

21

5

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

TABLE OF CONTENTS	PAGE
<u>SECTION I - GENERAL DESCRIPTION</u> . . . . .	1
1. <u>PURPOSE OF CIRCUIT</u> . . . . .	1
2. <u>GENERAL DESCRIPTION OF OPERATION</u> . . . . .	1
<u>SECTION II - DETAILED DESCRIPTION</u> . . . . .	2
1. <u>INTEROFFICE TRUNKS</u> . . . . .	2
ROUTING OF TEST CALL . . . . .	2
SEIZURE . . . . .	2
A. V Wiring . . . . .	2
B. T Wiring . . . . .	2
TRIPPING . . . . .	2
OPEN INTERVAL (0.5 SECOND) . . . . .	2
LOOP CLOSURE (1.0 TO 1.5 SECONDS) . . . . .	2
SUPERVISORY RELAY FLASHING AND TRANSMISSION TESTS (1.5 SECONDS OVERALL) . . . . .	3
CLOSED INTERVAL (5.5 SECONDS) . . . . .	3
DISCONNECTION . . . . .	3
2. <u>LOCAL TRUNKS - MESSAGE REGISTER TRUNK ARRANGED FOR CHARGING</u> . . . . .	3
ROUTING OF TEST CALL . . . . .	3
NONCHARGE TEST . . . . .	3
CHARGE TEST (5.5-SECOND INTERVAL) . . . . .	4
DISCONNECTION . . . . .	4
3. <u>LOCAL TRUNKS - COIN BOX TRUNKS</u> . . . . .	4
ROUTING OF TEST CALL . . . . .	4
COIN COLLECTION . . . . .	4
DISCONNECTION . . . . .	4

TABLE OF CONTENTS	PAGE
<u>SECTION III - REFERENCE DATA</u> . . . . .	4
1. <u>WORKING LIMITS</u> . . . . .	4
2. <u>FUNCTIONAL DESIGNATIONS</u> . . . . .	4
3. <u>FUNCTIONS</u> . . . . .	4
4. <u>CONNECTING CIRCUITS</u> . . . . .	5
<u>SECTION IV - REASONS FOR REISSUE</u> . . . . .	5
A. <u>Changed and Added Functions</u> . . . . .	5
B. <u>Changes in Apparatus</u> . . . . .	5
D. <u>Description of Changes</u> . . . . .	5
<u>SECTION I - GENERAL DESCRIPTION</u>	
1. <u>PURPOSE OF CIRCUIT</u>	
1.01 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.	
2. <u>GENERAL DESCRIPTION OF OPERATION</u>	
2.01 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 testman will originate calls from the toll board to this circuit.

2.02 The test line, when started, automatically applies to the tip and ring a series of time 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.

## SECTION II - DETAILED DESCRIPTION

### 1. INTEROFFICE TRUNKS

#### ROUTING OF TEST CALL

1.01 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 example 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 if such is provided, and a through call is dialed to the connector multiple test line in the terminating office.

#### SEIZURE

1.02 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, operates relay TD, and removes ground from the self-restoring arc of the selector.

#### A. V Wiring

1.03 When ringing starts, relays L, Ll, 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 testman 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 0.3 second closure and 0.2 second open.

#### B. T Wiring

1.04 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 testman 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 0.3 second closure and 0.2 second open.

#### TRIPPING

1.05 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 transformer, U option, or the inductor, Q option.

1.06 Relay H1 also cuts off the ringing bridge and prepares the tone circuit so as to return a tone signal toward the calling end later on in the test. The bridge serves to trip ringing in the connector. Where W wiring and apparatus and Fig. 2 or Fig. 3 are installed, the electron tube A will break down only on the ringing voltage and serve to trip ringing without afterward interfering with the 1113-ohm loop, U option, or 1223-ohm loop, Q option, in testing supervisory relays. The tripping time is 1.5 seconds when Y wiring is used and 1.0 second when Z wiring is furnished. These intervals consist 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 2.

#### OPEN INTERVAL (0.3 SECOND)

1.07 As the switch enters position 5, relay F operates, breaks the tone signal 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.

#### LOOP CLOSURE (1.0 TO 1.5 SECONDS)

1.08 As the switch enters position 7, relay F falls back and recloses the loop. 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. The function of the loop closure provided as just described will be explained in 1.09 to 1.11.

**SUPERVISORY RELAY FLASHING AND TRANS-MISSION TESTS (1.5 SECONDS OVERALL)**

1.09 The test line next proceeds to apply a series of flashes to test the supervisory features of various sections 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.

