

DIAL TONE SPEED REGISTER AND DIAL TONE SPEED INDICATING CIRCUITS

TESTS

STEP-BY-STEP DIAL OFFICES

1. GENERAL

1.01 This section describes a method of testing dial tone speed register and dial tone speed indicating circuits used in step-by-step offices. Registrations indicating unsatisfactory dial tone speed are scored when a dial tone delay exceeding 3 seconds is encountered.

1.02 This section is reissued to add a test of the KS-16663 timer and of the timing intervals incidental to circuit functions controlled by the KS-16663 timer. Text material has been rearranged to consolidate testing functions common to each of the two major dial tone speed checking circuits provided. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The tests and features tested are:

Offices Using Equipment per SD-96403-01 (Fig. 1)

A. T- Register Operation: This test checks that the T- register will score the number of test calls originated by the dial tone speed register circuit.

B. D- Register Operation: This test checks that the D- register will score the number of test calls which do not receive dial tone within 3 seconds.

C. Minimum Time Interval: This test checks the accuracy of the time interval between test calls. A check is also made to determine that the T- register scores and that the D- register does not score when dial tone is received in excess of the minimum time interval but in less than 3 seconds.

D. Timing Circuit (Electron Tube): This test checks the setting of the timing circuit calibration feature by measuring the elapsed time required by the A selector of the dial tone speed register circuit to advance ten steps.

E. Alarm Features: This test checks the alarm lock-in and stuck-switch alarm features of the dial tone speed register circuit.

F. Dial Tone Speed Indication: This test checks the test progression lamp indications together with the audible and visual alarms of the dial tone speed indicating circuit (DTSI).

G. DTSI Unit Test: This test checks the unit test feature of the dial tone speed indicating circuit.

Offices Using Equipment per SD-96403-01 (Fig. 12)

H. T- Register Operation: This test checks that the T- register will score the number of test calls originated by the dial tone speed register circuit.

I. D- Register Operation: This test checks that the D- register will score the number of test calls which do not receive dial tone within 3 seconds.

J. Alarm Features: This test checks the alarm lock-in and stuck-switch alarm features of the dial tone speed register circuit.

K. Line Circuit Test: This test checks the testing line circuits connected to the dial tone speed register circuit for equipment conditions which may cause incorrect scoring of unsatisfactory dial tone speed performance.

L. Timer and Timing Interval Test: This test verifies proper operation of the KS-16663 timer and that the timing intervals are correct when dial tone is received within 3 seconds and when dial tone is not received within 3 seconds.

1.04 The dial tone speed register and dial tone speed indicating circuits will not be available for use by the traffic department while tests in this section are in progress. Performance of all tests except Tests C and E (SD-96403-01, Fig. 1) and Test J (SD-96403-01, Fig. 12) causes the seizure of common equipment in checking for dial tone.

1.05 Test E (SD-96401-01, Fig. 12) should be performed monthly during a period of very light traffic. This procedure should limit the dial tone delay indications to those caused by central office line circuit equipment trouble.

1.06 Register readings made to reflect register scoring during testing should be recorded in accordance with local instructions.

1.07 Lettered Steps: A letter a, b, c, etc, added to a step number in Part 3 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter

within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

1.08 Test Line Assignment: Reference to local records will be required to establish the arc terminal number for each test line assigned. Information regarding the association of D- and T- registers with the rotary or toggle switches will be required. When equipment per SD-96401-01 (Fig. 12) is involved, circuit connections providing for a dwell period on selected unassigned terminals may be used. Another connecting method permits skipping unassigned terminals without interfering with the normal 4-second spacing between test calls or dwells. Skip and dwell test terminal assignment data is also used to determine the accuracy of traffic register scorings.

2. APPARATUS

Tests B, C, E, F, G, I, J

2.01 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 419A tool.

Test E

2.02 KS-3008 stop watch or equivalent.

Test C

2.03 510C tool equipped with a W2BL cord.

