STEP BY STEP SYSTEM
NO. 1, 350A OR 355A
TEST LINE CIRCUIT
FOR TESTING TRUNKS
INCOMING FROM LOCAL OFFICE
COIN BOX TRUNKS, OR TRUNK CIRCUITS
WITH DELAYED CHARGE INTERVAL FOR
OPERATING SUBSCRIBER REGISTER

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

1 - 1A Thermistor

B.2 Superseded — Superseded by

2 MF Condenser (A) — 1 MF Condenser (A)

B.3 Omitted

J25 Relay (L1)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 "T" wiring and apparatus are added to replace wiring and apparatus now designated "V" for purposes of economy and improved operation.

D.2 Information on LT_2 lead of Fig. B is changed. It previously read as follows, "To Tone Supply or to Misc. Alm. Ckt. See Note 101"

D.3 Numbering of terminals on Vacuum Tube (A) is changed.

All other headings under "Changes", no change.

1. PURPOSE OF CIRCUIT

1.1 This test line is used to make manually controlled routine tests of various interoffice and local trunks having access to the connector multiple, such as repeater and other trunks incoming from local offices, and certain local trunks of which coin box and message register trunks are examples.

The circuit appears on the multiple of the local connectors and is reached by dialing an assigned test code. Where interoffice trunks are concerned, the test man makes through calls from the originating office to this connector multiple test line in the terminating office. In the case of

local trunks, the circuit to be tested is either seized directly with a test set patched into the trunk jack, as with coin box trunks, or else access to the trunk is gained indirectly, as is done where message register trunks are reached from the test set through the line circuit and the line finder or line switch equipment. Where the supervisory relays of toll transmission selectors are being tested, the test man will originate calls from the Toll Board to this circuit.

The test line, when started, automatically applies to the tip and ring a series of timed closures and tone signals, with sufficient variety in these applications to test the supervisory, transmission, signaling, charging, and other features of the different trunks. Progress in the test is indicated by the tones and by lamp signals shown at the originating end.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

This circuit functions as outlined below in connection with the tests of the typical trunks mentioned.

3.1 Interoffice Trunks

3.101 Circuit prepares to start when sleeve is seized by connector.

3.102 Awaits ringing, in order to avoid false starting.

3.103 Delays starting for additional short interval after ringing begins to allow test man to recognize ringing induction tone.

3.104 Trips ringing. Loop closed for 1.0 to 1.5 second.

3.105 Opens loop for short interval (0.5 second).

3.106 Recloses loop across line for an interval of 1.0 to 1.5 seconds. This interval is used in connection with tests on message rate and coin box trunks (refer to sections 3.2 and 3.3 below).

3.107 Applies short series of flashes to test supervisory features of trunk.

3.108 Applies tone during closed portion of flashing period for the purpose of affording a test of transmission over trunk.

3.109 Opens loop for 1.8 second interval after flashing period to permit disconnection if the call is abandoned.

3.110 Closes loop for 5.5 second interval. This interval is used particularly for tests on message rate and coin box trunks. (See sections 3.2 and 3.3 below.)

3.111 Repeats the cycle of 2.0 second opening and 5.5 second closure until disconnection occurs.

3.112 Test line applies tone signal of steady low tone during each closure of the loop.

3.2 Local Trunks - Message Register Trunk - Arranged for Delayed Charging

3.21 Circuit operates as described for interoffice trunks (see section 3.1 above).

3.22 The message register trunk is tested for non-charging during the 1.5 second closed interval (i.e., the closed interval immediately following the 1.5 second "ringing trip" interval, see section 3.106 above). If all the message register trunks to be tested with the test line are arranged to delay charging for 2.0 second minimum, both the "Ringing Trip" and the "Non-charge" intervals are set at 1.5 seconds ("Y" wiring). When any of the message register trunks are arranged to delay charging for a period of less than 2.0 seconds, both of these intervals are shortened to 1.0 second ("X" wiring).

3.23 The message register trunk is tested for charging during the 5.5 second intervals.

3.3 Local Trunks - Coin Box Trunk

3.31 The immediate charge type of coin box trunk is set for charging during either the first or the second 1.0 to 1.5 second closed interval. If then the call is terminated during the first open interval (1.8 second) following the supervisory tests, the coin box trunk will be expected to collect the coin.

The delayed charge coin box trunk should not be set for charging until the first 5.5 second closure.

3.4 Transmission Selectors Supervisory Relays

3.41 Circuit operates as described for Interoffice trunks to test supervisory relays.

4. CONNECTING CIRCUITS

4.1 Any standard local connector.

4.2 60 and 120 I.P.M. interrupter and alarm circuit.

