

TELEPHONE ANSWERING SYSTEMS
TONE SIGNALING CIRCUIT SD-99556-01 (J59202)
USED WITH LINE CONCENTRATOR-IDENTIFIER SYSTEMS
TESTS AND ADJUSTMENTS

1. GENERAL

1.01 This section provides a method of testing and adjusting the tone signaling circuit SD-99556-01 (J59202) for use with the concentrator-identifier (Telephone Answering System). The tone signaling circuit (TSC), Fig. 1, converts the present dc signaling between concentrator and identifier to inband tone signaling using standard TOUCH-TONE® and SF signaling frequencies. The use of inband signaling enables the link between the concentrator and identifier to be either carrier facilities or 4-wire lines equipped for SF signaling.

1.02 This issue of the section is based on the following drawings:

SD-99556-01, Issue 1
SD-95964-01, Issue 16B
SD-99449-01, Issue 7B
SD-95962-01, Issue 9B.

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

1.03 On concentrator-identifiers equipped with TSC, the TSC should be tested before testing the concentrator-identifier circuits.

1.04 A general description of the TSC is contained in Section 951-830-100.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.

2.02 35-Type test set (used to test relays).

2.03 21A transmission measuring set, J94021A (SD-95115-01), or equivalent.

2.04 Central office TOUCH-TONE frequency circuit (used to check the frequencies of the TOUCH-TONE generator).

2.05 TOUCH-TONE telephone set (used to originate a call to the central office TOUCH-TONE frequency test circuit).

2.06 Testing cord, W2W, 10 feet long, equipped with a 310 plug, one 360B tool, one 360C tool (2W17C cord), and two 365 (alligator clips) tools (used to connect 35-type test set to relays under test).

2.07 Patching cord, P3N cord, 6 feet long, equipped with a 310 plug on one end and a 241A plug on other end (3P17B cord) (used to connect 21A transmission measuring set to circuits under test).

2.08 Patching cord, W2C cord, 10 feet long, equipped with a 310 plug on one end and two alligator clips on other end (2W6A cord) (used to connect TOUCH-TONE generator to test line).

2.09 Blocking and insulating tools, as required. Use tools and apply as covered in Section 069-020-801.

3. RELAY TESTS



The following electrical and mechanical tests should be applied in accordance with circuit requirement tables SD-99556-01.

Tone Signaling Circuit—Originating End

3.01 Check the TCD (A, B) and TC (1-6) relays for electrical and mechanical requirements.

Tone Signaling Circuit—Identifier

3.02 Check the TCI (A, B) relays for electrical and mechanical requirements.

3.03 The remaining relays in the tone signaling circuit should not require mechanical adjustment or electrical test. However, if a relay fails during subsequent testing, the requirements for the particular relay should be obtained by either mechanical adjustment or replacement.

4. CIRCUIT TESTS

4.01 The following tests can be performed on the TSC when it is in or out of service. If adjustment is necessary, procedures will be found in the test to be performed.

A. TOUCH-TONE Generator Output: The following features are checked:

- (1) The output power level of the TOUCH-TONE generator
- (2) The TOUCH-TONE frequencies corresponding to digits 0 through 9, alarm, and alarm release signals.

B. TOUCH-TONE Receiver Amplifier Output: This test contains procedures for setting the output power level of the amplifier in the TOUCH-TONE receiver circuit.

C. Data Trunk SF Signaling: This test checks the SF signaling of the two data trunks.

D. Talk Trunk SF Supervision: This test checks the SF supervision of the talk trunks.

E. Digit and Alarm Registration: This test checks the digit register relays operation, alarm, and alarm release indications in response to TOUCH-TONE frequencies produced by the TOUCH-TONE generator.

F. Data Trunk Operation and Lockout: The following features are tested.

- (1) Alternate use of data trunks
- (2) A data trunk and respective controllers can be locked out of service by operation of the controller make-busy keys (CA or CB) at the concentrator.