3. METHOD

STEP	ACTION	VERIFICATION
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Offices Using Equipment per SD-96403-01 (Fig. 1)

A. T- Register Operation

- | | | |
|----|--|--|
| 1a | If A2 through A6 and B2 through B6 rotary switches are provided —
At dial tone speed register (DTSR) —
Record switch settings. | |
| 2b | If TA2 through TA6 and TB2 through TB6 toggle switches are provided —
Record switch settings. | |

STEP	ACTION	VERIFICATION
3	Set A2 through A6 and B2 through B6 rotary switches to position 1, or set TA2 through TA6 and TB2 through TB6 toggle switches to position 1.	
4	Set FAST key to normal position.	
5	Block nonoperated SKA, D2 relays.	
6	At traffic register rack (TRR) — Record readings of all T- registers.	
7	Operate ST key.	At DTSR — R lamp lighted. Selector A makes five complete revolutions and stops; B Selector then makes five complete revolution and stops.
		<i>Note 1:</i> During the operation of the A and B selectors, observe that the selectors stop momentarily on each assigned terminal.
		<i>Note 2:</i> Observe the CN relay to determine that it is operated while coin lines are being scanned. (Consult office records.)
8	Record readings of all T- registers associated with corresponding rotary switch positions.	At TRR — T- registers score once for each assigned test line.
9	Record readings of all T- registers associated with corresponding toggle switches.	T- registers score once for each assigned test line.
10	Restore ST key.	At DTSR — R lamp extinguished. All selectors normal.
11	At DTSR — Set A2 through A6 and B2 through B6 rotary switches to position 2.	
12	Repeat Steps 7, 8, and 10 for rotary switch positions 2, 3, 4, and 5 in turn.	All verifications repeated.
13	Set A2 through A6 and B2 through B6 rotary switches to position 6.	
14	Set TA2 through TA6 and TB2 through TB6 toggle switches to position 2.	

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STEP	ACTION	VERIFICATION
15	Remove blocking tools from SKA, D2 relays.	
16	At TRR — Operate ST key.	At DTSR — R lamp lighted. A and B selectors do not step. C selector steps one complete revolution and continues to step. At TRR — Guard lamp lighted.
17	Restore ST key.	At TRR — Guard lamp extinguished. At DTSR — Guard lamp extinguished. C selector normal. E relay normal.
18	At DTSR — Set A2 through A6 and B2 through B6 rotary switches to position 1.	
19	At TRR — Operate ST key.	R lamp lighted. Selector A steps.
20	At DTSR — Operate FAST key.	Selector A and then selector B continue to step at a higher rate of speed. E relay operates at completion of one revolution of A and B selectors.
21	At TRR — Restore ST key.	R lamp extinguished. All selectors normal. E relay normal.
22	At DTSR — Restore FAST key.	
23	Restore A2 through A6 and B2 through B6 rotary switches to settings noted in Step 1a.	
24	Restore TA2 through TA6 and TB2 through TB6 toggle switches to settings noted in Step 2.	

B. D- Register Operation

- 1 At DTSR —
Record settings of A2 through A6 and B2 through B6 rotary switches.
- 2 Record settings of TA2 through TA6 and TB2 through TB6 toggle switches.

STEP	ACTION	VERIFICATION																		
3	Set A2 rotary switch to position 1.																			
4	Set TA2 toggle switch to position 1.																			
5	Using 893 cord, connect ground to 5B of T1 relay.																			
6	At TRR — Record readings of each D- register.																			
7	At DTSR — Operate ST key, leave operated for approximately 4 seconds (3 seconds minimum), then restore ST key.	At TRR — D- register associated with switch under test operates once.																		
8	Set A2 rotary switch to position 6.																			
9	Set A3 rotary switch to position 2.																			
10	Set TA2 toggle switch to position 2.																			
11	Set TA3 toggle switch to position 1.																			
12	Repeat Step 7.																			
13	Set A3 rotary switch to position 6. Repeat Step 7 for each of the following positions after setting each preceding rotary switch to position 6.																			
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B2	1																			
B3	2																			
B4	3																			
B5	4																			
B6	5																			
14	Set TA3 toggle switch to position 2. Repeat Step 7 for each toggle switch successively. (Set switch being tested to position 1 and preceding switch to position 2.)																			
15	Disconnect ground from 5B of T1 relay.																			
16	Restore rotary switches to settings noted in Step 1.																			

STEP	ACTION	VERIFICATION
17	Restore toggle switches to settings noted in Step 2.	

C. Minimum Time Interval

1	At DTSR — Record settings of A2 through A6 and B2 through B6 rotary switches.	
2	Set A2 rotary switch to position 1.	
3	Set A3 through A6 and B3 through B6 rotary switches to position 6.	
4	Using 893 cord, connect ground to 5B of T1 relay.	
5	Operate FAST key.	
6	At TRR — Record readings of T- and D- registers associated with rotary switch position 1.	
7	At DTSR — Operate ST key, start timing; after approximately 2 seconds, disconnect ground from 5B of T1 relay.	At TRR — T- register scores once. D- register does not score.
8	Restore ST, FAST keys.	
9	Restore A2 through A6 and B2 through B6 rotary switches to settings noted in Step 1.	

