

TOUCH-TONE®
STATION TEST CIRCUIT (SD-1A199)
TESTS AND ADJUSTMENTS
USING KS-21715 L1 OSCILLATOR
NO. 2/2B ELECTRONIC SWITCHING SYSTEM

	CONTENTS	PAGE
1. GENERAL		1
2. APPARATUS		2
3. PREPARATION		2
4. METHOD		5
 Figures		
1. Test A and Test B Connections		5
2. Location of L1, L2, R8, and R9 on Circuit Packs		8
 Tables		
A. Low Group Band Edge Frequency Test Limits		6
B. Low Group Band Edge Frequency Adjustment Limits		7
C. High Group Band Edge Frequency Test Limits		11
D. High Group Band Edge Frequency Adjustment Limits		11

1. GENERAL

1.01 This section describes a method of testing and adjusting the SD-1A199 TOUCH-TONE

station test circuit used in a No. 2/2B Electronic Switching System (ESS).

1.02 This section is reissued to upgrade the rating to AT&TCo Standard as a result of field evaluation. Since this is a general revision, arrows ordinarily used to denote changes have been omitted.

1.03 The tests and adjustments covered are:

A. Channel Detector Bandpass Test and Adjustment: This test checks the upper and lower band edge frequencies.

B. Sensitivity Test and Adjustment: This test checks the sensitivity of the station test circuit.

1.04 The tests in this section are to be performed on a periodic basis as prescribed by the No. 2 ESS equipment test list procedures or when a malfunction of one of the circuits is suspected.

1.05 In this section, the KS-21715 oscillator is referred to as OSC and the volt-ohm-milliammeter is referred to as VOM. The term low voltage means a range from 14.8 to 18.2 volts. The term high voltage means a range from 21.1 to 25.9 volts.

1.06 When using the trunk test panel (TTP) for these tests, the keys on the TTP may be either a locking or a nonlocking type. In order to differentiate between the two types of keys, the use of the locking type key shall be identified by the words "operate" and "release" and the use of a nonlocking type key shall be identified by the word "depress" in the ACTION column. For more

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SECTION 232-135-502

detailed information about the TTP and its operation, refer to Section 232-130-301.

1.07 Lettered Steps: A letter a, b, c, etc, added to a step number in Parts 3 and 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 following equipment is required to complete these tests.

- (a) KS-21715 L1 Oscillator (Precision).
- (b) Testing cord, W2W cord, 10 feet long, equipped with a 310 plug, 360B and 360C tools (2W17C cord).
- (c) A No. 48, combination 7/32- and 1/4-inch hex double-end socket wrench, or No. 32, 1/4-inch socket wrench and screwdriver for adjusting 1653-type inductors.
- (d) Resistor, 11,000 ohms, one-half watt.
- (e) Four testing cords, 893 cord, 3 feet or greater in length, equipped with two 360A tools (1W13A cord) and two KS-6278 connecting clips. Insulate KS-6278 connecting clips with 108 cord tip (insulation tubing).
- (f) KS-14510 L1, volt-ohm-milliammeter (VOM).
- (g) 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 clip with 108 cord tip insulated tubing.

- (h) Screwdrivers KS-6854, 0.140 inch, for adjusting potentiometers and 1653-type inductors.
- (i) A 158A adapter extender board used to bring out circuit packs containing controls that require adjustment.

Caution: *When making connections to terminals on test circuit terminal strip B, care should be taken that one terminal is not shorted to another. One method to prevent shorting is to connect a 30 Mueller Minigator clip (insulated by a 32 Mueller insulator) to the selected terminal and to make the regular connection to the other end of the 30 Mueller Minigator clip.*

3. PREPARATION

3.01 The TOUCH-TONE station test circuit has no network terminals, no group and member number. A specific circuit must be accessed through its associated Station Ringer and TOUCH-TONE test circuit (SRTT). The SRTT group number and member number can be found in local records. Refer to office records to obtain the trunk group number (TGN), member number (MEMN), and directed scan point number (DSP) of the SRTT.

