TOUCH-TONE
DETECTOR TEST CIRCUIT SD-1A151-01
TESTS AND ADJUSTMENTS
2-WIRE NO. 1 ELECTRONIC SWITCHING SYSTEM

1. GENERAL

1.01 This section describes a method for testing and adjusting the TOUCH-TONE® detector test circuit SD-1A151-01 for the 2-Wire No. 1 Electronic Switching System (ESS).

1.02 This section is reissued to change the circuit pack which is removed for Tests B through H.

This reissue does not affect the Equipment Test List.

1.03 The test and adjustments covered are:

A. Scan Points and State 0, Idle Test: This test checks test circuit continuity to scan points 0 through 3 and that all scan points are unsaturated when all relays operated by the signal distributor and central pulse distributor are released.

B. State 2, Overload Test and Adjustment: This test checks that all frequencies are 1.5 percent below the nominal value and that scan point 1 is saturated.

C. State 1, High Band Edge Test and Adjustment: This test checks that all frequencies are 1.5 percent above the nominal value and that scan point 1 is saturated.

D. State 3, Low Band Edge Test: This test checks that all frequencies are 1.5 percent below the nominal value and that scan point 1 is unsaturated.

E. State 6, Out of Band Test: This test checks that all frequencies are 3.5 percent below the nominal value and that scan point 1 is unsaturated.

F. State 7, Third Frequency Test and Adjustment: This test checks the 2000-Hz third frequency and that scan point 1 is saturated.

G. State 5, Low Group Only Test: This test checks that only a low group signal is emitted when the high group oscillator is inhibited. Scan point 1 is unsaturated.

H. State 4, High Group Only Test: This test checks that only a high group signal is emitted when the low group oscillator is inhibited. Scan point 1 is saturated.

1.04 These tests should be performed when a malfunction in the TOUCH-TONE detector test circuit is suspected.

1.05 If the frequency or level requirements described in this section cannot be met, CP A157 (for T-T signals) or CP 158 (for 2000 Hz third frequency) should be changed and requirements rechecked. If changing circuit packs does not result in meeting frequency requirements, consideration should be given to the use of an oscillator trimmer capacitor (see Section III, Part 5, of CD-1A151-01) or to replacing the appropriate oscillator inductor (HB, LB, or 3F).

1.06 Reference to the Output Message Manual OM-1A001 should be made to interpret TTY output messages relating to these tests.

1.07 In this section, the transmission measuring set is referred to as TMS and the volt-ohm-milliammeter is referred to as VOM.

1.08 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 or 4 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.

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 Blocking tools. Use tools and apply as covered in Section 069-020-801.

2.03 Hewlett-Packard 5233L, 5216A, or 522B electronic counter (frequency counter) or equivalent. (522B counter is manufacture discontinued.)

2.04 Hewlett-Packard 11001A cable assembly.

2.05 J94023A (23A) transmission measuring set (TMS).

2.06 Testing cord, W2C cord, 10 feet long, equipped with one 310 plug and two KS-6278 connecting clips (2W6A cord), insulated with 108 cord tips.

2.07 Testing cord, 893 cord, 3 feet long, equipped with two 360A tools (1W13A cord) and two KS-6278 connecting clips, insulated with 108 cord tips.

2.08 Resistor, 600 ohms, 1/2 watt.

2.09 Resistor, 1500 ohms, 2 watts.

TABLE A

APPARATUS	TESTS							
	A	B	C	D	E	F	G	H
Blocking Tool (2.02)	3	1	1	2	2	3	2	1
Frequency Counter (2.03)	–	1	1	1	1	1	1	1
Cord (2.04)	–	1	1	1	1	1	1	1
TMS (2.05)	–	1	1	1	1	1	1	1
Cord (2.06)	–	1	1	1	1	1	1	1
Cord (2.07)	–	10	10	10	10	8	9	9
Resistor (2.08)	–	1	1	1	1	1	1	1
Resistor (2.09)	1	1	1	1	1	1	1	1
VOM (2.10)	1	1	1	1	1	1	1	1
Test Leads (2.11)	–	1	1	1	1	1	1	1
Screwdriver (2.12)	–	1	1	1	1	1	1	1
Screwdriver (2.13)	–	1	–	1	–	1	1	1
Adapter (2.14)	–	1	–	1	–	1	1	1
Adjusting Tool (2.15)	–	1	1	–	–	1	–	–
227D Amplifier	–	1	1	1	1	1	1	1
2563E Transformer	–	1	1	1	1	1	1	1
KS-14525 Connector	–	1	1	1	1	1	1	1

2.10 KS-14510 L1 volt-ohm-milliammeter (VOM).

2.11 KS-14510 L3 test leads (one red and one black), each test lead equipped with an alligator clip at one end and a connector at the other end. Insulate alligator clips with 108 cord tip (insulating tubing).

