

DIAL TONE SPEED REGISTER AND DIAL TONE SPEED INDICATING CIRCUITS TESTS

1. GENERAL

1.01 This section describes a method of testing dial tone speed register and dial tone speed indicating circuits used in panel, No. 1 crossbar, No. 5 crossbar, and step-by-step offices.

1.02 This section is reissued to delete reference to toggle switches in Tests A and B, to clarify the toggle switch positions in Tests H and I, and to add the first-cycle delay feature to Test E.

1.03 The tests and features covered are:

PAGE

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. 2

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. 4

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. 5

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 twenty steps. 5

E. Alarm Features: This test checks the alarm lock-in, stuck-switch alarm and first-cycle delay features of the dial tone speed register circuit. 6

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). 7

G. DTSI Unit Test: This test checks the unit test feature of the dial tone speed indicating circuit. 8

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. 10

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. 11

J. Alarm Features: This test checks the alarm lock-in and stuck-switch alarm features of the dial tone speed register circuit. 13

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. 13

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

SECTION 252-101-501

received within 3 seconds and when dial tone is not received within 3 seconds.

14

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 K (SD-96403-01, 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 trouble in the central office line circuit equipment, associated common equipment, or the dial tone speed circuit.

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-96403-01 (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.

Tests E, D

2.02 KS-3008 stopwatch 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

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| 1 | At dial tone speed register (DTSR)—
Record switch settings of A2 through A6 and B2 through B6 switches. | |
| 2 | Set A2 through A6 and B2 through B6 rotary switches to position 1. | |
| 3 | Set FAST key to normal position. | |
| 4 | Block nonoperated SKA, D2 relays. | |

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

SECTION 252-101-501

STEP	ACTION	VERIFICATION
15	At DTSR— Set A2 through A6 and B2 through B6 rotary switches to position 1.	
16	At TRR— Operate ST key.	R lamp lighted. A selector steps.
17	At DTSR— Operate FAST key.	A selector and then B selector continue to step at a higher rate of speed. E relay operates at completion of one revolution of A and B selectors.
18	At TRR— Restore ST key.	R lamp extinguished. All selectors normal. E relay normal.
19	At DTSR— Restore FAST key.	
20	Restore A2 through A6 and B2 through B6 rotary switches to settings noted in Step 1a.	

B. D- Register Operation

1	At DTSR— Record settings of A2 through A6 and B2 through B6 rotary switches.	
2	Set A2 rotary switch to position 1.	
3	Using 893 cord, connect ground to 5B of T1 relay.	
4	At TRR— Record readings of each D- register.	
5	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.
6	Set A2 rotary switch to position 6.	
7	Set A3 rotary switch to position 2.	
8	Repeat Step 5.	
9	Set A3 rotary switch to position 6. Repeat Step 5 for each of the following positions after setting each preceding rotary switch to position 6.	

STEP	ACTION	VERIFICATION
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ROTARY SWITCH	POSITION
A4	3
A5	4
A6	5
B2	1
B3	2
B4	3
B5	4
B6	5

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| 10 | Disconnect ground from 5B of T1 relay. | |
| 11 | Restore rotary switches to settings noted in Step 1. | |

C. Minimum Time Interval

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| 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, <i>start timing</i> ; 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)

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| 1 | At DTSR—
Operate CAL, FAST keys. | |
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SECTION 252-101-501

STEP	ACTION	VERIFICATION
2	Operate ST key, simultaneously start timing, and observe operation of selector A.	<p>At DTSR— Elapsed time required for A selector to step 20 times with Fig. 5 (CB relay) furnished is 60.8 seconds minimum to 61.8 seconds maximum. With Fig. 5 not furnished, elapsed time is 59.2 seconds minimum to 60.2 seconds maximum.</p> <p><i>Note 1:</i> This test shall be made when the circuit voltage is between 48.5 and 50 volts.</p> <p><i>Note 2:</i> The timing interval may be changed by rotary adjustment of the T potentiometer.</p>
3	Restore ST, FAST, CAL keys.	All selectors normal.
E. Alarm Features		
1	At DTSR— Using 893 cord, connect ground to 5B of T1 relay.	
2	Operate SD, ST keys.	<p>At DTSR— After approximately 3 seconds, audible alarm sounded. DT lamp lighted.</p>
3	Disconnect ground from 5B of T1 relay.	Selectors do not step.
4	Restore SD key.	<p>DT lamp extinguished. Audible alarm silenced. A selector steps to next succeeding terminal.</p>
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.	<p>R lamp lighted. After at least 3 seconds, DT lamp does not light. Audible alarm does not sound.</p>
8	Restore ST key.	<p>R lamp extinguished. All selectors normal.</p>
9	At DTSI— Operate ST key.	<p>R lamp lighted. After at least 3 seconds, DT lamp does not light. Audible alarm does not sound.</p>

STEP	ACTION	VERIFICATION
10	Restore ST key.	R lamp extinguished. All selectors normal.
11	At DTSR— Restore SD key.	
12	◆Block nonoperated E relay.	
13	Operate ST key.	After 2 to 4 minutes— A relay operated. Audible alarm sounded DT lamp lighted.
14	Restore ST key.	A relay normal. Audible alarm silenced. DT lamp extinguished.
15	Block operated E relay.	
16	Operate ST key.	A selector steps to next succeeding terminal every 3 seconds. Audible alarm not sounded. DT lamp not lighted.
17	Remove blocking tool E relay.	
18	Restore ST key.	All selectors normal.
19	Disconnect ground from 5B of T1 relay.◆	

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 arc and set to corresponding position.	
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.	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.