3.02 Verify DSP obtained from office records as follows:

AT MCC TTY type in:

A VY:SVC:aaa bbb!

aaa = TGN

bbb = MEMN

Refer to Input Message Manual IM-2H200 and Output Message Manual OM-2H200 for interpretations of machine language.

3.03 For all tests, use the following procedure for gaining access to the circuit under test.

STEP	ACTION	VERIFICATION
1	At telephone set on TTP— Operate ACCESS TRUNK 1 key.	
2	Lift handset off-hook, or operate TRFR key at TEL CKT on TTP if using headset.	At telephone set— Access trunk 1 lamp lighted.

STEP	ACTION	VERIFICATION
		<p>At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.</p>
3	<p>At TOUCH-TONE dial— Dial 1 + TGN + MEMN + ST to gain access to the SRTT.</p>	<p>At ACCESS TRUNK 1 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. At MISC TEST CONTROL— P & E lamp lighted if connection was successful.</p>
		<p>Note: If the EQPT ST lamp is flashing and the P&E lamp is not lighted steadily, the TTP is not connected to the circuit to be tested.</p>
4a	<p>If the P&E lamp is not lighted steadily; At ACCESS TRUNK 1 CONTROL— Depress RLS key.</p>	
5a	<p>Repeat Step 3 until connection is successful.</p>	
6	<p>Place handset on-hook or release TRFR key.</p>	<p>At telephone set— ACCESS TRUNK 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.</p>
7	<p>At MISC TEST CONTROL— Operate MK BSY key.</p>	<p>At MISC TEST CONTROL— MK BSY lamp lighted.</p>
8	<p>At ACCESS TRUNK 1 CONTROL— Depress RLS key.</p>	<p>At ACCESS TRUNK 1 CONTROL— EQPT ST lamp extinguished. SUPV lamp extinguished.</p>
		<p>At maintenance TTY— If circuit was not previously busy, message received will be: My SV OS If circuit was previously busy, message received will be: MR SV BSY A camp-on condition will go into effect, and this message will be reported periodically until the request is completed or is canceled.</p>
		<p>Note: For detailed breakdown of TTY output messages, consult the No. 2 ESS Output Message Manual OM-2H200.</p>
9	<p>At MISC TEST CONTROL— Release MK BSY key.</p>	<p>At MISC TEST CONTROL— MK BSY lamp extinguished. P&E lamp extinguished.</p>

SECTION 232-135-502

STEP	ACTION	VERIFICATION
10	At OSC— Operate selector switch to TONE RECVR TEST.	
11	Operate POWER switch to ON.	POWER ON lamp lighted.
12	At test circuit— Establish connections as shown in Fig. 1 using option T or V. T = 638B input filter V = 638A input filter	

Note: If the OVERLOAD lamp is lighted, a low impedance bridge in the connecting circuit is indicated. Correct this condition before proceeding.