G. Data Trunk Transfer: The following features are tested:

- (1) At the originating end, data trunks can be transferred by operating the TRF key. To provide a controller lockout and data trunk transfer, the controller make-busy keys (CA or CB) must be operated in addition to the TRF key.
- (2) At the identifier, a data trunk can be transferred and associated controller locked out of service by operating the BSY key to the respective position.

4.02 Failure of tests E, F, and G could indicate trouble in either the concentrator-identifier or the tone signaling circuit.

4.03 Performance of the tests in this section requires simultaneous action and verification at the originating central office and at the identifier. If a talking path is not available, a test line can be connected to a vacant ringup circuit and a talking path established via the test line and concentrator-identifier equipment.

4.04 The instruction "activate ringup circuit" in the ACTION column of Part 6 is performed by the use of test set KS-21056 (SD-95964-01, only) or by manually operating the RU relay of the associated ringup circuit. In the instruction "activate ringup circuit three times," permit the concentrator-identifier to process a call after each activation of the ringup circuit.

TABLE A

APPARATUS	QUANTITIES REQUIRED FOR TESTS							
	RELAY TESTS	CIRCUIT TESTS						
		A	B	C	D	E	F	G
35-Type Test Set (2.02)	1							
21A Transmission Measuring Set (2.03)		1	1					
Central Office TOUCH-TONE Frequency Test Circuit (2.04)		1						
TOUCH-TONE Telephone Set (2.05)		1						
2W17C Cord (2.06)	2							
3P17B Cord (2.07)		1	1					
2W6A Cord (2.08)		1						
Tools (2.09)				√	√	√		

√ As required

SECTION 473-500-501

5. PREPARATION

STEP	ACTION	VERIFICATION
1	Establish a talking connection between the originating central office and the answering service bureau.	
2	Select for test a vacant ringup circuit and inform answering service bureau which line was selected for test.	

6. METHOD

STEP	ACTION	VERIFICATION
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A. TOUCH-TONE Generator Output

Note: The following test is to be performed at the originating Central Office.

1	Calibrate 21A TMS as covered in Section 103-221-101.	
2	At concentrator— Operate CA key.	
3	Using 3P17B cord, connect 600Ω DET IN jacks of 21A TMS to TT jack of TOUCH-TONE generator of Controller A.	
4	At TSC equipment— Turn SEL switch to digit 3.	
5	At TSC equipment— Depress TST key.	
6	At TSC equipment— Remove the 3P17B cord from TT jack of TOUCH-TONE generator of Controller A.	
7	At concentrator— Restore CA key. Operate CB key.	
8	At TSC equipment— Place the 3P17B cord into TT jack of TOUCH-TONE generator of Controller B.	

21A TMS reads -10 dBm.

Note: If this reading is not obtained, change 89-type resistor of TTP pad of TT generator under test. For example, if reading is -8 dBm, add -2 dBm (89 J resistor) to meet the requirement (see Table B).

STEP	ACTION	VERIFICATION
9	At TSC equipment— Depress TST key.	21A TMS reads -10 dBm. <i>Note:</i> If this reading is not obtained, change 89-type resistor of TTP pad of TT generator under test until requirement is obtained (see Table B).
10	At TSC equipment— Remove patch cord from test set and TT jack of TOUCH-TONE generator.	
11	At concentrator— Restore CB key.	
12	At concentrator— Operate CA key.	
13	At TSC equipment— Connect a TOUCH-TONE station set to a test line.	
14	Using 2W6A cord— Connect white lead to tip of test line. Connect blue lead to ring of test line. Connect plug to TT jack of TOUCH-TONE generator of Controller A.	
15	At TOUCH-TONE station set— Originate a call to central office TOUCH-TONE frequency test circuit. <i>Note: Steps 16 and 17 must be performed in a 15 sec. interval after seizure tone is heard.</i>	At TOUCH-TONE station set— Low tone heard indicating test circuit is seized.
16	At TOUCH-TONE station set— Dial preliminary digit 4 to indicate 12 pushbutton station set (if required).	
17	At TSC equipment— Place SEL switch to digit 1 and hold TST key operated. Rotate SEL switch clockwise stopping on position AL. Release TST key. Place SEL switch to digit 0 and hold TST key operated. Rotate SEL switch to ALR position. Release TST key.	At TOUCH-TONE station set— After ALR position is tested— Test verification or rejection tone heard.
18	At TSC equipment— Remove patch cord from TT jack of Controller A.	

