 900 |
| (b) 8 Pty. (Adjust) | 1120 | 970 |

Type of Connector Pre-Trip Trip

A-C. - D-C. Office (Cont'd)

| | | |
|--------------------------|------|---------|
| (f) 10 Pty.Term.Per Sta. | 3000 | 1100 or |
| (f) 10 Pty.Term.Per Sta. | 3000 | 1200 |
| (g) 10 Pty.Term.Per Line | 2780 | 1050 or |
| (g) 10 Pty.Term.Per Line | 2780 | 1200 |

Keys Operated

- (a) SUP-TST
- (b) SUP-ADJ
- (c) SUP-TST and 10P-TFS
- (d) SUP-TST and 10P-TPL
- (e) —
- (f) 10P-TFS
- (g) 10P-TPL

3.17 When the test circuit is advanced from the pre-trip position into the ringing position, ringing should continue as before.

3.18 When the test circuit is again advanced it goes into the trip position. For those test sets which are wired in accordance with Fig. B of the circuit drawing SD-31637-01, the trip resistance values for the various conditions and the keys which apply these values are indicated on the drawing. For those test sets which are wired in accordance with Fig. A of the circuit drawing, the values and the keys are indicated in Table A included herein.

3.19 Referring to Fig. 6, when tripping occurs the connector reverses battery and ground, thereby operating the RE relay which in turn operates the TS relay which removes the trip resistance and substitutes a path which includes the RW relay and one winding of the induction coil. When the TS relay operates, the buzzer operates. Tone is generated and is supplied to the called end of the connector. This tone is heard in the test set receiver which is connected to the test set jack TEL on the calling end of the connector. (See Fig. 3.) When testing connectors which are not arranged to reverse battery, the NON-REV key is operated to operate the TS relay. In either case, the RW relay should not operate if the polarity is correct. Incorrect polarity is indicated by the lighting of the REV-C lamp.

3.20 Again referring to Fig. 6, when the test circuit is advanced from the trip position to position 7, which is the tone cutoff position, the ground supply for the buzzer is removed and tone is not generated. In this position a test for noisy connector wiper cords can be made.

3.21 Referring to Figs. 3 and 6, when the test circuit is advanced to position 8, which is the called party hold position, the HC relay is short circuited and therefore releases and opens the calling loop. The loop through the RW relay on the called end, however, remains closed in this posi-