D. Timing Circuit (Electron Tube)

1	At DTSR — Operate CAL, FAST keys.	
2	Operate ST key, start timing, and observe operation of selector A.	At DTSR — Elapsed time required for selector A to step 20 times is 60.8 seconds minimum, 61.8 seconds maximum. <i>Note 1:</i> This test shall be made when the circuit voltage is between 48.5 and 50 volts. <i>Note 2:</i> The timing interval may be changed by rotary adjustment of the T potentiometer.
3	Restore ST, FAST, CAL keys.	All selectors normal.

STEP	ACTION	VERIFICATION
E. Alarm Features		
1	At DTSR — Using 893 cord, connect ground to 5B of T1 relay.	
2	Operate SD, ST keys.	At DTSR — After approximately 3 seconds, audible alarm sounded. DT lamp lighted.
3	Disconnect ground from 5B of T1 relay.	Selectors do not step.
4	Restore SD key.	DT lamp extinguished. Audible alarm silenced. Selector A steps to next succeeding terminal.
5	Restore ST key.	All selectors normal.
6	Using 893 cord, connect ground to 5B of T1 relay. Operate SD key	
7	At TRR — Operate ST key.	R lamp lighted. After at least 3 seconds, DT lamp does not light. Audible alarm does not sound.
8	Restore ST key.	R lamp extinguished. All selectors normal.
9	At DTSI — Operate ST key.	R lamp lighted. After at least 3 seconds, DT lamp does not light. Audible alarm does not sound.
10	Restore ST key.	R lamp extinguished. All selectors normal.
11	At DTSR — Restore SD key.	

F. Dial Tone Speed Indication

- | | |
|---|--|
| 1 | At DTSR —
Record settings of A2 through A6 and B2 through B6 rotary switches. |
| 2 | Select two rotary switches (A2 through A6) which together have 21 or more test lines on their test arcs and set to corresponding position. |

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STEP	ACTION	VERIFICATION
3	Set all other A- and B- rotary switches to position 6.	
4	Using 893 cord, connect ground to 5B of T1 relay.	
5	At DTSI — Operate ST key.	<p>At DTSI — T lamp lighted. T1 through T20 lamps lighted in succession at 3-second intervals. As T selector steps, T20 lamp remains lighted. B lamp lighted. T lamp extinguished. B1 through B20 lamps light in succession at 3-second intervals. As B selector steps, ALM lamp lights. Buzzer A sounds when a T- or B-lamp lights.</p> <p><i>Note:</i> The DTSI circuit may be arranged to bring in the alarm immediately after the first test failure (T1 lamp), or after a predetermined number of test failures (T1 through T20 or B1 through B20 lamps). The predetermined number of test failures required to bring in the visual and audible alarms may be obtained from local records.</p>
6	Restore ST key.	All selectors normal.
7	Operate ACO key momentarily.	ALM lamp extinguished. Buzzer A silenced.
8	Operate ST key.	ALM lamp lights and buzzer A sounds when correct T- or B- lamp lights.
9	Operate ACO key momentarily.	<p>ALM lamp extinguished. Buzzer A silenced. T and B selectors continue to step. During next cycle, ALM lamp lights and buzzer A sounds when correct T- or B- lamp lights.</p>
10	Restore ST key.	<p>All selectors normal. At alarm extension location — ALM lamp lighted. Buzzer A sounded.</p>
11	Operate ACO key momentarily.	<p>ALM lamp extinguished. Buzzer A silenced. At alarm extension location — ALM lamp extinguished. Buzzer A silenced.</p>