SECTION 473-500-501

STEP	ACTION	VERIFICATION
19	At concentrator— Restore CA key. Operate CB key.	
20	At TSC equipment— Connect patch cord to TT jack of Controller B.	
	<i>Note:</i> Step 21 must be performed in the 15 sec. interval following zip tone signals.	
21	At TSC equipment— Place SEL switch to digit 1 and hold TST key operated. Rotate SEL switch clockwise stopping on position AL. Release TST key. Place SEL switch to digit 0 and hold TST key operated. Rotate SEL switch to ALR position. Release TST key.	At TOUCH-TONE station set— After ALR position is tested— Test verification or rejection tone heard.
22	At TSC equipment— Remove patch cord from TT jack of Controller B and TOUCH-TONE station set.	
23	At concentrator— Restore CB key.	
24	At TOUCH-TONE station set— Disconnect call to central office TOUCH-TONE frequency test circuit. Disconnect TOUCH-TONE station set from test line.	

B. TOUCH-TONE Receiver Amplifier Output

Note: Standard transmission levels between originating central office and identifier serving central office should be in proper adjustment.

- 2 Calibrate 21A TMS as covered in Section 103-221-101.
- 3 At concentrator—
Operate CA key.
- 4 At identifier—
At AMP A—
Using 3P17B cord, connect 600Ω DET IN jacks of 21A TMS to AMP OUT jack.
- 5 At originating end—
At TSC equipment—
Turn SEL switch to digit 3.

STEP	ACTION	VERIFICATION
6	At originating end— At TSC equipment— Depress TST key.	At identifier— 21A TMS reads -3 dBm. See Fig. 2. <i>Note:</i> If this requirement is not obtained, adjust AMP A until the requirement is obtained.
7	At identifier— At AMP A— Remove 3P17B cord from AMP OUT jack.	
8	At concentrator— Restore CA key. Operate CB key.	
9	At identifier— At AMP B— Insert 3P17B cord into AMP OUT jack.	
10	At originating end— At TSC equipment— Depress TST key.	At identifier— 21A TMS reads -3 dBm. See Fig. 2. <i>Note:</i> If this requirement is not obtained, adjust AMP B until the requirement is obtained.
11	At identifier— At AMP B— Remove 3P17B cord from AMP OUT jack and 21A TMS.	
12	At concentrator— Restore CB key.	
C. Data Trunk SF Signaling		
2	At concentrator— Operate CA key.	
3	At identifier— Insulate 3 and 4T of PC(A) relay.	
4	At originating end— At TSC equipment— Block ADS(A) relay operated.	At originating end— At TSC equipment— Relay TCD(A) operates which indicates the originating end signaled the terminating end. At identifier— At TSC equipment— Relay TCI(A) operates to indicate signaling was received.
5	At originating end— At TSC equipment— Block EDO(A) relay nonoperated.	