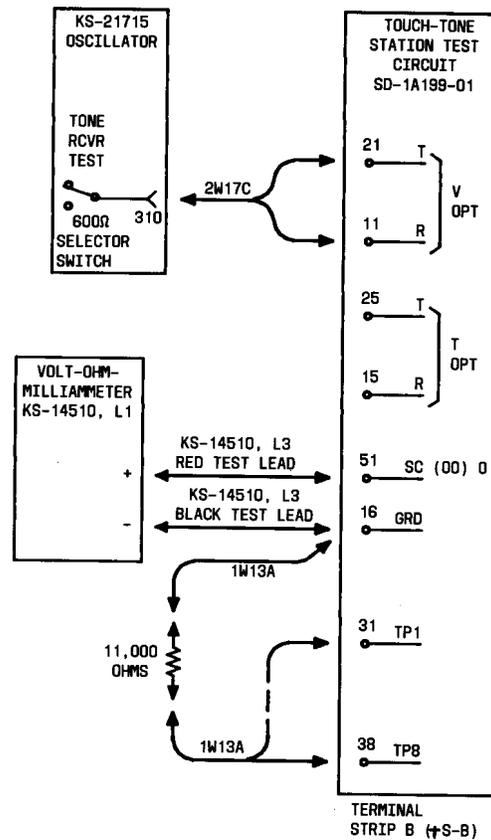


Fig. 1—Test A and Test B Connections

4. METHOD

4.01 The following procedure outlines testing for the channel detector bandpass and sensitivity.

STEP	ACTION	VERIFICATION
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A. Channel Detector Bandpass Test and Adjustment

Low-Group Channel Check

13	At OSC— Adjust output level to -5.0 dBm.	
14	At OSC— Adjust frequency to 697.0 Hz.	At VOM— Meter indicates high voltage.
15	At OSC— Adjust frequency to lower side of 697-Hz channel midband frequency (toward 686 Hz); adjust to point where VOM indication drops to low voltage; and then slowly adjust toward	At OSC— Lower band edge frequency for 697-Hz channel is within limits given in Table A.

SECTION 232-135-502

- | STEP | ACTION | VERIFICATION |
|------|--|--|
| | midband frequency just to point where VOM indication increases to high voltage. | |
| | Note: This frequency should be determined as accurately as possible to the nearest tenth of a Hz. If necessary, repeat Step 15. | |
| 16 | If requirements of Step 15 are not within limits given in Table A—
The 697-Hz channel must be adjusted (Steps 21 through 36). | |
| 17 | Repeat Step 15 except vary frequency to higher side of 697-Hz channel midband frequency (toward 707 Hz). | Higher band edge frequency for 697-Hz channel is within limits given in Table A. |
| 18b | If requirements of Step 17 are not within limits given in Table A—
The 697-Hz channel must be adjusted (Steps 21 through 36). | |
| 19 | Repeat Steps 14 through 18b replacing 697-Hz designation with 770-Hz, 852-Hz, and 941-Hz channels in low group. (Refer to Table A for nominal midband frequencies and for band edge frequency limits.) | Band edge frequencies are within limits given in Table A. |
| 20c | If no channels in the low group require adjustment—
Proceed to Step 37. | |

Low-Group Channel Adjustment

- | | | |
|----|--|--|
| 21 | At OSC—
Adjust frequency to nominal midband frequency | At VOM—
Meter indicates high voltage. |
|----|--|--|

TABLE A

LOW GROUP BAND EDGE FREQUENCY TEST LIMITS

CHANNEL	NOMINAL MIDBAND FREQUENCY Hz	LOWER BAND EDGE FREQUENCY Hz		UPPER BAND EDGE FREQUENCY Hz	
		MIN	MAX	MIN	MAX
697 Hz	697.0	685.1	687.9	706.1	708.9
770 Hz	770.0	756.9	760.0	780.0	783.1
852 Hz	852.0	837.5	840.9	863.1	866.5
941 Hz	941.0	925.0	928.8	953.2	957.0

STEP	ACTION	VERIFICATION
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for first channel in low group to be adjusted.
(Refer to Table A.)

Note: Adjustment of band edge frequencies is made by adjusting potentiometer R8 or R9 and 1653-type inductor L1 or L2. To gain access to R8 or R9 and L1 or L2, extend the selected channel circuit pack using 158A adapter extender board. Use Table B to determine potentiometer and inductor controls associated with the selected channel circuit pack. Location of R8, R9, L1, and L2 are shown in Fig. 2. Turning R8 or R9 counterclockwise increases the channel bandwidth; that is, it increases upper edge frequency and decreases lower edge frequency by approximately the same amount. Turning adjustment screw on inductor L1 and L2 clockwise raises the midband frequency and increases both the upper and lower edge frequencies by approximately the same amount.