2.12 Screwdriver D.

2.13 Screwdriver KS-6854.

2.14 158A adapter extender board used to bring out circuit packs that contain controls that require adjustment.

2.15 KS-19355 L3 adjusting tool used for adjusting transformers.

Caution: When making connections to terminals on test circuit terminal strip A, care should be taken to ensure that one terminal is not shorted to another.

3. PREPARATION

3.01 Unless otherwise indicated, all keys are locking keys. When the locking key is operated and released, the key remains closed until operated and released again. The nonlocking key remains closed only during the time the key is held operated.

3. PREPARATION (Cont)

STEP	ACTION	VERIFICATION
All Tests		
1	At line and trunk test panel— Pick up handset and operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted. Dial tone heard from handset.
2	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit to be tested.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished. Dial tone stops after first digit is dialed.
3	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp lighted as follows: Steady—idle trunk 60 ipm—traffic busy 120 ipm—maintenance busy.
4	Operate BUSY CONTROL—MAKE BUSY nonlocking key.	
5	Operate MASTER TEST LINE—RLS nonlocking key.	
6	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— If circuit is not already busy— Receive TL01 output message. *Note 1:* The TL01 message indicates that the circuit has been made maintenance busy. If the circuit is traffic busy, the printout will

STEP	ACTION	VERIFICATION
		be delayed until the traffic busy condition has been released. ***Note 2:*** If power is temporarily removed from a circuit during any of the tests, it must be made maintenance busy again.
Tests B through H		
7	At frequency counter— Connect power cord of frequency counter to ac power supply; operate POWER switch to ON; and allow at least 5 minutes for the equipment to warm up.	POWER ON lamp lighted.
8a	If using a 5233L frequency counter— Operate channel input switch to CHECK. (For 5216A frequency counter, proceed to Step 13B.)	
9a	Operate TIME BASE switch to 10.	
10a	Operate SAMPLE RATE control to obtain a display long enough to be read.	Counter displays 00000.0.
11a	Operate channel input switch to SEP.	
12a	Operate FUNCTION switch to FREQUENCY A.	
13b	If using a 5216A frequency counter— Operate SENSITIVITY switch to CHECK.	
14b	Operate GATE TIME switch to 1.	
15b	Operate SAMPLE RATE control to obtain a display long enough to be read.	Counter displays 000000.0.
16	At TMS— Operate DIAL-MEAS-SLV switch to MEAS.	
17	Operate INPUT switch to 900.	
18	At VOM— Set DC VOLTS switch to 60.	
19	At test circuit— Establish connections as shown in Fig. 2, and remove circuit pack ▶A151.◀ ***Caution: When making connections to terminals on test circuit terminal strip A,***	

STEP	ACTION	VERIFICATION
	care should be taken to ensure that one terminal is not shorted to another.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Scan Points and State 0, Idle Test	
	Scan Point 0 Test	
7	At VOM— Set OHMS switch to X100.	
8	At test circuit— Make connections designated (1) as shown in Fig. 1. ***Caution: When making connections to terminals on test circuit terminal strip A, care should be taken to ensure that one terminal is not shorted to another.***	
9	Block operated A relay.	At VOM— Meter indicates approximately 1000 ohms.
10	Remove blocking tool from A relay.	Meter indicates open circuit.
11	Block operated B relay.	Meter indicates approximately 1000 ohms.
12	Remove blocking tool from B relay.	Meter indicates open circuit.
13	Block operated C relay.	Meter indicates approximately 1000 ohms.
14	Remove blocking tool from C relay.	Meter indicates open circuit.
	Scan Point 1 Test	
15	At VOM— Set DC VOLTS switch to 60.	
16	At test circuit— Remove connections designated (1) and make connections designated (2) as shown in Fig. 1.	
17	Block operated A relay.	Meter indicates zero.
18	Block operated B relay.	Meter indicates +24 volts.
19	Remove blocking tool from A relay.	Meter indicates zero.
20	Block operated C relay.	Meter indicates +24 volts.