STEP	ACTION	VERIFICATION
12	At DTSR — Disconnect ground from 5B of T1 relay.	
13	Restore A2 through A6 and B2 through B6 rotary switches to settings recorded in Step 1.	
G. DTSI Unit Test		
1	Consult office records to determine: (a) T and B selector brush positions at which alarms are initiated. (b) Number of arcs assigned for testing in each unit.	
2	At DTSR — Using 893 cord, connect ground to 5B of T1 relay.	
3	At TRR — Record readings of T- and D- registers.	
4	At DTSI — Operate key A.	At DTSI — AA, AB lamps, as determined in Step 1, lighted in sequence. T lamp lighted. As DTSR tests terminals, T1 through T20 lamps lighted and extinguished in sequence. T lamp extinguished. B lamp lighted. As DTSR continues to test terminals, B1 through B20 lamps lighted and extinguished in sequence. At predetermined point in cycle of T and B selectors, ALM lamp lighted. Buzzer A sounded.
5	Operate ACO key momentarily.	ALM lamp extinguished. Buzzer A silenced.
6	At completion of a cycle of lighted T- and B- lamps, restore key A.	T and B selectors normal. T, B, T-, B- lamps extinguished.
7	Operate B key.	AA, AB lamps, as determined in Step 1, lighted in sequence. T lamp lighted. As DTSR tests terminals, T1 through T20 lamps lighted and extinguished in sequence. T lamp extinguished. B lamp lighted.

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STEP	ACTION	VERIFICATION
7 (Cont)		As DTSR continues to test terminals, B1 through B20 lamps lighted and extinguished in sequence. At predetermined point in cycle of T and B selectors, ALM lamp lighted. Buzzer A sounded.
8	Momentarily operate ACO key.	ALM lamp extinguished. Buzzer A silenced.
9	At completion of a cycle of lighted T- and B- lamps, restore B key.	T and B selectors normal. T, B, T-, B- lamps extinguished.
10	Repeat Steps 7, 8, 9 substituting C, D, E keys in turn for B key.	AA-, AB- lamps, as determined in Step 1, light in sequence with operation of C, D, E keys. All other verifications repeated.
11	At DTSR — Disconnect ground from 5B of T1 relay.	
12	At TRR — Read T- and D- registers.	At TRR — T- and D- registers have not scored and readings are unchanged from recording made in Step 3.

Offices Using Equipment per SD-96403-01 (Fig. 12)

H. T- Register Operation

- 1a If A2 through A6 and B2 through B6 rotary switches are provided —
At dial tone speed register (DTSR) —
Record switch settings.
- 2b If TA2 through TA6 and TB2 through TB6 toggle switches are provided —
Record switch settings.
- 3 Set A2 through A6 and B2 through B6 rotary switches to position 1, or set TA2 through TA6 and TB2 through TB6 toggle switches to position 1.
- 4 Block nonoperated SKA, D2 relays.
- 5 At traffic register rack (TRR) —
Record readings of all T- registers.

STEP	ACTION	VERIFICATION
6	Operate ST key.	<p>At DTSR — R lamp lighted. Selector A makes five complete revolutions and stops. B selector then makes five complete revolutions and stops.</p> <p><i>Note 1:</i> During operation of the A and B selectors, observe to determine that the selectors stop on each terminal for a 3-second test or stop for 4 seconds on unassigned dwell terminals unless the skip feature is provided. If the skip feature is provided, note that unassigned terminals are passed over without delay. (See 1.08.)</p> <p><i>Note 2:</i> Observe the CN relay to determine that it is operated while coin lines are being observed.</p>
7	Record readings of all T- registers associated with corresponding rotary switch positions.	<p>At TRR — T- registers score once for each assigned test line.</p>
8	Restore ST key.	<p>At DTSR — R lamp extinguished. All selectors normal.</p>
9	<p>At DTSR — Set A2 through A6 and B2 through B6 rotary switches to position 2.</p>	
10	Repeat Steps 6, 7, 8 for rotary switch positions 2, 3, 4, 5 in turn.	All verifications repeated.
11	Set A2 through A6 and B2 through B6 rotary switches to position 6.	
12	Set TA2 through TA6 and TB2 through TB6 toggle switches to position 2.	
13	Remove blocking tools from SKA, D2 relays.	
14	<p>At TRR — Operate ST key.</p>	<p>At DTSR — R lamp lighted. A and B selectors do not step. C selector steps one complete revolution and continues to step. At TRR — Guard lamp lighted.</p>