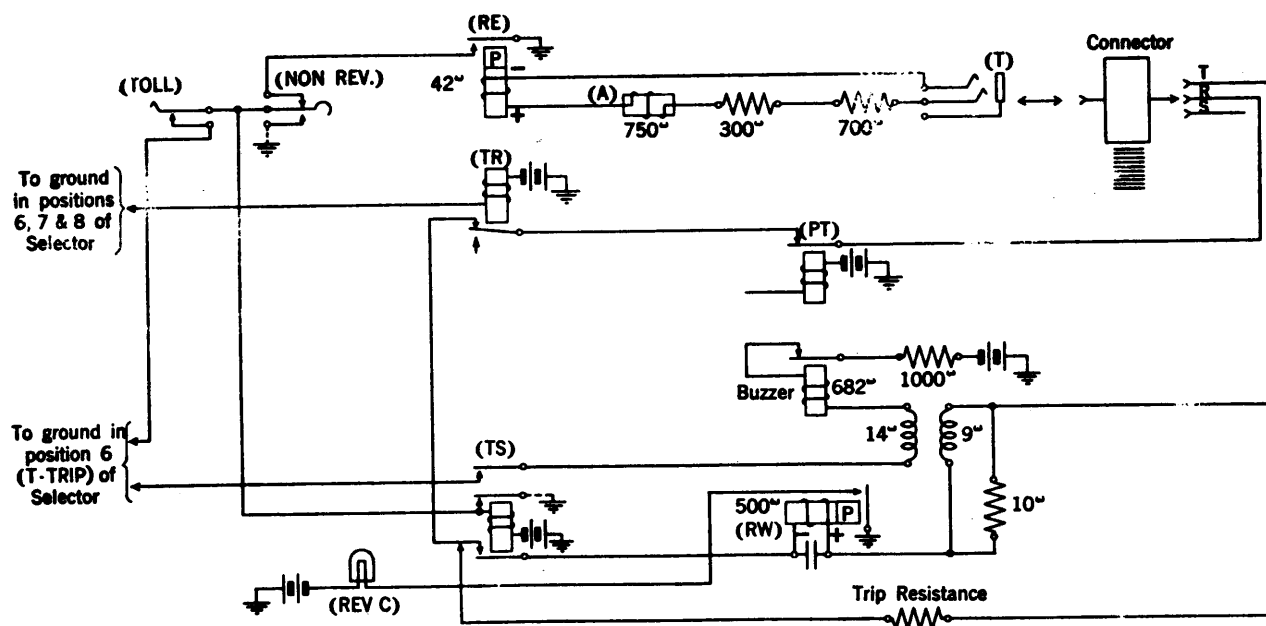


Fig. 6.

tion. If the connector is arranged for calling party control it should release; if it is arranged for joint control it should hold under control of called loop.

Rapid Operation Test

3.22 The so-called rapid operation test is made with the test set selector in the normal position and with the ROT key operated as shown in Fig. 7. As in the

full operation test, if the test set is connected to a busy connector the SC relay (see Fig. 3) operates as discussed in 3.07. If the busy signal is ignored and the PLS key (see Fig. 7) is operated, the calling loop will not be closed since the SC relay opens the circuit from ground which is normally supplied through the SC relay contacts, the ROT key, and the PL relay contacts to operate the HC relay to close the loop.

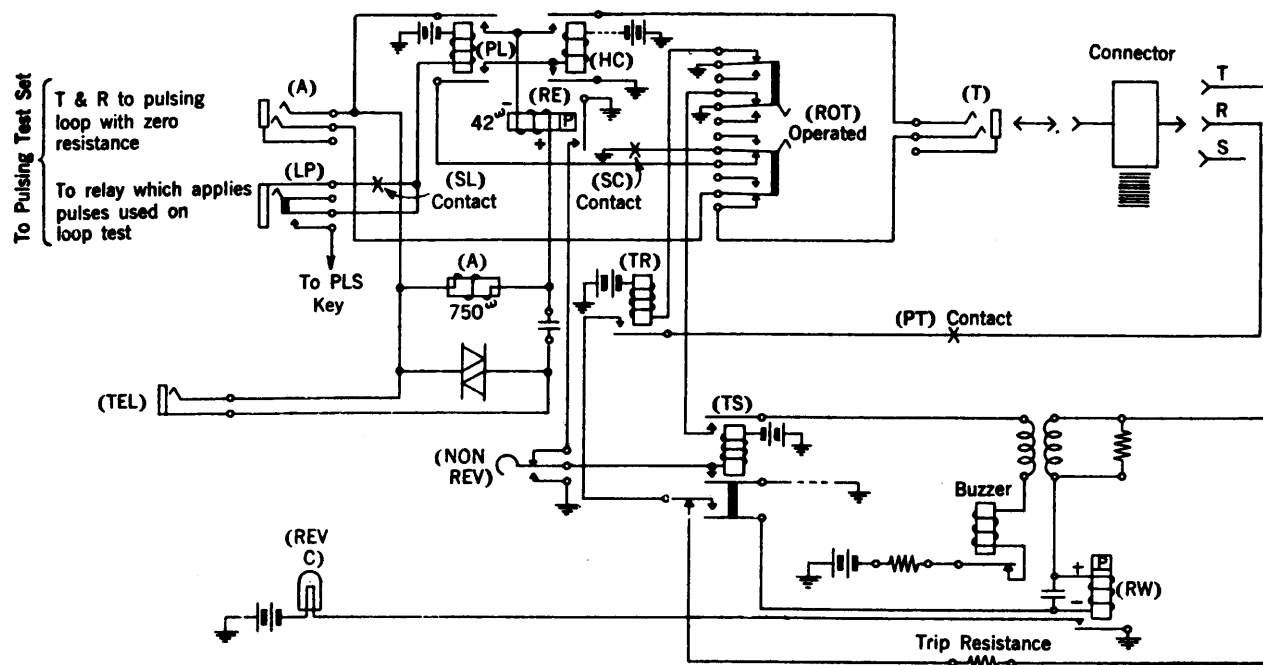


Fig. 7.