STEP	ACTION	VERIFICATION
21	Block operated A relay.	Meter indicates zero.
22	Remove blocking tool from B relay.	Meter indicates +24 volts.
23	Remove blocking tool from A relay.	Meter indicates zero.
24	Remove blocking tool from C relay.	Meter indicates +24 volts.
Scan Point 2 and 3 Tests		
25	At test circuit— Remove red test lead connection designated (2) and make connection designated (3) as shown in Fig. 1.	
26	Block operated A relay.	Meter indicates less than 1 volt.
27	Remove blocking tool from A relay.	Meter indicates +24 volts.
28	Block operated B relay.	Meter indicates less than 1 volt.
29	Remove blocking tool from B relay.	Meter indicates +24 volts.
30	Block operated C relay.	Meter indicates less than 1 volt.
31	Remove blocking tool from C relay.	Meter indicates +24 volts.
32	Remove all connections between test circuit and VOM.	
33	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
34	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
35	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
36	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
37	Operate MASTER TEST LINE—RLS nonlocking key.	
38	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

STEP	ACTION	VERIFICATION
B. State 2, Overload Test and Adjustment		
20	At amplifier— Set MON potentiometer to 3.	
21	At screws 10-24 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 0-13 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to +5.	
24	At test circuit— Using 1W13A cord, connect terminal 7 to 10 of transformer HB.	
25	Block operated B relay.	
26	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 686.2 and 686.8.
27c	If frequency requirement of Step 26 is not met— Adjust transformer LB to obtain frequency counter indication of 686.5.	
28	At test circuit— Remove 1W13A cord connection to terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.75 and −5.25 dBm. At VOM— Meter indicates zero.
29d	If level requirement of Step 28 is not met— Remove circuit pack A157 from its socket; replace it with 158A adapter; and plug circuit pack A157 into 158A adapter.	
30d	Adjust potentiometer R4 to obtain TMS meter indication of −5 dBm. (See Fig. 3 for location of R4.)	
31d	Remove 158A adapter from socket, and replace it with circuit pack A157.	
32	At test circuit— Reconnect cord connection removed in Step 28 to terminal 1 of 2563E transformer.	

STEP	ACTION	VERIFICATION
33	Remove 1W13A cord connection from terminal 47 of terminal strip A, and connect to terminal 37.	At frequency counter— Counter indicates between 757.7 and 759.2.
34e	If frequency requirement of Step 33 is not met— Adjust transformer LB to reduce difference between 758.5 and frequency counter indication in Step 33 by one-half.	
35	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.75 and −5.25 dBm. At VOM— Meter indicates zero.
36f	If level requirement of Step 35 is not met— Remove circuit pack A157 from its socket; replace it with 158A adapter; and plug circuit pack A157 into 158A adapter.	
37f	Adjust potentiometer R4 to reduce difference between −5 dBm and meter reading in Step 35 by one-half. (See Fig. 3 for location of R4.)	
38f	Remove 158A adapter from socket, and replace it with circuit pack A157.	
39	At test circuit— Reconnect cord connection removed in Step 35 to terminal 1 of 2563E transformer.	
40	Remove 1W13A cord connection from terminal 37 of terminal strip A, and connect to terminal 47.	
41	Remove 1W13A cord connection from terminal 7 to 10 of transformer HB, and connect terminal 7 to 10 of transformer LB.	At frequency counter— Counter indicates between 1190.5 and 1191.3.
42g	If frequency requirement of Step 41 is not met— Adjust transformer HB to obtain frequency counter indication of 1190.9.	
43	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.75 and −5.25 dBm. At VOM— Meter indicates zero.
44h	If level requirement of Step 43 is not met— Remove circuit pack A157 from its socket;	