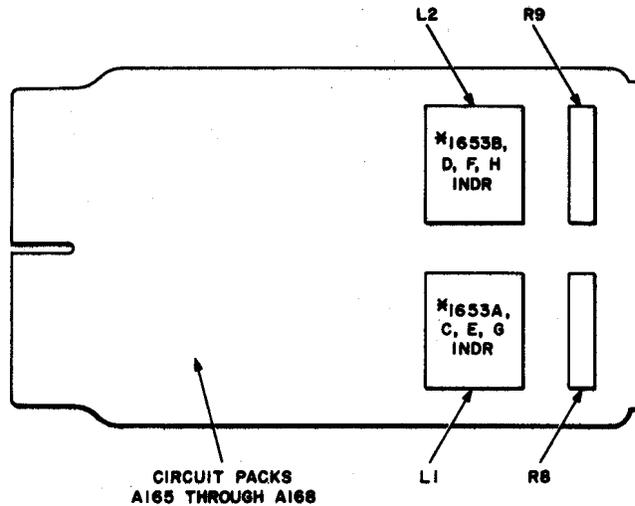
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|----|--|---|
| 22 | At test circuit—
Extend circuit pack using 158A adapter for first channel in low group to be adjusted. | |
| 23 | Determine from Table B and Fig. 2 circuit pack for selected channel in low group, location of inductor (L1 or L2), and potentiometer (R8 or R9) associated with selected channel to be adjusted. | |
| 24 | At OSC—
Adjust frequency to nominal value given in | At VOM—
Meter indicates low voltage or high voltage. |

TABLE B

LOW GROUP BAND EDGE FREQUENCY ADJUSTMENT LIMITS

CHANNEL	CIRCUIT PACK	CONTROLS	NOMINAL MIDBAND FREQUENCY Hz	LOWER BAND EDGE FREQUENCY Hz			UPPER BAND EDGE FREQUENCY Hz		
				MIN	NOM	MAX	MIN	NOM	MAX
697 Hz	A165	R8, L1	967.0	686.3	686.5	686.7	707.3	707.5	707.7
770 Hz	A165	R9, L2	770.0	758.3	758.5	758.7	781.3	781.5	781.7
852 Hz	A166	R8, L1	852.0	838.9	839.2	839.5	864.5	864.8	865.1
941 Hz	A166	R9, L2	941.0	926.6	926.9	927.2	954.8	955.1	955.4

STEP ACTION VERIFICATION



*1653 INDUCTOR LOCATIONS	
INDUCTOR	CIRCUIT PACK
A AND B	A165
C AND D	A166
E AND F	A167
G AND H	A168

Fig. 2—Location of L1, L2, R8, and R9 on Circuit Packs

Table B for lower band edge frequency of first channel in low group to be adjusted.

25d If VOM in Step 24 indicates low voltage—
At test circuit—
Slowly adjust potentiometer R8 or R9 counterclockwise just to point where VOM indicates high voltage.

26e If VOM in Step 24 indicates high voltage—
At test circuit—
Slowly adjust potentiometer R8 or R9 clockwise to point where VOM indication drops to low voltage; then slowly adjust potentiometer R8 or R9 counterclockwise just to point where VOM indicates high voltage.

27 At OSC—
Adjust frequency toward upper band edge frequency to point where VOM indicates low voltage; then slowly adjust frequency toward

At OSC—
Frequency indicated is within limits for upper band edge frequency given in Table B.