3.23 If the connector is idle, the operation of the PLS key causes the loop to be closed through the connector test set to the pulsing test set without any resistance being inserted. The resistance keys in the pulsing test set are not operated, so that the pulsing is over a zero resistance loop but the pulses supplied under this condition are the same, as regards the ratio of make to break, as those supplied under the loop condition on the full operation test.

Note: If, for any reason, one of the dials is used in place of the pulsing test set, the dialing path is over a zero loop not shown in Fig. 7.

3.24 The test line number is pulsed the same as in the full operation test. When the PLS key is released the PL relay releases, thereby placing the RE relay and the retardation coil A in the calling loop.

3.25 The test set presents an idle line condition both for non-level hunting and level hunting connectors the same as under the idle line condition on the full operation test. See 3.14.

3.26 With the ROT key operated the TR relay is operated and the trip resistance is presented as soon as the connector seizes the test line. The trip resistance values are the same as those covered in 3.18 for the full operation test trip condition.

3.27 When the connector trips and reverses battery the RE relay operates, in turn operating the TS relay. The TS relay in operating, operates the buzzer thereby causing tone to be generated. This tone is supplied to the called end of the connector and is heard in the test receiver which is connected to the test set jack TEL on the calling end of the connector. When testing connectors which are not arranged to reverse battery, the NON-REV key is operated

to operate the TS relay. In either case, the RW relay should not operate if the polarity is correct. Incorrect polarity is indicated by the lighting of the REV-C lamp.

3.28 The called party hold feature of connectors arranged for joint control is tested by disconnecting from the test jack of the connector. The called loop remains closed and the connector should not release. In such cases the connector is then released by operating the RLS key (not shown in Fig. 7). For switches arranged for calling party control it is necessary only to disconnect from the connector test jack.

Reverting Call Test - 10-Party Terminal per Station Connectors

3.29 Referring to Fig. 8, the reverting call test of the 10-party terminal per station connectors is started with the test set selector in position 5, the ringing position. The connector returns ground over the sleeve to operate the SC relay and thereby light the GD lamp.

3.30 By momentarily operating the SLB key the RC relay operates and locks to the ground returned over the sleeve by the connector. With the RC relay operated the sleeve of the called end of the connector is connected to the sleeve of the calling end of the connector, which is the condition encountered in service on reverting calls.

3.31 The test line number is pulsed or dialed in the usual way and the ground supplied by the sleeve of the calling end of the connector to the sleeve of the called end of the connector causes the test line to test busy.

3.32 By operating the OLP key, the calling loop is opened. The connector then makes the reverting call test over the sleeve of the calling end, through the RC relay contacts, and over the sleeve of the

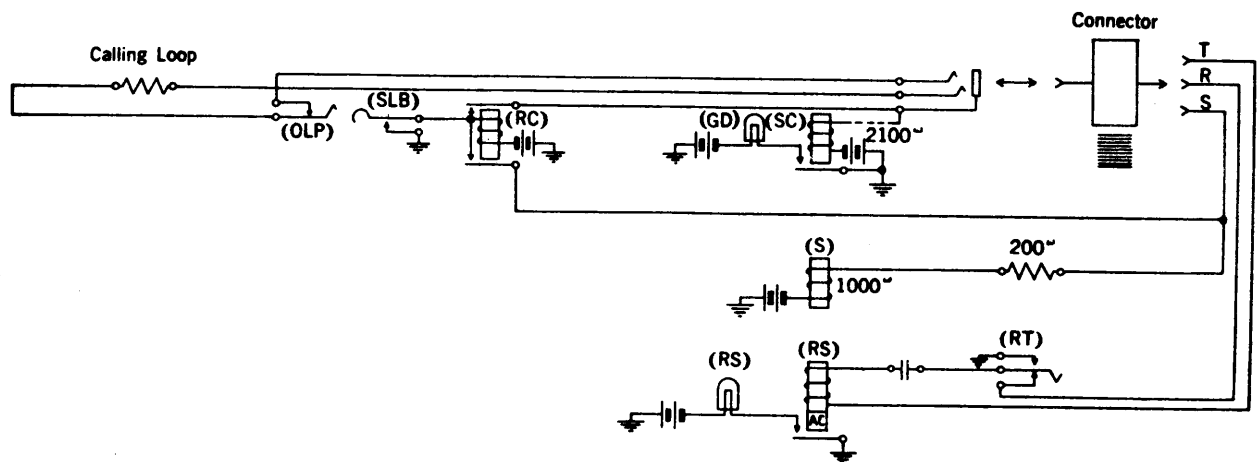


Fig. 8.