STEP	ACTION	VERIFICATION
	replace it with 158A adapter; and plug circuit pack A157 into 158A adapter.	
45h	Adjust potentiometer R10 to obtain TMS meter indication of −5 dBm. (See Fig. 3 for location of R10.)	
46h	Remove 158A adapter from socket, and replace it with circuit pack A157.	
47	At test circuit— Reconnect cord connection removed in Step 43 to terminal 1 of 2563E transformer.	
48	Remove 1W13A cord connection from terminal 47 of terminal strip A, and connect to terminal 37.	At frequency counter— Counter indicates between 1314.6 and 1317.3.
49i	If frequency requirement of Step 48 is not met— Adjust transformer HB to reduce difference between 1316.0 and frequency counter indication in Step 48 by one-half.	
50	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.75 and −5.25 dBm. At VOM— Meter indicates zero.
51j	If level requirement of Step 50 is not met— Remove circuit pack A157 from its socket; replace it with 158A adapter; and plug circuit pack A157 into 158A adapter.	
52j	Adjust potentiometer R10 to reduce difference between −5 dBm and meter indication in Step 50 by one-half. (See Fig. 3 for location of R10.)	
53j	Remove 158A adapter from socket, and replace it with circuit pack A157. ***Note:*** Transformers HB and LB and potentiometers R4 and R10 should now be in adjustment for the remaining tests. The third frequency transformer (3F) and the potentiometer (R4 on circuit pack A158) are adjusted in Test F if necessary.	
54	At test circuit— Reconnect cord connection removed in Step 50 to terminal 1 of 2563E transformer.	

STEP	ACTION	VERIFICATION
55	Remove 1W13A cord connection from terminal 37 of terminal strip A, and connect to terminal 27.	At frequency counter— Counter indicates between 1453.4 and 1456.4.
56	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
57	At test circuit— Reconnect cord connection removed in Step 56.	
58	Remove 1W13A cord connection from terminal 27 of terminal strip A, and connect to terminal 36.	At frequency counter— Counter indicates between 1606.8 and 1610.2.
59	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
60	At test circuit— Reconnect cord connection removed in Step 59.	
61	Remove 1W13A cord connection from terminal 7 to 10 of transformer LB, and connect to terminal 7 to 10 of transformer HB.	At frequency counter— Counter indicates between 925.9 and 927.8.
62	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
63	At test circuit— Reconnect cord connection removed in Step 62.	
64	Remove 1W13A cord connection from terminal 36 of terminal strip A, and connect to terminal 27.	At frequency counter— Counter indicates between 838.3 and 840.1.
65	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
66	At test circuit— Remove 1W13A cord connection from terminals 18 and 27 of terminal strip A.	

STEP	ACTION	VERIFICATION
67	Remove 1W13A cord connection from terminal 7 to 10 of transformer HB.	
68	Remove blocking tool from B relay.	
	Note: If Test C, D, E, F, G, or H is to be performed, proceed to Step 20 of Test C or the appropriate test.	
69	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established in Fig. 2.	
70	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
71	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
72	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
73	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
74	Operate MASTER TEST LINE—RLS nonlocking key.	
75	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

C. State 1, High Band Edge Test and Adjustment

20	At amplifier— Set MON potentiometer to 15.	
21	At screws 0-13 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 10-24 on amplifier— Turn screws in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to −20.	

STEP	ACTION	VERIFICATION
24	At test circuit— Using 1W13A cord, connect terminal 7 to 10 of transformer LB.	
25	Block operated A relay.	
26	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 1225.9 and 1228.3.
27	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
28c	If level requirement in Step 27 is not met— Extend circuit pack A157 with the 158A adapter.	
29c	Adjust potentiometer R10 to reduce difference between −2.0 dBm and meter reading in Step 27 by one-half. (See Fig. 3 for location of R10.)	
30c	Remove 158A adapter, and replace circuit pack A157.	
31	At test circuit— Reconnect cord connection removed in Step 27 to terminal 1 of 2563E transformer.	
32	Remove 1W13A cord connection from terminal 47, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 1354.7 and 1357.4.
33	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
34	At test circuit— Reconnect cord connections removed in Step 33 to terminal 1 of 2563E transformer.	
35	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 1497.6 and 1500.6.
36	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.

STEP	ACTION	VERIFICATION
37	At test circuit— Reconnect cord connection removed in Step 36 to terminal 1 of 2563E transformer.	
38	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 36 of terminal strip A.	At frequency counter— Counter indicates between 1655.8 and 1659.2.
39	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
40	At test circuit— Reconnect cord connection removed in Step 39 to terminal 1 of 2563E transformer.	
41	Remove 1W13A cord connection from terminal 7 to 10 of transformer LB, and connect terminal 7 to 10 of transformer HB.	At frequency counter— Counter indicates between 954.2 and 956.1.
42	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
43	At test circuit— Reconnect cord connection removed in Step 42 to terminal 1 of 2563E transformer.	
44	Remove 1W13A cord connection from terminal 36, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 863.9 and 865.6.
45	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
46	At test circuit— Reconnect cord connection removed in Step 45 to terminal 1 of 2563E transformer.	
47	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 780.8 and 782.3.
48	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.