SECTION 473-500-501

STEP	ACTION	VERIFICATION
6	At identifier— Remove insulating tool from 3 and 4T of PC(A) relay.	
	<i>Note:</i> This action causes the terminating end to signal the originating end.	
7	At originating end— At TSC equipment— Remove blocking tool from EDO(A) relay.	At originating end— At TSC equipment— Relays EDO(A) and DS(A) operate to indicate signaling was received from the terminating end.
8	At originating end— At TSC equipment— Block the operated EDO(A) relay operated.	
9	At identifier— Insulate 3 and 4T of PC(A) relay.	
	<i>Note:</i> This action causes the terminating end to signal the originating end.	
10	At originating end— At TSC equipment— Remove blocking tool from EDO(A) relay.	At originating end— At TSC equipment— Relays EDO(A) and DS(A) release which indicates signaling was received from the terminating end.
11	At originating end— At TSC equipment— Remove blocking tool from ADS(A) relay.	At originating end— At TSC equipment— Relay TCD(A) releases. At identifier— At TSC equipment— Relay TCI(A) releases.
12	At identifier— At TSC equipment— Remove insulating tool from 3 and 4T of PC(A) relay.	
13	At concentrator— Restore CA key. Operate CB key.	
14	At identifier— Block CA relay operated.	
15	Repeat Steps 3 through 12 on Data Trunk 2 and Controller B circuitry.	

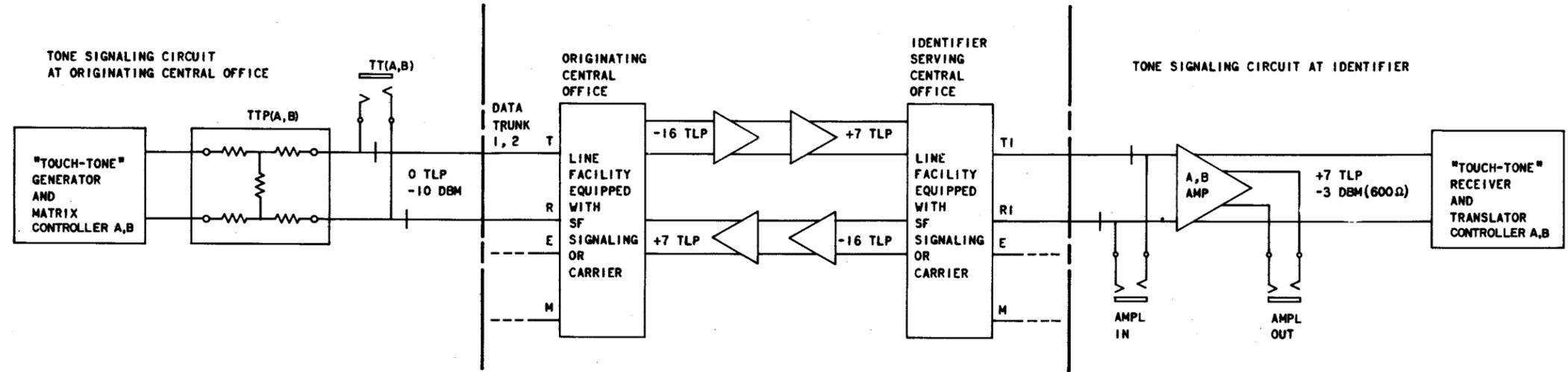


Fig. 2—Transmission Diagram of Tone Signaling Circuit

STEP	ACTION	VERIFICATION
16	At identifier— Remove blocking tool from CA relay.	
17	At concentrator— Restore CB key.	
D. Talk Trunk SF Supervision		
2	At originating end— At concentrator— Operate TB key of trunk selected for test.	
3	At identifier— At trunk unit— Block TC_ relay nonoperated of trunk selected for test.	
4	At concentrator— At trunk unit— Block operated S1 relay of trunk selected for test.	At concentrator— At TSC equipment— Relay TC of talk trunk selected for test operates which indicates concentrator has signaled the identifier to seize the trunk.
5	At identifier— Remove blocking tool from TC relay of trunk selected for test.	At identifier— Observe TC relay operates which indicates the identifier received the signal from the concentrator and seized the trunk. T-lamps lighted of trunk selected for test.
6	At identifier— At trunk connector unit— Block operated TCA relay of trunk selected for test. (Relay TCA operates when a call is answered.)	At concentrator— At TSC equipment— Relay EO operates which indicates the identifier has signaled to trip ringing via the line facility. At trunk unit— Relay S of trunk under test operates. (Relay S operates to trip ringing.)
7	At identifier— At trunk connector unit— Remove blocking tool from TCA relay of trunk under test. (Relay TCA releases when the attendant disconnects.)	At concentrator— At TSC equipment— Relay EO of talk trunk under test releases which indicates concentrator received the disconnect signal from the identifier.
8	At concentrator— At trunk unit— Remove blocking tool from S1 relay of trunk under test.	At concentrator— At TSC equipment— Relay TC releases. At identifier— At trunk unit— Relay TC releases. T-lamp of trunk selected for test extinguishes.