STEP	ACTION	VERIFICATION
	midband just to point where VOM indicates high voltage.	
28f	If frequency indicated in Step 27 is within tolerance limits for upper band edge frequency given in Table B— Adjustment of channel bandpass completed.	
29g	If frequency indicated in Step 27 is not within limits for upper band edge frequency given in Table B— Perform Steps 30g through 35g.	
30g	At OSC— Adjust frequency to half way between the actual upper band edge frequency determined in Step 27 and in its nominal value given in Table B.	
31g	At test circuit— Using No. 48 socket wrench, slowly adjust L1 or L2 just to point where VOM indicates high voltage. (See Note after Step 21.)	
32g	Adjust frequency to nominal value for upper band edge frequency given in Table B.	
33g	At test circuit— Slowly adjust potentiometer R8 or R9 just to point where VOM indicates high voltage.	
34g	Repeat Steps 27 and 28f except check lower band edge frequency. If necessary, repeat Steps 29g through 33g to adjust lower band edge frequency.	
35g	Repeat Steps 27 through 33g as many times as necessary to have both upper and lower band edge frequencies within tolerance limits given in Table B.	
36	Repeat Steps 21 through 29g for each remaining channel to be adjusted in low group using appropriate designations from Table B.	

High-Group Channel Check

- 37 At test circuit—
Remove 1W13A cord connection from terminal 38 on terminal strip B (Fig. 1) and connect to terminal 31.

SECTION 232-135-502

STEP	ACTION	VERIFICATION
38	At OSC— Adjust output level to -5.0 dBm.	
39	Adjust frequency to 1209.0 Hz.	At VOM— Meter indicates high voltage.
40	At OSC— Adjust frequency to lower side of 1209-Hz channel midband frequency (toward 1190 Hz); adjust to point where VOM indication drops to low voltage; and then slowly adjust toward midband frequency just to point where VOM indication increases to high voltage. Note: This frequency should be determined as accurately as possible to the nearest tenth of a Hz. If necessary, repeat Step 40.	At OSC— Lower band edge frequency for 1209-Hz channel is within limits given in Table C.
41h	If requirements of Step 40 are not within limits given in Table C— Record that 1209-Hz channel requires adjustment.	
42	Repeat Step 40 except vary frequency to higher side of 1209-Hz channel midband frequency (toward 1226 Hz).	Higher band edge frequency for 1209-Hz channel is within limits given in Table C.
43i	If requirements of Step 42 are not within limits given in Table C— The 1209-Hz channel must be adjusted (Steps 45 through 61).	
44	Repeat Steps 38 through 43i replacing 1209-Hz designation with 1336-Hz, 1477-Hz, and 1633-Hz channels in high group. (Refer to Table C for nominal midband frequencies and for band edge frequency limits.)	Band edge frequencies are within limits given in Table C.

High-Group Channel Adjustment

45	At OSC— Adjust frequency to nominal midband frequency for first channel in high group to be adjusted. (Refer to Table D.)	At VOM— Meter indicates high voltage.
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Note: Adjustment of band edge frequencies is made by adjusting potentiometer R8 or R9 and 1653-type inductor L1 or L2. To gain access to R8 or R9 and L1 or L2, extend the selected channel circuit pack using 158A adapter extender board. Use Table D to determine potentiometer and inductor controls associated with the selected channel circuit pack. Location

STEP	ACTION	VERIFICATION
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TABLE C

HIGH GROUP BAND EDGE FREQUENCY TEST LIMITS

CHANNEL	NOMINAL MIDBAND FREQUENCY Hz	LOWER BAND EDGE FREQUENCY Hz		UPPER BAND EDGE FREQUENCY Hz	
		MIN	MAX	MIN	MAX
1209 Hz	1209.0	1188.4	1193.3	1224.7	1229.6
1336 Hz	1336.0	1313.3	1318.6	1353.4	1358.7
1477 Hz	1477.0	1451.9	1457.8	1496.2	1502.1
1633 Hz	1633.0	1605.2	1611.8	1654.2	1660.8