STEP	ACTION	VERIFICATION
49	At test circuit— Reconnect cord connection removed in Step 48 to terminal 1 of 2563E transformer.	
50	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 47 of terminal strip A.	At frequency counter— Counter indicates between 706.8 and 708.2.
51	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates zero.
52d	If level requirement in Step 51 is not met— Extend circuit pack A157 with the 158A adapter.	
53d	Adjust potentiometer R4 to reduce difference between −2.0 dBm and meter reading in Step 51 by one-half. (See Fig. 3 for location of R4.)	
54d	Remove 158A adapter, and replace circuit pack A157.	
55	At test circuit— Remove 1W13A cord connection from terminal 18 to 47 of terminal strip A.	
56	Remove 1W13A cord connection from terminal 7 to 10 of transformer HB.	
57	Remove blocking tool from A relay. ***Note:*** If Test D, E, F, G, or H is to be performed, proceed to Step 20 of Test D or the appropriate test.	
58	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
59	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
60	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.

STEP	ACTION	VERIFICATION
61	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
62	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
63	Operate MASTER TEST LINE—RLS nonlocking key.	
64	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.
D. State 3, Low Band Edge Test		
20	At amplifier— Set MON potentiometer to 15.	
21	At screws 0-13 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 10-24 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to −20.	
24	At test circuit— Using 1W13A cord, connect terminal 7 to 10 of transformer LB.	
25	Block operated A and B relays.	
26	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 1189.7 and 1192.1.
27	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
28	At test circuit— Reconnect cord connection removed in Step 27 to terminal 1 of 2563E transformer.	
29	Remove 1W13A cord connection from terminal 47, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 1314.6 and 1317.3.

STEP	ACTION	VERIFICATION
30	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
31	At test circuit— Reconnect cord connection removed in Step 30 of terminal 1 of 2563E transformer.	
32	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 1453.4 and 1456.4.
33	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
34	At test circuit— Reconnect cord connection removed in Step 33 to terminal 1 of 2563E transformer.	
35	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 36 of terminal strip A.	At frequency counter— Counter indicates between 1606.8 and 1610.2.
36	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
37	At test circuit— Reconnect cord connection removed in Step 36 to terminal 1 of 2563E transformer.	
38	Remove 1W13A cord connection from terminal 7 to 10 of transformer LB, and connect terminal 7 to 10 of transformer HB.	At frequency counter— Counter indicates between 925.9 and 927.8.
39	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
40	At test circuit— Reconnect cord connection removed in Step 39 to terminal 1 of 2563E transformer.	
41	Remove 1W13A cord connection from terminal 36, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 838.3 and 840.1.

STEP	ACTION	VERIFICATION
42	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
43	At test circuit— Reconnect cord connection removed in Step 40 to terminal 1 of 2563E transformer.	
44	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 757.7 and 759.2.
45	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
46	At test circuit— Reconnect cord connection removed in Step 45 to terminal 1 of 2563E transformer.	
47	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 47 of terminal strip A.	At frequency counter— Counter indicates between 685.8 and 687.2.
48	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −1.5 and −2.5 dBm. At VOM— Meter indicates +24 volts.
49	At test circuit— Remove 1W13A cord connection from terminal 18 to 47 of terminal strip A.	
50	Remove 1W13A cord connection from terminal 7 to 10 of transformer HB.	
51	Remove blocking tools from A and B relays. ***Note:*** If Test E, F, G, or H is to be performed, proceed to Step 20 of Test E or the appropriate test.	
52	Remount circuit pack ◗A151◖ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
53	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.

STEP	ACTION	VERIFICATION
54	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
55	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
56	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
57	Operate MASTER TEST LINE—RLS nonlocking key.	
58	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

E. State 6, Out of Band Test

20	At amplifier— Set MON potentiometer to 3.	
21	At screws 10-24 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 0-13 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to +5.	
24	At test circuit— Using 1W13A cord, connect terminal 7 to 10 of transformer LB.	
25	Block operated B and C relays.	
26	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 1164.3 and 1169.1.
27	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and -7.0 dBm. At VOM— Meter indicates +24 volts.