1.10 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 re-close 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 positions 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.

1.11 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.

**CLOSED INTERVAL (5.5 SECONDS)**

1.12 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 2. and 3. below. This interval begins with the release of relay F as the switch enters position 17. The path which releases relay F also releases the TD relay. When the TD relay releases, tone is passed through the inductor and is received by the test man. The delay from loop closure to the time that tone is applied is the time of the slow-release TD relay which is 150 to 280 msec. This continues until the switch has timed through position 6 and has advanced on pass-by to position 11. Here relay F again operates as does relay TD and this in turn opens

the loop and the Tone Supply 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.

1.13 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 second closures as long as the connection is held.

**DISCONNECTING**

1.14 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.

**2. LOCAL TRUNKS - MESSAGE REGISTER TRUNK ARRANGED FOR DELAYED CHARGING**

**ROUTING OF TEST CALL**

2.01 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.

**NONCHARGE TEST**

2.02 The circuit applies the cycle of tests described under 1. 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 noncharge 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 noncharge 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.

2.03 The testman 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.

**CHARGE TEST (5.5-SECOND INTERVAL)**

2.04 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.

**DISCONNECTION**

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

**3. LOCAL TRUNKS - COIN BOX TRUNKS**

**ROUTING OF TEST CALL**

3.01 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.

**COIN COLLECTION**

3.02 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.

3.03 If the coin box trunk is arranged for delayed charging, the noncharge 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.

3.04 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 incomplete call, the coin should be returned.

**DISCONNECTION**

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

**SECTION III - REFERENCE DATA**

**1. WORKING LIMITS**

None.

**2. FUNCTIONAL DESIGNATIONS**

None.

**3. FUNCTIONS**

**Interoffice Trunks**

- 3.01 Prepares to start when sleeve is seized by connector.
- 3.02 Awaits ringing, in order to avoid false starting.
- 3.03 Delays starting for additional short interval after ringing begins to allow test man to recognize ringing induction tone.
- 3.04 Trips ringing. Loop closed for 1.0 to 1.5 seconds.
- 3.05 Opens loop for short interval (0.5 second).
- 3.06 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 (see 3.12 through 3.15).
- 3.07 Applies short series of flashes to test supervisory features of trunk.
- 3.08 Opens loop for 1.8 second interval after flashing period to permit disconnection if the call is abandoned.
- 3.09 Closes loop for 5.5 second interval. This interval is used particularly for tests on message rate and coin box trunks (see 3.12 through 3.15).
- 3.10 Repeats the cycle of 2.0 second opening and 5.5 second closure until disconnection occurs.
- 3.11 Provides that test line applies tone signal of steady low tone during each closure of the loop.

Local Trunks - Message Register Trunk - Arranged for Delayed Charging

3.12 Provides for operation of this circuit as described for interoffice trunks (see 3.01 through 3.11).

3.13 Provides for testing the message register trunk 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 3.05). 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).

3.14 Provides for testing the message register trunk for charging during the 5.5 second intervals.

Local Trunks - Coin Box Trunk

3.15 Provides for setting the immediate charge type of coin box trunk 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.

Transmission Selectors Supervisory Relays

3.16 Provides for operation of this circuit as described for interoffice trunks to test supervisory relays.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet the connecting information thereon is to be followed.

- (a) Any standard local connector circuit - SD-31738-01.
- (b) 60 and 120 IPM Interrupter and Interrupter Alarm Circuit - SD-31606-01.
- (c) Tone Supply Circuit - SD-31521-01.
- (d) Power Ring Circuit - SD-80885-01, SD-80780-01.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 Fig. 4 is added to delay connection of low tone for a minimum of 150 msec after the off-hook indication in order to prevent possible interference of the test line combined tone and flash signal with the operation of some types of SF units.

B. Changes in Apparatus

B.1 ADDED

TD Relay AG36 - Fig. 4.

B.2 SUPERSEDED

SUPERSEDED BY

F Relay E1883,  
K Option

F Relay E1920,  
J Option

D. Description of Changes

D.1 Rate this circuit A&M Only for No. 350A offices.

D.2 Fig. 4 is added to delay connection of low tone for a minimum of 150 msec after the off-hook indication in order to prevent possible interference of the test line combined tone and flash signal with the operation of some types of SF units.

D.3 Fig. 4 and options K and J are added to Circuit Notes 109 and Options Used table. Option K is designated and rated Mfr Disc. Option J is added and rated AT&TCo Std.

D.4 Circuit Note 111 is added to reflect the use of options K and J.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-NPS-RJJ