called end. The connector then momentarily removes the ground from the sleeve, thereby releasing the SC relay, extinguishing the GD lamp, and also releasing the RC relay to separate the calling and called sleeve circuits. The connector then makes a test for battery on the sleeve of the called end and, finding it, starts ringing. The RS relay, and in turn the RS lamp, respond to the ringing current, which is a combination of the short reverting call code and the ringing code assigned to the test line. By operating the RT key, the RS relay and the RS lamp respond to the short reverting call code rings only.

3.33 By advancing the test selector to position 6, the ringing is tripped and the connector is held until released by the operation of the RLS key (not shown in Fig. 8).

Toll Connectors

3.34 In 3.35 to 3.44, the principal functions of the test set which apply to toll connector tests only are described.

3.35 Referring to Fig. 9, the toll connector tests are made with the TOLL key operated. The busy line test is made in position 1, as for local connectors, in which position the HC relay operates to close the calling loop and to place ground forward on the sleeve. The connector returns ground on the C lead thereby operating the DR relay which locks and lights the C lamp.

3.36 The test line number is pulsed or dialed in the usual way. Upon reaching the busy line, relay LS (operating path not shown) operates and opens the operating path for the DR relay. The connector removes ground from the C lead, relay DR releases and the C lamp is extinguished. Relay CC operates, disconnects the calling loop, and connects the CT relay to the connector. The connector returns interrupted ground over the ring causing the intermittent operation of the CT relay and corresponding flashing of the CT lamp as a busy signal.

3.37 The idle line test is made in position 2 as for local connectors. The DR relay operates as in the busy line test and lights the C lamp.