STEP	ACTION	VERIFICATION
28	At test circuit— Reconnect cord connection removed in Step 27 to terminal 1 of 2563E transformer.	
29	Remove 1W13A cord connection from terminal 47, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 1286.5 and 1291.9.
30	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
31	At test circuit— Reconnect 1W13A cord connection removed in Step 30 to terminal 1 of 2563E transformer.	
32	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 1422.4 and 1428.3.
33	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
34	At test circuit— Reconnect cord connection removed in Step 33 to terminal 1 of 2563E transformer.	
35	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 36 of terminal strip A.	At frequency counter— Counter indicates between 1572.5 and 1579.0.
36	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
37	At test circuit— Reconnect cord connection removed in Step 36 to terminal 1 of 2563E transformer.	
38	Remove 1W13A cord connection from terminal 7 to 10 of transformer LB, and connect terminal 7 to 10 of transformer HB.	At frequency counter— Counter indicates between 906.2 and 910.0.
39	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.

STEP	ACTION	VERIFICATION
40	At test circuit— Reconnect cord connection removed in Step 39 to terminal 1 of 2563E transformer.	
41	Remove 1W13A cord connection from terminal 36, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 820.5 and 823.9.
42	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
43	At test circuit— Reconnect cord connection removed in Step 42 to terminal 1 of 2563E transformer.	
44	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 741.5 and 744.6.
45	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
46	At test circuit— Reconnect 1W13A cord connection removed in Step 45 to terminal 1 of 2563E transformer.	
47	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 47 of terminal strip A.	At frequency counter— Counter indicates between 671.2 and 674.0.
48	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −7.0 dBm. At VOM— Meter indicates +24 volts.
49	At test circuit— Remove 1W13A cord connection from terminal 18 to 47 of terminal strip A.	
50	Remove 1W13A cord connection from terminal 7 to 10 of transformer HB.	
51	Remove blocking tools from B and C relays.	
	Note: If Test F, G, or H is to be performed, proceed to Step 20 of Test F or the appropriate test.	

STEP	ACTION	VERIFICATION
52	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
53	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
54	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
55	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
56	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
57	Operate MASTER TEST LINE—RLS nonlocking key.	
58	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

F. State 7, Third Frequency Test and Adjustment

20	At amplifier— Set MON potentiometer to 15.	
21	At screws 10-24 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 0-13 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to −5.	
24	At test circuit— Block operated A, B, and C relays.	At frequency counter— Counter indicates between 1900 and 2100.
25c	If frequency requirement of Step 24 is not met— Adjust transformer 3F to obtain frequency counter indication between 1980.0 and 2020.0.	

STEP	ACTION	VERIFICATION
26	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.75 and −5.75 dBm. At VOM— Meter indicates zero.
27d	If level requirement of Step 26 is not met— Remove circuit pack A158 from its socket; replace it with 158A adapter; and plug circuit pack A158 into 158A adapter.	
28d	Adjust potentiometer R4 to obtain TMS meter indication of −5 dBm.	
29d	Remove 158A adapter from socket, and replace it with circuit pack A158.	
30	At test circuit— Remove blocking tools from A, B, and C relays. ***Note:*** If Test G or H is to be performed, proceed to Step 20 of Test G or the appropriate test.	
31	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
32	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
33	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
34	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
35	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
36	Operate MASTER TEST LINE—RLS nonlocking key.	
37	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

STEP	ACTION	VERIFICATION
G. State 5, Low Group Only Test		
20	At amplifier— Set MON potentiometer to 15.	
21	At screws 10-24 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 0-13 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to −5.	
24	At test circuit— Block operated A and C relays.	
25	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 696.3 and 697.7.
26	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates +24 volts.
27	At test circuit— Reconnect cord connection removed in Step 26 to terminal 1 of 2563E transformer.	
28	Remove 1W13A cord connection from terminal 47, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 769.2 and 770.8.
29	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates +24 volts.
30	At test circuit— Reconnect cord connection removed in Step 29 to terminal 1 of 2563E transformer.	
31	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 851.1 and 852.9.
32	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates +24 volts.