TABLE D

HIGH GROUP BAND EDGE FREQUENCY ADJUSTMENT LIMITS

CHANNEL	CIRCUIT PACK	CONTROLS	NOMINAL MIDBAND FREQUENCY Hz	LOWER BAND EDGE FREQUENCY Hz			UPPER BAND EDGE FREQUENCY Hz		
				MIN	NOM	MAX	MIN	NOM	MAX
1209 Hz	A167	R8, L1	1209.0	1190.5	1190.9	1191.3	1226.7	1227.1	1227.5
1336 Hz	A167	R9, L2	1336.0	1315.6	1316.0	1316.4	1355.6	1356.0	1356.4
1477 Hz	A168	R8, L1	1477.0	1454.4	1454.8	1455.2	1498.8	1499.2	1499.6
1633 Hz	A168	R9, L2	1633.0	1608.0	1608.5	1609.0	1657.0	1657.5	1658.0

of R8, R9, L1, and L2 are shown on Fig. 2. Turning R8 or R9 counterclockwise increases the channel bandwidth; that is, it increases upper edge frequency and decreases lower edge frequency by approximately the same amount. Turning adjustment screw on inductor L1 or L2 clockwise raises the midband frequency and increases both the upper and lower edge frequencies by approximately the same amount.

46 At test circuit—
Extend circuit pack using 158A adapter for first channel in high group to be adjusted.

SECTION 232-135-502

STEP	ACTION	VERIFICATION
47	Determine from Table D and Fig. 2 circuit pack for selected channel in high group, location of inductor (L1 or L2), and potentiometer (R8 or R9) associated with selected channel to be adjusted.	
48	At OSC— Adjust frequency to nominal value given in Table D for lower band edge frequency of first channel in high group to be adjusted.	At VOM— Meter indicates either low voltage or high voltage.
49j	If VOM in Step 48 indicates low voltage— At test circuit— Slowly adjust potentiometer R8 or R9 counterclockwise just to point where VOM indicates high voltage.	
50k	If VOM in Step 48 indicates high voltage— At test circuit— Slowly adjust potentiometer R8 or R9 clockwise to point where VOM indication drops to low voltage; then slowly adjust potentiometer R8 or R9 counterclockwise just to point where VOM indicates high voltage.	
51	At OSC— Slowly adjust frequency toward upper band edge frequency to point where VOM indicates low voltage; then slowly adjust frequency toward midband just to the point where VOM indication changes to high voltage.	At OSC— Frequency indicated is within limits for upper band edge frequency given in Table D.
52l	If frequency indicated in Step 51 is within tolerance limits for upper band edge frequency— Adjustment of channel passband completed.	
53m	If frequency indicated in Step 51 is not within limits for upper band edge frequency given in Table D— Perform Steps 54n through 59n.	
54n	At OSC— Adjust frequency halfway between the actual upper band edge frequency determined in Step 51 and in its nominal value given in Table D.	
55n	At test circuit— Using No. 48 socket wrench, slowly adjust L1 or L2 just to point where VOM indicates high voltage. (See Note after Step 45.)	

STEP	ACTION	VERIFICATION
56n	At OSC— Adjust frequency to nominal value for upper band edge frequency given in Table D.	
57n	At test circuit— Slowly adjust potentiometer R8 or R9 just to point where VOM indicates high voltage.	
58n	Repeat Steps 51 and 52l except check lower band edge frequency. If necessary, repeat Steps 53m through 57n to adjust lower band edge frequency.	
59n	Repeat Steps 51 through 58n as many times as necessary to have both upper and lower band edge frequencies within tolerance limits given in Table D.	
60	Remove 158A adapter and restore circuit pack to service.	
61	Repeat Steps 45 through 60 for each remaining channel to be adjusted in high group using appropriate limits from Table D.	
62	At test circuit— Remove cord connection between terminals 31 and 16 on terminal strip B.	
	Note: Steps 63 through 68 may be omitted if Test B (Sensitivity Test and Adjustment) is to be performed. Be sure to have all connections as shown in Fig. 1 before starting Test B.	
63	Remove all connections established as shown in Fig. 1.	
64	At telephone set on TTP— Operate access trunk 1 key.	
65	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	Access trunk 1 lamp lighted. At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
66	At telephone TOUCH-TONE set— Dial 1 + TGN + MEMN + ST for appropriate SRTT to the TTP.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp flashing at 120 ipm.