SECTION 473-500-501

STEP	ACTION	VERIFICATION
9	At concentrator— Restore TB- key of trunk selected for test.	
10	Repeat Steps 2 through 9 until all trunks are tested.	
E. Digit and Alarm Registration		
2	At concentrator— Operate CA key.	
3	At identifier— Block nonoperated PC1(A), US(A), and TS(A) relays.	
4	At originating end— At concentrator— Block ST1(A) relay nonoperated. At TSC equipment— Block ADS(A) relay operated.	
5	At originating end— At TSC equipment— Place SEL switch to digit to be tested (see Table C). Momentarily operate TST key.	At identifier— Controller A digit register relays operate corresponding to SEL switch position. See Table C.
6	At identifier— Manually operate PC(A) relay.	At identifier— Controller A digit register relays release.
7	Repeat Steps 5 and 6 until all digits 0 through 9 are tested.	
	Note: Steps 8 and 9 will result in all service being interrupted and should be performed only during periods of light traffic.	
8	At originating end— At TSC equipment— Place SEL switch to AL position. Momentarily operate TST key.	At identifier— TO lamp lighted.
9	At originating end— At TSC equipment— Place SEL switch to ALR position. Momentarily operate TST key.	At identifier— TO lamp extinguished.
10	At originating end— At TSC equipment— Remove blocking tool from ADS(A) relay.	

TABLE B

89-TYPE RESISTORS	
CODE NO.	ATTENUATION IN dB
89A	Zero
89B	Infinite
89C	0.5
89D	0.75
89E	1
89F	1.25
89G	1.5
89H	1.75
89J	2
89K	2.25
89L	2.5
89M	2.75
89N	3
89P	3.25
89R	3.5
89S	3.75
89T	4
89U	4.25
89W	4.5
89Y	4.75
89AA	5

TABLE C

DIGIT REGISTRATION

POSITION OF SEL SWITCH	DIGIT REGISTER RELAYS OPERATED		
0	XN	—	—
1	XN	YN	ZP
2	XN	YN	ZN
3	XN	YP	ZN
4	XN	YP	ZP
5	XP	—	—
6	XP	YN	ZP
7	XP	YN	ZN
8	XP	YP	ZN
9	XP	YP	ZP

SECTION 473-500-501

STEP	ACTION	VERIFICATION
	At concentrator— Remove blocking tool from ST1(A) relay.	
11	At identifier— Remove blocking tools from PC1(A), US(A), and TS(A) relays.	
12	At concentrator— Restore CA key. Operate CB key.	
13	At identifier— Block nonoperated PC1(B), US(B), and TS(B) relays. Block CA relay operated.	
14	At originating end— At concentrator— Block ST1(B) relay nonoperated. At TSC equipment— Block ADS(B) relay operated.	
15	At originating end— At TSC equipment— Place SEL switch to digit to be tested (see Table C). Momentarily operate TST key.	At identifier— Controller B digit register relays operate corresponding to SEL switch position. See Table C.
16	At identifier— Manually operate PC(B) relay.	At identifier— Controller B digit register relays release.
17	Repeat Steps 15 and 16 until all digits 0 through 9 are tested.	
	Note: Steps 18 and 19 will result in all service being interrupted and should be performed only during periods of light traffic.	
18	At originating end— At TSC equipment— Place SEL switch to AL position. Momentarily operate TST key.	At identifier— TO lamp lighted.
19	At originating end— At TSC equipment— Place SEL switch to ALR position. Momentarily operate TST key.	At identifier— TO lamp extinguished.
20	At originating end— At TSC equipment— Remove blocking tool from ADS(B) relay.	