STEP	ACTION	VERIFICATION
33	At test circuit— Reconnect cord connection removed in Step 32 to terminal 1 of 2563E transformer.	
34	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 36 of terminal strip A.	At frequency counter— Counter indicates between 940.0 and 942.0.
35	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates +24 volts.
36	At test circuit— Remove 1W13A cord connection from terminal 18 to 36 of terminal strip A.	
37	Remove blocking tools from A and C relays. ***Note:*** If Test H is to be performed, proceed to Step 20 of Test H or Step 20 of any preceding test.	
38	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
39	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
40	At TOUCH-TONE set— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
41	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
42	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
43	Operate MASTER TEST LINE—RLS nonlocking key.	
44	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

STEP	ACTION	VERIFICATION
H. State 4, High Group Only Test		
20	At amplifier— Set MON potentiometer to 15.	
21	At screws 10-24 and 21-36 on amplifier— Turn screws back out to prevent contact with respective side rails.	
22	At screw 0-13 on amplifier— Turn screw in to make contact with respective side rails.	
23	At TMS— Operate ADD DBM switch to −5.	
24	At test circuit— Block operated C relay.	
25	Using 1W13A cord, connect terminal 18 to 47 of terminal strip A.	At frequency counter— Counter indicates between 1207.7 and 1210.3.
26	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
27	At test circuit— Reconnect cord connection removed in Step 26 to terminal 1 of 2563E transformer.	
28	Remove 1W13A cord connection from terminal 47, and connect cord to terminal 37 of terminal strip A.	At frequency counter— Counter indicates between 1334.6 and 1337.4.
29	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
30	At test circuit— Reconnect cord connection removed in Step 29 to terminal 1 of 2563E transformer.	
31	Remove 1W13A cord connection from terminal 37, and connect cord to terminal 27 of terminal strip A.	At frequency counter— Counter indicates between 1475.5 and 1478.5.
32	At test circuit— Remove 1W13A cord connection from terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.

STEP	ACTION	VERIFICATION
33	At test circuit— Reconnect cord connection removed in Step 32 to terminal 1 of 2563E transformer.	
34	Remove 1W13A cord connection from terminal 27, and connect cord to terminal 36 of terminal strip A.	At frequency counter— Counter indicates between 1631.3 and 1634.7.
35	At test circuit— Remove 1W13A cord connection to terminal 1 of 2563E transformer.	At TMS— Meter indicates between −4.5 and −5.5 dBm. At VOM— Meter indicates zero.
36	At test circuit— Remove 1W13A cord connection from terminal 18 to 36 of terminal strip A.	
37	Remove blocking tool from C relay.	
38	Remount circuit pack ▶A151◀ removed in Step 19 of preparation, and remove all connections established as shown in Fig. 2.	
39	At line and trunk test panel— Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—MTL lamp lighted.
40	At TOUCH-TONE SET— Dial trunk network number of TOUCH-TONE detector test circuit used.	At line and trunk test panel— MASTER TEST LINE—MTL lamp extinguished.
41	Operate nonlocking ST key.	MASTER TEST LINE—REG lamp lighted. MASTER TEST LINE—EQPT ST lamp flashes at 120 ipm.
42	Operate BUSY CONTROL—RMV BUSY nonlocking key.	
43	Operate MASTER TEST LINE—RLS nonlocking key.	
44	Operate MASTER TEST LINE—TEST and TRUNK keys.	MASTER TEST LINE—REG and EQPT ST lamps extinguished. At TTY— Receive TL01 output message.