SECTION 252-101-501

STEP	ACTION	VERIFICATION
		T lamp extinguished. B1 through B20 lamps light in succession at 3-second intervals. As B selector steps, ALM lamp lighted. Buzzer A sounds when a T- or B- lamp lighted.
		<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.
6	Restore ST key.	All selectors normal.
7	Momentarily operate ACO key.	ALM lamp extinguished. Buzzer A silenced.
8	Operate ST key.	ALM lamp lighted and buzzer A sounds when correct T- or B- lamp lighted.
9	Momentarily operate ACO key.	ALM lamp extinguished. Buzzer A silenced. T and B selectors continue to step. during next cycle, ALM lamp lighted and buzzer A sounds when correct T- or B- lamp lighted.
10	Restore ST key.	All selectors normal. At alarm extension location— ALM lamp lighted. Buzzer A sounded.
11	Momentarily operate ACO key.	ALM lamp extinguished. Buzzer A silenced. At alarm extension location— ALM lamp extinguished. Buzzer A silenced.
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.

STEP	ACTION	VERIFICATION
	(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 A key.	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	Momentarily operate ACO key.	ALM lamp extinguished. Buzzer A silenced.
6	At completion of a cycle of lighted T- and B- lamps, restore A key.	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. 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.

SECTION 252-101-501

STEP	ACTION	VERIFICATION
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 DTSR—
Record switch settings.
- 2a Set A2 through A6 and B2 through B6 rotary switches to position 1.
- 3b If TA2 through TA6 and TB2 through TB6 toggle switches are provided—
Record switch settings.
- 4b Set TA2 through TA6 and TB2 through TB6 toggle switches to up position.
- 5 Block nonoperated SKA, D2 relays.
- 6 At TRR—
Record readings of all T- registers.
- 7 Operate ST key.

At DTSR—
A selector makes five complete revolutions and stops.
B selector then makes five complete revolutions and stops.

Note 1: 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.)

STEP	ACTION	VERIFICATION
8a	Record readings of all T- registers associated with corresponding rotary switch positions.	At TRR— T- registers score once for each assigned test line.
9b	◆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— All selectors normal.
11a	At DTSR— Set A2 through A6 and B2 through B6 rotary switches to position 2.	
12a	Repeat Steps 7, 8 and 10 for rotary switch positions 2, 3, 4, 5 in turn.	All verifications repeated.
13a	Set A2 through A6 and B2 through B6 rotary switches to position 6.	
14b	Set TA2 through TA6 and TB2 through TB6 toggle switches to position 2.	
15	Remove blocking tools from SKA, D2 relays.	
16	At TRR— Operate ST key.	At DTSR— 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.	Guard lamp extinguished. At DTSR— C selector normal. E relay normal.
18a	At DTSR— Restore A2 through A6 and B2 through B6 rotary switches to positions noted in Step 1a.	
19b	Restore TA2 through TA6 and TB2 through TB6 toggle switches to positions noted in Step 2b.	

I. D- Register Operation

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| 1a | At DTSR—
Record settings of A2 through A6 and B2 through B6 rotary switches. |
| 2a | Set A2 rotary switch to position 1. |

SECTION 252-101-501

STEP	ACTION	VERIFICATION
3b	Record settings of TA2 through TA6 and TB2 through TB6 toggle switches.	
4b	Set TA2 toggle switch to up position.	
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.
10a	Set A2 rotary switch to position 6.	
11b	Set TA2 toggle switch to down position.	
12b	Set TA3 toggle switch to up position.	
13	Repeat Step 9.	
14a	Set A3 rotary switch to position 6. Repeat Step 9 for each of following positions after first setting preceding rotary switch to position 6.	

ROTARY SWITCH	POSITION
A4	3
A5	4
A6	5
B2	1
B3	2
B4	3
B5	4
B6	5

STEP	ACTION	VERIFICATION
15b	Set TA3 toggle switch to down position. Repeat Step 9 for each of toggle switches in order after setting switch under test to up position and preceding switch to down position.	
16	Disconnect ground from 5B of T1 relay.	
17	Remove insulator from 3-4T of L relay.	
18a	Restore rotary switches to positions noted in Step 1a.	
19b	Restore toggle switches to positions noted in Step 2b.	

J. Alarm Features

1	At DTSR— Using 893 cord, connect ground to 5B of T1 relay.	
2	Operate TST key.	After 20 to 30 seconds (2 to 4 minutes for a Fig. 1 modified to a Fig. 12), DT lamp lighted. Minor alarm sounded.
3	Restore TST key.	DT lamp extinguished. Minor alarm silenced.
4	Disconnect ground from 5B of T1 relay.	
5	Connect 510C tool to 48V battery and to 2T of A1 relay.	
6	Operate ST key.	510C tool lamp flashes as A selector and then B selector step over terminals 1 through 19.
7	Restore ST key.	All selectors normal.
8	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.	A selector 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.

STEP	ACTION	VERIFICATION
		<p>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.</p> <p>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 IVT2 lead. Under this temporary condition, the selector will skip the terminal, allowing a test to proceed.</p> <p>Caution: <i>If a terminal has been temporarily strapped to the IVT2 lead, it is essential that the strap be removed when repairs have been made and the customer test line reconnected.</i></p> <p>Note 4: A delay registration without an alarm being sounded could indicate an intermittent trouble. In this case, if the trouble clears itself after 3 seconds but before the alarm sounds, the selector will advance and the identity of the offending terminal will be lost. If this occurs with any frequency, it may be necessary to observe the selector as it rides over the arc in question.</p>
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 has the fewest number of skip terminals. (See 1.08.) Start stopwatch 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 $80 \pm .05$ seconds, less 4 seconds for each skip terminal.

STEP	ACTION	VERIFICATION
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Using any assigned terminal, start stopwatch 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 stopwatch. Repeat this test six 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.

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