4.3 Tone supply circuit.

DESCRIPTION OF OPERATION

5. INTEROFFICE TRUNKS

5.1 Routing of Test Call

An example of this type of trunk is one originating in a manual office and terminating on an incoming selector in a

step-by-step office. Another is the repeater trunk originating in one step-by-step office and terminating on an incoming selector in another step-by-step office. In the former case, selection of the trunk to be tested is made at a manual switchboard and a through call is dialed to the test line which appears on the local connector multiple in the step-by-step office. In the case of the repeater trunk, however, a test set is connected directly to the outgoing end of the trunk, or to an outgoing repeater of such is provided, and a through call is dialed to the connector multiple test line in the terminating office.

5.2 Seizure

Upon the seizure of the test line, a check is made of the sleeve closure when relay (SL) is operated to ground supplied over the sleeve from the connector. This relay locks to the sleeve grounds the common holding path, and removes ground from the self-restoring arc of the selector.

5.21 "V" Wiring

When ringing starts, relays (L), (L1) and (H) operate. Relay (H) starts the selector by supplying interrupted ground to the winding of relay (IN). The time taken by the switch in advancing to position 3 provides an interval in which the test man may recognize induction tone applied by the connector. This interval varies from 1.0 to 1.5 seconds, depending upon the position of the interrupter at the moment of seizure. It should be noted that the interruptions controlling relay (IN) have nominal intervals of .3 second closure and .2 second open.

5.22 "T" Wiring

When ringing starts, the thermistor (A) is high in resistance which prevents operation of relay (L) either on the ringing or silent interval. Continued action of ringing current on the thermistor causes it to lower its resistance to the point where relay (L) operates. Relay (H) is thus caused to operate and start the selector by supplying interrupted ground to the winding of relay (IN). The time taken by the switch in advancing to position 3 provides an interval in which the test man may recognize induction tone applied by the connector. This interval varies from 1.5 to 2.0 seconds, depending upon the position of the interrupter at the moment of seizure. It should be noted that the interruptions controlling relay (IN) have nominal intervals of .3 second closure and .2 second open.

5.3 Tripping

When the selector reaches position 3, relay (H1) operates through a front contact of relay (H) and locks to common ground. Relay (H1) permanently closes the interrupter lead to the winding of relay (IN) and closes a loop across the line through the output winding of the repeating coil.

Relay (H1) also cuts off the ringing bridge and closes the tone circuit so as to return a tone signal toward the calling end. The bridge serves to trip ringing in the connector, after which the test man can hear the steady low tone for the remainder of the tripping interval. Where "W" wiring and apparatus and Fig. 2 or Fig. 3 are installed the vacuum tube (A) will break down only on the ringing voltage and serve to trip ringing without afterward interfering with the 1213 ohm loop in testing supervisory relays. The tripping time is 1.5 seconds when "Y" wiring is used and 1.0 second when "X" wiring is furnished, these intervals consisting of the time required by the switch either to step on interruptions through positions 3, 4 and 5 or else to pass by position 3 and step through positions 4 and 5. The purpose of this optional wiring will be explained in section 6 below.

5.4 Open Interval (0.5 second)

As the switch enters position 6, relay (F) operates, breaks the tone supply lead, and opens the loop in order to terminate the tripping interval. This opening will be recognizable at the originating end if attention is being paid to the supervision at the moment.

5.5 Loop Closure (1.0 to 1.5 second)

As the switch enters position 7, relay (F) falls back and recloses the loop and the tone circuit. Assuming "Y" wiring to be furnished, the switch now steps on timed interruptions through positions 7, 8 and 9. This takes 1.5 seconds. In position 10, relay (F) again comes up and opens the loop and the tone circuit. The function of the loop closure provided as just described will be explained in section 6 below.

5.6 Supervisory Relay Flashing and Transmission Tests (1.5 Seconds Overall)

The test line next proceeds to apply a series of flashes to test the supervisory features of various sections of the trunk. The low tone applied during the closed intervals of these flashes enables the test man to make a rough check of the transmission qualities of the trunk. Three openings and three closures are included in the series of flashes. The first open interval extends for 0.5 second and the other two intervals for 0.3 second each, while the three closures are for 0.2 second each.

As just stated above, relay (F) operates in position 10 and opens the loop. This opening continues for 0.5 second interval while the switch remains in position 10, after which the switch passes to position 11 and relay (F) is allowed to release and reclose the loop. This closure continues for 0.2 second until relay (IN) again comes up and reoperates relay (F). This opens the loop for 0.3 second, after which the switch passes to position 12. The same cycle is repeated in position 12, the loop being closed for 0.2 second and

open for 0.3 second. In position 13 the release of relay (F) again closes the loop for 0.2 second and at the end of this time, when relay (IN) reoperates, a circuit is closed for operating relay (SW). Relay (SW) locks to common ground, closes the ground for holding relay (F) through position 11 to 16 inclusive and grounds the magnet interrupter springs from positions 7 to 12 inclusive ("Y" wiring). However, since the switch has already passed beyond position 12, as just stated, this self-interrupter path will remain ineffective until the next round.

Relay (F) is kept operated and the loop is held open throughout the last 0.3 second interval while the switch is standing in position 13, and also through the time occupied in stepping through positions 14 to 16 inclusive. This interval, which amounts to 1.8 seconds, affords an opportunity for disconnection in case the call is abandoned at this time.