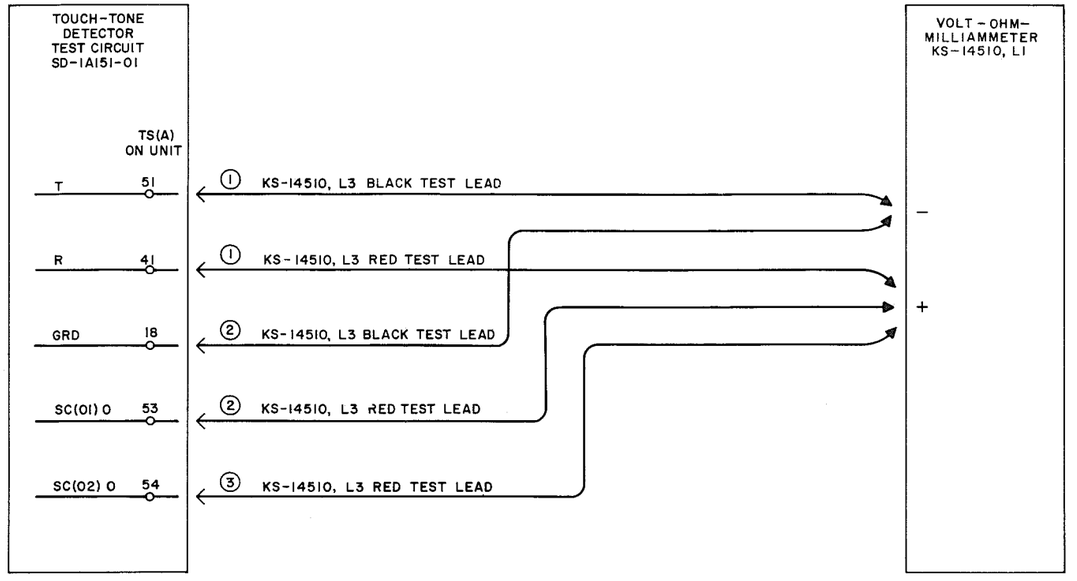

Fig. 1—Test A Connections

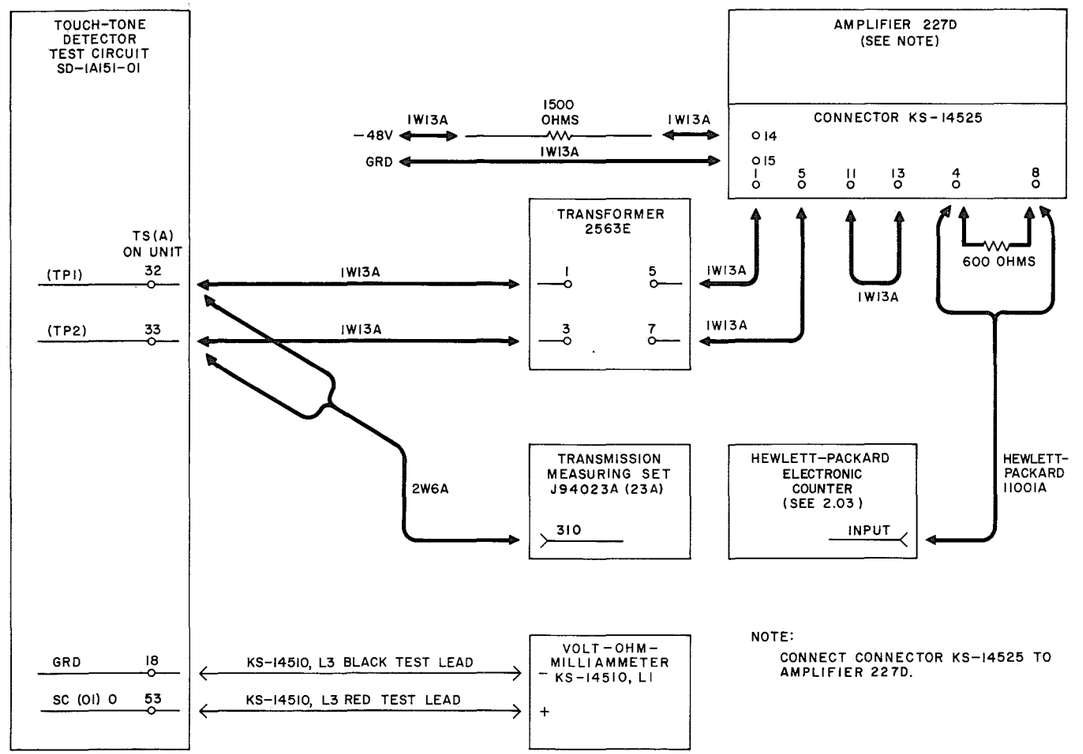

Fig. 2—Tests B Through H Connections

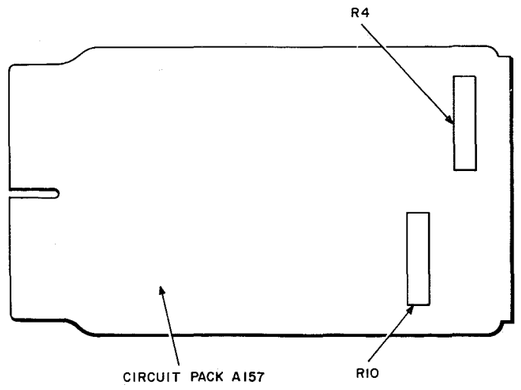

Fig. 3—Location of R4 and R10 on Circuit Pack A157