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STEP	ACTION	VERIFICATION
15	Restore ST key.	Guard lamp extinguished. At DTSR — R lamp extinguished. C selector normal. E relay normal.
16	At DTSR — Restore A2 through A6 and B2 through B6 rotary switches to positions noted in Step 1a.	
17	Restore TA2 through TA6 and TB2 through TB6 toggle switches to positions noted in Step 2b.	
1. D- Register Operation		
1	At DTSR — Record settings of A2 through A6 and B2 through B6 rotary switches.	
2	Record settings of TA2 through TA6 and TB2 through TB6 toggle switches.	
3	Set A2 rotary switch to position 1.	
4	Set TA2 toggle switch to position 1.	
5	Using 893 cord, connect ground to 5B of T1 relay.	
6	Insulate 3-4T of L relay (ZU option).	
7	Determine first terminal of arc connected to a test line. (See 1.08.)	
8	At TRR — Record readings of all D- registers.	
9	At DTSR — Operate ST key. When selector reaches first terminal connected to test line, hold ST key operated approximately 4 seconds (3 seconds minimum) then restore ST key.	At TRR — D- register associated with switch under test operated once.
10	Set A2 rotary switch to position 6.	
11	Set TA2 toggle switch to position 2.	
12	Set TA3 toggle switch to position 1.	

STEP	ACTION	VERIFICATION																		
13	Repeat Step 9.																			
14	Set A3 rotary switch to position 6. Repeat Step 9 for each of following positions after first setting preceding rotary switch to position 6.																			
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B6	5																			
15	Set TA3 toggle switch to position 2. Repeat Step 9 for each of toggle switches in order (after setting switch under test to position 1 and preceding switch to position 2).																			
16	Disconnect ground from 5B of T1 relay.																			
17	Remove insulator from 3-4T of L relay.																			
18	Restore rotary switches to positions noted in Step 1.																			
19	Restore toggle switches to positions noted in Step 2.																			

J. Alarm Features

1	At DTSR — Using 893 cord, connect ground to 5B of T1 relay.	
2	Operate ST key.	At DTSR — Within 2 to 4 minutes, DT lamp lighted. Audible alarm sounded.
3	Restore ST key.	DT lamp extinguished. Audible alarm silenced. All selectors normal.
4	Operate TST key.	After 20 to 30 seconds, DT lamp lighted. Minor alarm sounded.

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STEP	ACTION	VERIFICATION
5	Restore TST key.	DT lamp extinguished. Minor alarm silenced.
6	Disconnect ground from 5B of T1 relay.	
7	Connect 510C tool to 48V battery and to 2T of A1 relay.	
8	Operate ST key.	510C tool lamp flashes as selector A and then B selector step over terminals 1 through 19.
9	Restore ST key.	All selectors normal.
10	Disconnect 510C tool.	

K. Line Circuit Test

1 At TRR —
Record readings of T- and D- registers.

2 Note that DTSR circuit is normal.
Operate TST key.

Selector A steps.

Note 1: If dial tone is received promptly, the T- register will score and the selector will advance in the normal manner, making a test or resting on a dwell terminal every 4 seconds.

Note 2: If dial tone is not received within 20 to 30 seconds (2 to 4 minutes for a modified unit), an alarm will sound and the DT lamp will light. Since the test is made during light traffic hours, this is probably an indication of equipment trouble, usually associated with the customer line circuit connected to the terminal on which the selector stopped.

Note 3: The cause of the failure should be determined and repairs made promptly. However, if necessary, the line circuit may be temporarily disconnected from the test circuit and the terminal involved strapped to the V2 lead. Under this temporary condition, the selector will skip the terminal, allowing a test to proceed.

Caution: If a terminal has been temporarily strapped to the V2 lead, it is essential to assure that the strap is removed when repairs have been made and the customer test line reconnected.

- 3 After test has run approximately 1 hour, restore TST key. T- register scored once for each test.
D- register scored once for each dial tone delay encountered.
- 4 Record readings of T- and D- registers.

L. Timer and Timing Interval Test

- 1 At TRR —
Record readings of T- and D- registers.
- 2 At DTSR —
Operate TST key. Select any arc which does not contain skip terminals. (See 1.10.) Start stop watch timing when the selector stops on terminal 1 and stop timing when selector stops on terminal 1 of the next arc. The elapsed time should be 80 ± 0.5 seconds.

Using any assigned terminal, start stop watch timing when the ST2 relay operates and stop timing when the P1 relay operates. This interval should be 3 seconds, and any error is likely to be much less than the error involved in operating the stop watch. Repeat this test 6 times to determine if the KS-16663 timer is producing any significant error.

Note: Since no adjustment procedures are available, defective KS-16663 timer must be replaced.

- 4 Restore TST key.
- 5 At TRR —
Record readings of T- and D- registers.