5.7 Closed Interval (5.5 second)

The circuit next applies a 5.5 second closure, which is intended primarily for testing message rate and coin box trunks, as will be explained in sections 6 and 7 below. This interval begins with the release of relay (F) as the switch enters position 17 and continues until the switch has timed through position 6 and has advanced on pass-by to position 11. Here relay (F) again operates and opens the loop and the tone circuit. On the second half revolution of the switch positions 3 and 7 became pass-by points with "Y" wiring, the purpose being to make the circuit operation in such case conform to what it would be with "X" wiring.

A 2.0 second open interval begins with the operation of relay (F) in position 11, continuing through the remainder of the pass-by positions 7 to 12 inclusive and through the timed positions 13 to 16 inclusive. Upon reaching 17 the circuit again applies a 5.5 second closure, and from that point repeats the 2.0 second opens and 5.5 closures as long as the connection is held.

5.8 Disconnection

With the removal of ground from the connector sleeve, relay (SL) falls back and closes ground to the self-restoring circuit controlled by arc No. 1. The switch then returns to normal on self-interruptions. All relays locked to the off-normal ground restore. It will be noted that relay (SL) can be operated only in the normal position of the switch, so that the circuit must be fully restored before it can be seized again.

6. LOCAL TRUNKS - MESSAGE REGISTER TRUNK ARRANGED FOR DELAYED CHARGING

6.1 Routing of Test Call

In line finder offices a line finder test set is patched to an ordinary test line appearing on the line finder bank, and test calls are made from the test set, through the line finder and the associated message register trunk circuit,

through the selectors, and the local connector, to the connector multiple test line. A similar procedure is followed for line switch offices.

6.2 Non-Charge Test

The circuit applies the cycle of tests described under section 5 above. The non-charge feature of the message rate trunk is tested during the first short closure following the tripping interval. When any of the message rate trunks to be tested with this test line are arranged to delay their charging for a period of less than 2.0 seconds, the test line is correspondingly arranged to shorten the non-charge interval from 1.5 seconds to 1.0 second and the tripping interval must be shortened likewise to prevent false charging. This is done by means of "X" wiring which causes the switch to pass by position 3 of the tripping interval and position 7 of the non-charge interval instead of timing through in the regular way. The longer or 1.5 second interval is provided by means of "Y" wiring in cases where the message register trunks to be tested are arranged for either immediate charging or for delayed charging with a positive delay interval of 2.0 seconds.

The test man observes the message register associated with the line finder test line to see that the message register does not operate during the 1.0 or the 1.5 second closed intervals.

6.3 Charge Test (5.5 second interval)

The charging feature of the message rate trunk is tested when the test line enters the 5.5 second closed interval. The test man observes the message register associated with the line finder test line to see that the register operates as expected during this test.

6.4 Disconnection

Disconnection may take place during any of the 2.0 second open intervals.

7. LOCAL TRUNKS - COIN BOX TRUNKS

7.1 Routing of Test Call

In order to test the coin collect feature of the coin box trunk, a No. 50 coin collector and a trunk test set may be patched directly to the coin box trunk under test. The separate No. 50 coin collectors will not be required in cases where the test set is arranged to simulate the coin collector by means of relay action. A call is dialed through the coin box trunk, and through the selectors and the local connector to the connector multiple test line.

7.2 Coin Collection

Either the first or the second closed interval of 1.0 to 1.5 second should be sufficient to set the coin box trunk for charging, so that when the coin box receiver is hung up, the coin should be collected.

If the coin box trunk is arranged for delayed charging, the non-charge test will be made during the initial short closures (1.0 to 1.5 second) and the charging feature will be tested by means of the first 5.5 second closure.

It should be explained that the test line is not arranged for testing the coin return feature of the coin box trunk. This feature must be tested by the method heretofore followed, of dialing a portion of the called number and then hanging up. On such an incompleted call, the coin should be returned.

7.3 Disconnection

Disconnection becomes possible during any of the 2.0 second intervals after the required tests have been made.

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DEPT. 332

RLQ)
RSW) IF

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CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Condenser (A) of "T" wiring is changed for proper circuit operation, to connect to 3T of relay (H1) instead of 2T of relay (F).

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3350

RLQ)
RSW) EJ

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CHANGES

B. CHANGES IN APPARATUS

B.1	Superseded	Superseded By
	(F) E966 relay	(F) E1883 relay
	(L1) J25 relay	(L1) J20 relay
	(SL) E461 relay	(SL) E1552 relay
	(A) 97A rept. coil U option	(A) 307R retard coil Q option
	(B) 19NT resist. W option	(B) 19UU resist. S option

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Circuit notes 110 and 111 are added.

D.2 Options used table is added.

D.3 Reference to options U, Q and S and the newly added relays is made in note 109.

D.4 Cross connection figure 1K is rated Mfr. Disc. and figure 51 is added.

All other headings, no change.

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