STEP	ACTION	VERIFICATION
21	<p>At concentrator— Remove blocking tool from ST1(B) relay.</p> <p>At identifier— Remove blocking tools from PC1(B), US(B), TS(B), and CA relays.</p>	
22	<p>At concentrator— Restore CB key.</p>	
F. Data Trunk Operation and Lockout		
3	<p>At concentrator— Activate ringup circuit (4.04) three times.</p> <p><i>Note:</i> Controllers A at the concentrator and identifier are interconnected by Data Trunk 1. Controllers B at the concentrator and identifier are interconnected by Data Trunk 2.</p>	<p>At originating end— At TSC equipment— Relays TCD(A) and TCD(B) operate alternately to indicate alternate use of data trunks. At identifier— At TSC equipment— Relay TCI(A) and TCI(B) operate alternately to indicate alternate use of data trunks.</p>
4	<p>At concentrator— Operate CB key.</p>	
5	<p>At concentrator— Activate ringup circuit (4.04) three times.</p>	<p>At originating end— Controller A serves Data Trunk 1 (relay TCD(A) operated) for each ringup circuit operation. At identifier— Data Trunk 1 (relay TCI(A) operated) serves Controller A (relay CA operated) for each ringup circuit operation.</p>
6	<p>At concentrator— Restore CB key. Operate CA key.</p>	
7	<p>At concentrator— Activate ringup circuit (4.04) three times.</p>	<p>At originating end— Controller B serves Data Trunk 2 (relay TCD(B) operated) for each ringup circuit operation. At identifier— Data Trunk 2 (relay TCI(B) operated) serves Controller B (relay CB operated) for each ringup circuit operation.</p>
8	<p>At concentrator— Restore CA key.</p>	

SECTION 473-500-501

STEP	ACTION	VERIFICATION
G. Data Trunk Transfer		
3	At originating end— At TSC equipment— Operate TRF key.	
4	At concentrator— Activate ringup circuit (4.04) three times.	At originating end— Controller A serves Data Trunk 2 (relay TCD(B) operates). Controller B serves Data Trunk 1 (relay TCD(A) operates). At identifier— Controller A (relay CA operated) serves Data Trunk 1 (relay TCI(A) operated). Controller B (relay CB operated) serves Data Trunk 2 (relay TCI(B) operated).
5	At concentrator— Operate CB key.	
6	At concentrator— Activate ringup circuit (4.04) three times.	At originating end— Controller B does not operate. Controller A operates and is served by Data Trunk 2 for each ringup circuit operation. At identifier— Controller B operated for each ringup circuit operation.
7	At concentrator— Restore CB key. Operate CA key.	
8	At concentrator— Activate ringup circuit (4.04) three times.	At originating end— Controller A does not operate. Controller B operates and is served by Data Trunk 1 for each ringup circuit operation. At identifier— Controller A operated for each ringup circuit operation.
9	At concentrator— Restore CA key.	
10	At originating end— At TSC equipment— Restore TRF key.	
11	At identifier— At TSC equipment— Operate BSY key to A position.	At identifier— At TSC equipment— MB lamp lighted.

STEP	ACTION	VERIFICATION
12	At concentrator— Activate ringup circuit (4.04) three times.	At originating end— Controller A serves Data Trunk 1. Controller B serves Data Trunk 2. At identifier— Controller A does not operate. Controller B serves Data Trunks 1 and 2.
13	At identifier— At TSC equipment— Operate BSY key to B position.	
14	At concentrator— Activate ringup circuit (4.04) three times.	At originating end— Controller A serves Data Trunk 1. Controller B serves Data Trunk 2. At identifier— Controller B does not operate. Controller A serves Data Trunks 1 and 2.
15	At identifier— At TSC equipment— Restore BSY key to normal.	At identifier— At TSC equipment— MB lamp extinguished.