SECTION 232-135-502

STEP	ACTION	VERIFICATION
67	At telephone set— Place handset on-hook or release TRFR key at TEL CKT on TTP.	At telephone set— Access trunk 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
68	At ACCESS TRUNK 1 CONTROL— Depress RLS key.	At ACCESS TRUNK 1 CONTROL— SUPV lamp extinguished. EQPT ST lamp extinguished. At maintenance TTY— Receive M SV RST output message.
B. Sensitivity Test and Adjustment		
	<i>Note 1:</i> The following test should be performed only if all the requirements of Test A have been met.	
	<i>Note 2:</i> If option M is provided, an A1009 circuit pack is in equipment location 14. If option N is provided, an A163 circuit pack is in equipment location 14.	
13a	If option N is provided— Proceed to Step 23e.	
14b	If option M is used— At OSC— Adjust output level to -5.0 dBm.	
15b	Adjust frequency to 941.0 Hz.	At VOM— Meter indicates high voltage.
16b	At OSC— Decrease output level to point where VOM indication drops from high to low value; and then slowly increase output level just to point where VOM indication increases to a high voltage.	At OSC— Output level indicates between -22.2 and -24.2 dBm.
17c	If requirement of Step 16b is met— Proceed to Step 32.	
18d	If requirement of Step 16b is not met— At OSC— Adjust output level to -23.2 dBm.	
19d	At test circuit— Extend input amplifier circuit pack A1009, using 158A adapter.	
20d	Slowly adjust potentiometer R15 counterclockwise to point where VOM indication drops to low	

STEP	ACTION	VERIFICATION
	voltage; then slowly adjust R15 clockwise just to point where VOM indicates high voltage.	
21d	At OSC— Decrease output level to point where VOM indication drops to low voltage. Slowly increase the output level just to point where VOM indicates high voltage.	At OSC— Output level indicates between -23.1 and -23.3 dBm.
22d	At test circuit— Restore input amplifier circuit pack A1009 to service. Proceed to Step 32.	
23e	If option N is provided— At OSC— Adjust output level to -5.0 dBm.	
24e	Adjust frequency to 941.0 Hz.	At VOM— Meter indicates high voltage.
25e	At OSC— Decrease output level to point where VOM indication drops from high to low value. Then slowly increase output level just to point where VOM indication increases to a high voltage.	At OSC— Output level indicates between -19.9 and -21.9 dBm.
26e	If requirement of Step 25e is met— Proceed to Step 32.	
27f	If requirement of Step 25e is not met— At OSC— Adjust output level to -20.9 dBm.	
28f	At test circuit— Extend input amplifier circuit pack A163 using 158A adapter.	
29f	Slowly adjust potentiometer R15 counterclockwise to point where VOM indication drops to low voltage; then slowly adjust R15 clockwise just to point where VOM indicates high voltage.	
30f	At OSC— Decrease output level to point where VOM indication drops to low voltage. Slowly increase the output level just to point where VOM indicates high voltage.	At OSC— Output level indicates between -20.8 and -21.0 dBm.
31f	At test circuit— Remove 158A adapter and restore input amplifier circuit pack A163 to service.	

SECTION 232-135-502

STEP	ACTION	VERIFICATION
32	Remove all connections established as shown in Fig. 1.	
33	At telephone set on TTP— Operate access trunk 1 key.	
34	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	Access trunk 1 lamp lighted. At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
35	At telephone TOUCH-TONE set— Dial 1 + TGN + MEMN + ST for appropriate SRTT to the TTP.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp flashing at 120 ipm.
36	At telephone set— Place handset on-hook or release TRFR key at TEL CKT on TTP.	At telephone set— Access trunk 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
37	At ACCESS TRUNK 1 CONTROL— Depress RLS key.	At ACCESS TRUNK 1 CONTROL— SUPV lamp extinguished. EQPT ST lamp extinguished. At maintenance TTY— Receive M SV RST output message.