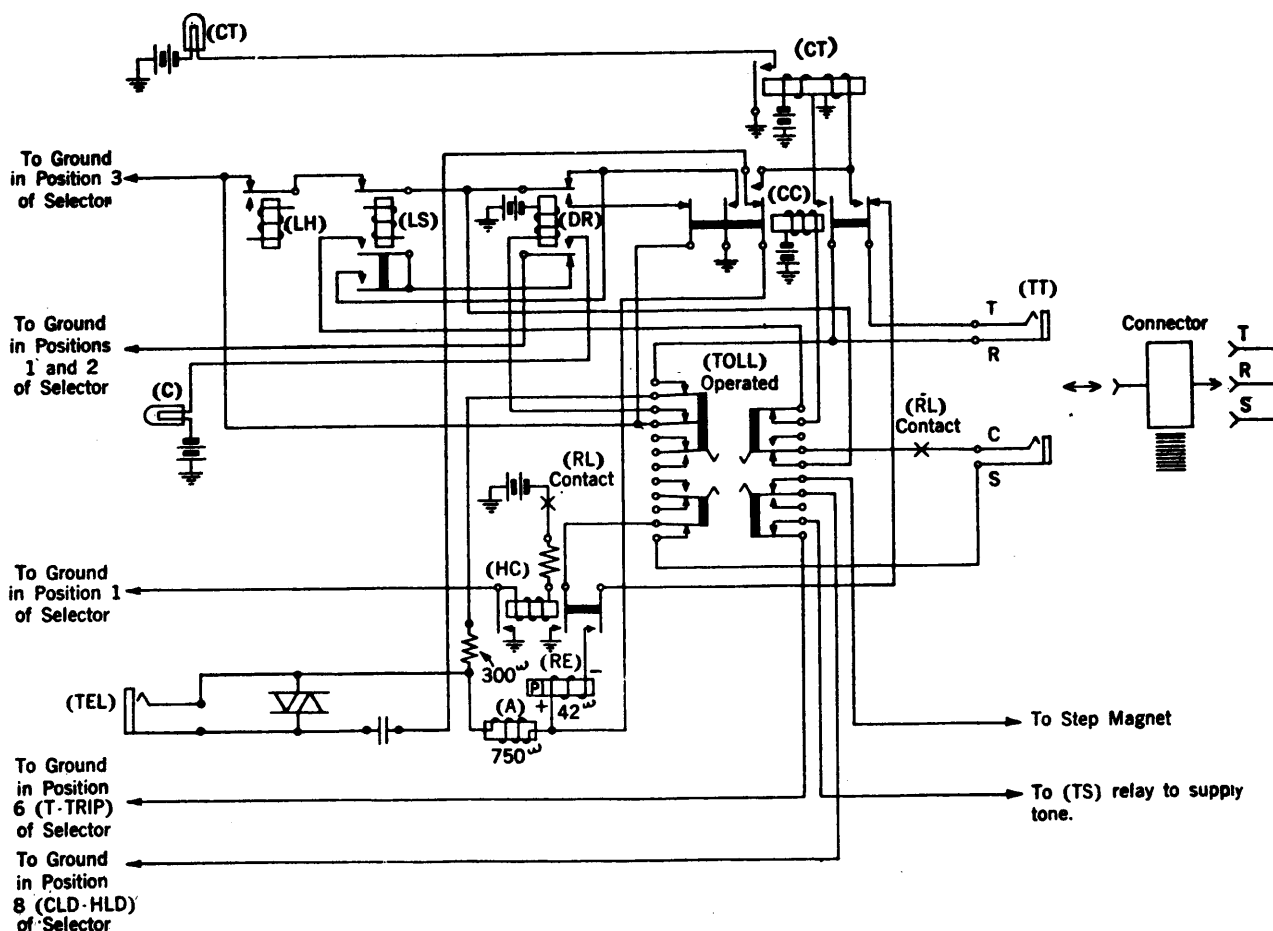


Fig. 9.

3.38 The test line number is pulsed or dialed in the usual way. However, if dialed, a 300-ohm resistance, instead of 1000 as in the case of local connectors, is inserted in the pulsing loop (actual pulsing loop not shown in Fig. 9). The reason for this reduced resistance is that the relay in the toll side of combination connectors, which operates in series with the connector A relay, will not function satisfactorily if the higher value is employed, and no distinction is made between the test set condition for toll connectors and for the toll side of combination connectors. If the test line is pulsed instead of dialed, the 300-ohm resistance in the connector test set is out of the circuit and the proper resistance value is inserted in the pulsing test set as in the case of tests of local connectors.

3.39 Upon reaching the idle line, the connector removes ground from the C lead, relay DR releases and the C lamp is extinguished. Relay CC operates to connect the CT relay to the connector as in the busy line test but the CT relay does not operate at this time. Ground is supplied by the CC relay, as well as from the test set selector in position 2, through contacts of the DR relay released, through contacts of the TOLL key and RL relay to the C lead to prevent the connector from ringing.

3.40 By stepping the test set selector to position 3, ground is supplied for reoperating the DR relay and the ground forward on the C lead is removed, thereby allowing the connector to ring.

3.41 The pre-trip and ringing tests are made as in the case of local connectors in positions 4 and 5.

3.42 By stepping the test set selector to position 6, the trip test is applied in the same manner as for local connectors. Upon tripping, the connector cuts through on a metallic basis and the CT relay operates and lights the CT lamp. The TS relay (see also Fig. 6) operates to ground supplied by the test set selector in position 6. The operated TS relay supplies tone to the called end of the connector and this tone is heard in the receiver which is connected to the test set jack TEL on the calling end of the connector. The operation of the TS relay also places the RW relay (see Fig. 6) in the called loop. The RW relay in the case of toll connectors should operate and light the REV-C lamp.

3.43 In position 7, the tone supply is removed as in the case of local connectors to permit testing for noisy wiper cords.

3.44 The called party hold test does not apply to toll connectors. Therefore, in position 8 (see Fig. 9), ground is supplied by the test set selector to operate the step magnet to advance the selector automatically.

Toll Intermediate Selectors

3.45 The test set connections are made in a manner similar to that described for toll connectors, the set being located at the selector frame. The test line is dialed and an idle line test similar to that described for toll connectors is made to check the control of ringing over the C lead. The pre-trip and trip tests are functions of the connector only and would not ordinarily be made in connection with the selector test.

